FORTY-THIRD QUARTO VOLUME

From July 1, 1907, to December 31, 1907

RAILROAD GAZETTE

A JOURNAL OF TRANSPORTATION, ENGINEERING AND RAILROAD NEWS

(Established in April, 1856)

FIFTY-SECOND YEAR

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INDEX

Forty-third Quarto Volume—July 1, 1907, to December 31, 1907

AUTHORS

GENERAL INDEX

[Illustrated articles are indicated thus; Editorials thus†; Contributions thus‡.]*

D

E

GENERAL INDEX—Continued.

[Illustrated articles are indicated thus; Editorials thus†; Contributions thus‡.]*

GENERAL INDEX—Continued.

[Illustrated articles are indicated thus; Editorials thus†; Contributions thus‡.]*

O

P

R

GENERAL INDEX—Continued.

[Illustrated articles are indicated thus; Editorials thus†; Contributions thus‡.]*

U

V

W

Y

NEW PUBLICATIONS.

INTERSTATE COMMERCE COMMISSION RULINGS.

PERSONAL.

[Portraits are indicated thus.]*

OBITUARY.

[Portraits are indicated thus.]*

ELECTIONS AND APPOINTMENTS.

RAILROAD CONSTRUCTION.

RAILROAD CONSTRUCTION—Continued.

RAILROAD CORPORATION NEWS.

RAILROAD CORPORATION NEWS—Continued.

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS.

THE BRITISH AND EASTERN CONTINENTS edition of the Railroad Gazette is published each Friday at Queen Anne's Chambers, Westminster, London. It contains selected reading pages from the Railroad Gazette, together with additional British and foreign matter, and is issued under the name Railway Gazette.

CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.

ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

CONTENTS

VOL. XLIII., No. 1. FRIDAY, JULY 5, 1907.

We show in another column photographs of some of Governor Hughes' new Public Service commissioners. The formation of the two boards was announced last Friday, only three days in advance of the time when it was necessary for them to commence their duties. A plain characteristic of both the up-state and the New York City commissions is that they have been chosen on purely non-political grounds. The Governor evidently does not regard these commissions as a sailors' snug harbor for worthy politicians, and it is sure that so long as Mr. Hughes remains in office he will keep the ten places filled with the best men he can get to accept the somewhat arduous conditions of service. We have no comment to make as to the special fitness of the men chosen to perform the monumental task at hand. We believe that they will be conservative and that they will earnestly try to drive the team of unruly horses committed to their charge. We venture the prophecy that a great deal of the future state corporation regulation in this country will depend upon the success of their efforts.

While the discussion on rails at the annual meeting of the American Society for Testing Materials was disappointing in that it failed to emphasize specifically the many bad features of present mill practice and bring out any strongly expressed opinions as to how better rails could and should be made, it at least had the effect of forcing a show of hands by the rail makers in the specifications presented for adoption. These specifications, which are printed elsewhere in this issue, were obviously a compromise on the part of the members of the committee representing the railroads. They got all they could get, not all they wanted to get, from the representatives of the rail makers. For the purpose of getting the committee report before the meeting the railroad representatives concurred with the rail makers and signed a specification under which, with present conditions, it is practically impossible to get high quality rails even if the maker adheres rigidly to all the provisions. The time for such action was opportune in the light of other circumstances. The committee on rails of the American Railway Engineering & Maintenance of Way Association has agreed on a specification drawn to give the railroads what they want, regardless of what the steel makers are willing to furnish. The committee on rails of the American Society of Civil Engineers, it is understood, will recommend for future, not present consideration, a redesign of the section for heavy rails, together with rigid requirements as to methods of manufacture. At the coming conference between the rail makers and the committee of the American Railway Association the issue can be sharply drawn by comparing these three specifications, one representing the extreme requirements acceptable to the rail makers; the other two representing the lowest requirements acceptable to the railroads.

We should seize the opportunity that is presented by legislation in other states tending to make further railroad construction there unprofitable, to attract railroad capital to Kentucky. We should offer the equal protection of the law, fair treatment and an assurance that those who are willing to benefit Kentucky by making investments in the state will have the good will of her people.

Does this quotation from a set of resolutions passed by the Louisville Board of Trade June 17 indicate that the tide has turned? Can it be taken to show that the wave of hostility towards corporations in general and railroads in particular has reached the high-water mark and that henceforth the efforts of the agitators will recede gradually, each from the high record made by the one before him? We hesitate to believe that this is the case and yet we feel that the earnest efforts of a few more boards of trade supplemented by the example and precept of a few more governors like Mr. Hughes who know how to veto, would go far towards correcting a very socialistic and dangerous state of the public mind. Why cannot influential and sober minded citizens in every state assemble together as the Louisville Board of Trade has done and put themselves on record in some fashion like the following, which we quote:

> This board favors legislation, if such be necessary, to prevent fictitious capitalization while demanding the enforcement of laws to correct corporate abuses, as well as the punishment of those who fail to obey such laws; but it believes that what is now in order and for the interests of the public, as well as for the interests of the railroads, is co-operation between the people of the state and the railroads with a view to the good of both. We believe that if the railroads honestly accept their responsibilities to the public and endeavor to live up to them, then the public should as honestly strive to make the business of the railroads successful and profitable. Public hostility, harsh criticism and drastic legislation can serve no good end.

If this were done, we believe that a little wholesome competition between the states to encourage the development of corporations

would prove a good deal more profitable for all concerned than the present competition to drive them out of business.

In civics there is the familiar adage that "politics makes strange bedfellows." In railroading there ought to be some like proverb to express the strange incongruities that events bring about and especially those events that sometimes attend great railroad mergers. It is, for example, a scant two years since the New York, New Haven & Hartford took in the Ontario & Western. Its uses in the Connecticut legislature were immediate and effective. The New York Central was, as an offsetting step, seeking a cross-cut through northwestern Connecticut to the Boston & Albany line, and was making its survey. The new line could be built under the Connecticut general railroad law. But President Mellen flung himself athwart the path. He appealed in "open-air lobby" to the state legislature for what was practically a repeal of the general railroad act. Were Connecticut and New England to be cut off from cheap coal via the O. & W.? Was the New Haven to be penalized for this beneficent act by the legislature's assent to the New York Central crosscut? The legislature answered with an emphatic "No," and granted the repealer. Two short years have passed and lo! the omens point to return of the philanthropic O. & W. to the New York Central as, presumptively, a makeweight in the Boston & Maine deal. There is another odd historical twist in New England railroad happenings not so incongruous as it is picturesque. It will be recalled how some fourteen years ago President C. P. Clark, of the New Haven, agreed with the Connecticut River Railroad Company's directors for an absorption of their snug and profitable property, reaching up into Boston & Maine territory; and how Boston & Maine interests, acting through Boston bankers, bought up, at a great price, a majority of the scattered Connecticut River shares, blocked the deal and merged the line with the Boston & Maine system. Now, a decade and a half later comes along with giant strides the New Haven again and engorges not only the Connecticut River child, but the Boston & Maine parent. Thus, on the railroad stage, is American comedy—and now and then Greek tragedy—enacted in vivid colorings and contrasts.

A discussion of the trolley situation in Ohio, as regards competition with the steam railroads, was printed in the *Railroad Gazette*, February 6, 1903, and figures of the losses to the steam roads in the vicinity of Cleveland were shown. These have been widely quoted, turning up this spring in Herrick and Boynton's *American Electric Railway Practice.* We are now enabled to bring this table up to the year 1907, as follows:

LAKE SHORE & MICHIGAN SOUTHERN.

Passengers Carried Between Cleveland and Oberlin, and Intermediate Points.

Year.	Westbound.	Eastbound.	Total.	Average per month.
1895.....	104,426	98,588	203,014	16,918
1902.....	46,328	45,433	91,761	7,647
1906.....	58,837	57,294	116,131	9,678
Passengers Carried Between Cleveland and Painesville and Intermediate Points.				
1895.....	97,460	101,832	199,292	16,608
1902.....	13,106	15,602	28,708	2,392
1906.....	19,204	21,982	41,186	3,432

NEW YORK, CHICAGO & ST. LOUIS.

Passengers Carried Between Cleveland and Lorain.

Year.	Total passengers.	Revenue.	Average revenue.
1895.....	42,526	$25,523	60.0 cents.
1902.....	9,795	4,379	44.0 "
1906.....	7,422	3,836	54.7 "

Oberlin is 34 miles from Cleveland, Painesville 29, and Lorain 26. The statistics of the trolley roads are not kept in such fashion that exact comparisons can be made of the gains to offset these losses. Seven years after the trolley lines began active business, one of them, covering approximately the territory described in one of the above classifications, was doing thirty times the short-haul business of the steam road between the same points. It is worthy of note that the passenger business on the Lake Shore & Michigan Southern, between the points cited, after languishing to a minimum in 1902, is now increasing again, though the increase is slight. On the other hand, the business between Cleveland and Lorain, on the New York, Chicago & St. Louis, is even smaller than it was five years ago. It is to be regretted that there is no statistical method of showing the increases in general business arising from the building up of suburban traffic by the trolley lines. Nevertheless, it may be risked with assurance that the total effect of this trolley line development has been to increase, rather than decrease, the earnings of the steam roads.

VOLUNTARY PUBLICATION OF ACCIDENT REPORTS.

Mr. Kruttschnitt's decision to publish the true causes of all accidents which may occur on the Union or Southern Pacific lines is warmly to be commended.* There can be no doubt that the only motive actuating either the managing officers or the directors above them is the laudable one given in the announcement—to "reduce the risk of casualties to the extreme minimum." And yet a perusal of this announcement suggests some mild speculations concerning the probable actual results. A "policy of perfect frankness" toward the public will have to contend with a chilling atmosphere. Not that people will refuse to take the railroad's word at its full value; but "the public" is such an elusive entity to deal with. The average reporter and the average editor believe in blaming the company instead of the employees for most accidents, and this bent of their minds will influence everything that they say or do. And, for better or worse, these managers of the news-machine do mould public opinion in this matter. In some newspapers, the railroad's statements will have to be stereotyped by the road itself, to insure a fair presentation, if we may judge by those papers' treatment of accident news in the past.

The announcement expresses the hope that publishing the causes of accidents will help the company to enforce better discipline; which must mean that the superintendents, when acting in private, cannot enforce their orders. This is equivalent to a declaration that the employees are decidedly unruly; and as the first article of the newspapers' creed is friendship to the employee no one need expect that facts unfavorable to an employee are going to be heralded with any excessive gladness. The statement that an engineman is directly responsible for a collision, and therefore should bear, say, 99 per cent. of the responsibility, and that the superintendent who made or approved a faulty rule or failed to detect the faults of a faulty man is chargeable with only 1 per cent., will be received with incredulity. In any event the newspaper critic will advocate the imposition of 99 per cent. of the punishment on the company. That is the attitude of juries also. It takes a strong and determined judge to make jurymen accept any other view: and if they accept it they are likely still to acquit or disagree.

The newspapers, with rare exceptions, aim to please the greatest number of readers, which, in the case of "labor"—the brotherhoods—versus a railroad company means please "labor" every time. The employees' brotherhoods believe that brothers should go free of punishment even when they have caused a collision or a derailment—for the reason, perhaps, that they think the penalties under the criminal laws are too severe.

But publicity in this matter will do good whether it does or does not result in immediately strengthening the arm of justice. The attitude of the press could not easily be changed even if Mr. Kruttschnitt were to have his accident investigations made and published by expert outside unbiased critics; but it seems a pity that this could not be done. Our Government has been inexcusably slow in this matter. Government investigation has not always been char-

*The Union Pacific System and Southern Pacific Company, courting full investigation, have decided to give freely and fully all information at command to throw light upon the causes and responsibilities for railroad accidents. The findings of boards of inquiry will be given to the daily papers, and the policy of the company will be one of perfect frankness with the public as to these matters.

Investigation of accidents by such boards of inquiry have long been an established policy, having been inaugurated on the Pacific System over four years ago, and on the Union Pacific Lines for more than three years. Whenever an accident occurs the cause of which is not apparent beyond question, the Division Board of Inquiry, made up of the division superintendent, the master mechanic and the resident engineer, is convened immediately . . . and submits its findings by wire to the general office with formal reports by mail, the report being signed by all members concurring in the conclusions. All employes involved are independently questioned, their answers being taken down in writing. Examinations are made of rolling stock and track where accidents may have possibly been traceable to such causes, and every effort is made to determine the cause of the accident clearly and unquestionably. The report "causes unknown" will not be accepted until every means of locating the cause has been exhausted.

Where members of the Division board do not agree, or where their report is not satisfactory, a second board of inquiry, made up of the General Superintendent, the Superintendent of Motive Power and the Chief Engineer in charge of Maintenance of Way and Structures, is convened by the General Manager. This higher board proceeds to the scene of the accident and . . . must likewise submit its finding to the General Manager. If the General Manager still has any doubt, he is authorized to employ expert assistance and adopt any other means necessary to determine the cause of the accident. The findings of the Board of Inquiry conducted in this manner are absolutely unbiased, and it is hoped that this policy, taken in connection with the surprise tests of signal observations by train and engine men and the large amount of block signals lately erected, which at the close of the year should provide this protection on nearly 4,700 miles of track—most of this work being done in the past two years—together with earnest and well-directed effort on the part of the officers, will be of material assistance in reducing the risk of casualties to the extreme minimum.

acterized by perfection, even under the excellent system established by the British government, but notwithstanding the limitations of human fallibility a railroad manager finds a government report a much more satisfactory means of answering criticisms of newspapers or individuals than any statement which he can himself make. He cannot possibly write or speak with the true perspective—or at any rate not with a perspective that will satisfy the public. He can be unprejudiced but he can never make people generally believe that he is. Railroads have for years in important accidents admitted the fullest responsibility for the fault by paying immense sums in damages beyond what a strict construction of the law would require of them, and yet public criticism is not allayed.

The thing that would most please the public would be to let people see what is done to cure the accident evil. Levelheaded citizens are not so much interested to know whether it is Engineman Brown or Conductor Jones that is responsible, as to see what is done to prevent conductors and enginemen from committing the same error in the future. In this matter the English system falls short of satisfying the public. The railroad journals publish the Government inspectors' reports with all necessary fulness, but these do not say what discipline has been administered, nor—until perhaps a year or two afterward—does the public know anything as to how fully the companies carry out the recommendations of the inspectors.

In speaking of this feature of the subject we are not criticising Mr. Kruttschnitt in particular for he has done as much, probably, as any manager in America, toward carrying out a true policy of frankness and in making the practices of the subordinate officers such that they will bear publicity. In his plans for block signaling thousands of miles of line within a single year he has evinced a financial and practical boldness never before heard of; and, judging by the testimony of unprejudiced eastern railroad managers who have visited the Union Pacific lines, the discipline of trainmen on those lines is as marked in its excellence as is the policy of the company in easier problems. If any eastern railroad officer desires to take a summer-school course in the Great American Railroad University he cannot afford to neglect the advantages offered by the "field observations" available west of the Missouri river. Indeed, we do not know but this is what Mr. Eustis means when he advertises so loudly in the magazines to "Spend Your Vacation in Colorado."

SALE OF THE CENTRAL OF GEORGIA.

The Central of Georgia operates 1,890 miles of line, about two-thirds of which is in Georgia, one-third in Alabama, and 41½ miles, over which it reaches the city of Chattanooga, in Tennessee. Its most important through lines are from Chattanooga, Tenn.; Atlanta, Ga., and Birmingham, Montgomery, Andalusia and Lockhart, Ala., via Macon, Ga., to Savannah. Several parts of it parallel lines of the Southern Railway. The Central of Georgia has within recent years come to be prosperous. Beginning with the first payment on the third series in 1905, 5 per cent. has since been paid on the first, second and third preference income bonds. The first payment on the second incomes was in 1904, before which the two junior series had never received any return. These securities are the ones in which the public is interested. The exact ownership of the $5,000,000 stock was not generally known up to last week except that it was in some way held in trust in the interests of the Southern Railway, which, because of its parallel and competing lines, was unable to take over control as a matter of public record. However, the late Samuel Spencer and another Southern Railway director were directors of the Central of Georgia. It now appears that this stock has been held by the same committee which in 1894 reorganized the old Richmond & West Point Terminal Railway & Warehouse Company, of which the Southern Railway is the successor company. This committee has maintained its existence in order to hold this Central of Georgia stock which came to it in the course of reorganization of certain roads in Georgia in which the Richmond Terminal Company was interested. It was announced last week that the Richmond Terminal reorganization committee has sold its holdings—almost the entire capital stock of the Central of Georgia—to Oakleigh Thorne, a New York banker, and Marsden J. Perry, of Providence, R. I., who are for the present to operate and develop the road as an independent property. The proceeds of this sale are to be turned over to the Southern, which, though it never actually held control of the Central of Georgia, is entitled to the financial benefit of any sale of the stock held by the Richmond Terminal committee. This sale of the road by the reorganization committee apparently marks the [illegible] on the part of the Southern Railway that it is preferable to give up the advantages of an allied control in order to set itself right in the eyes of the people of Georgia, who have shown great dissatisfaction with its alleged control of the local road. One of the most valuable parts of the property thus sold is the Ocean Steamship Company, which has lines from Savannah to New York and to Boston. As no report of its operations is made and as it is carried upon the balance sheet of the Central of Georgia at an absurdly small figure it is not possible to judge accurately as to its value; but it is one of the most successful coastwise lines, and we are inclined to think that it could have paid the whole cost of one or two new steamers out of its aggregate surplus earnings for the last three years. Since the sale was announced it has been suggested that the Central of Georgia will eventually be sold to the Rock Island Company in order to give the St. Louis & San Francisco an outlet to the Atlantic seaboard. The two roads connect at Birmingham, Ala. Should this be done, the Rock Island lines in the West would have the same sort of an advantage in rate-making that the Southern Pacific has as a trans-continental line by reason of its control of steamers from New Orleans to New York. It would then be possible to ship goods from northern Atlantic ports to Savannah by the Ocean Steamship Company and carry them from Savannah to the territory west of the Mississippi river entirely over Rock Island lines, thus giving a through water and rail line between the Southwest and New York and Boston under Rock Island management, which could compete even with the trunk lines if necessary. At the rate the Southwest is now developing, such a new through line from the north Atlantic ports should at once find plenty of traffic in addition to its potential advantages to the Rock Island Company as a rate-maker.

In India, it appears, there is no traffic department as we understand the term, the department which holds that title being almost entirely concerned in moving rather than getting the traffic. The *Indian Railway Gazette* in an editorial urges the establishment of a real traffic department with freight and passenger solicitors, after the fashion of English and American practice. At first sight this would appear to be unnecessary as for the most part there is no competition between different lines in India. Each road has its own sphere of influence and tariffs cannot be reduced below a fixed minimum. It is believed, however, that by the establishment of a separate department concerned only with securing traffic, it would be possible to extend and widen the business of any particular road by branching out in new directions and creating new industries and a desire to travel where they do not now exist. In regard to the passenger traffic, first, second and intermediate class traffic is unprofitable in India, while it is the third class traffic, made up of natives, which pays. This makes up nine-tenths of the passenger business, yet the time-tables are printed in English and are, therefore, useless to most of these travelers. Time cards and guide books might be printed in the vernaculars and distributed among the towns and villages along a line, and attractive posters setting forth the sanctity and virtue of some particular (non-competitive) shrine, posted in conspicuous places. As a unique example of progressiveness in the attraction of travel the case of a certain railroad is cited which presented to a native shrine of some sanctity a valuable jewel, in order to increase pilgrimages over its line to that point. Although it is evident from this instance that English or American traffic methods would have to be adapted to Indian conditions, yet the history of the traffic department, particularly in this country, amply proves that such an officer would be likely to succeed on an Indian railroad. The great skill of the traffic department has been its ability to adapt itself to conditions and originate means for securing traffic, and this same ability could be applied, we have no doubt, with equal success in India.

NEW PUBLICATIONS.

Proceedings of the Society for the Promotion of Engineering Education. Vol. XIV. 300 pages, 5⅝×8½ in.; cloth. Edited by Dugald C. Jackson, Charles L. Crandall and Wm. T. Magruder, Committee. The Engineering News Publishing Co., New York. 1907.

The volume at hand contains the roll call of the society, a report of the fourteenth annual meeting, and a collection of some 19 papers presented at the meeting. These give a pretty wide outlook of the problems arising in the education of young engineers, and are well worth reading by those interested in the subject.

Specifications for Street Roadway Pavements. By S. Whinery. New York: The Engineering News Publishing Co., 1907. Pamphlet, paper cover; 6 in. × 9 in. Price, 50 cents.

The municipal engineer is often called on to frame specifications for street pavements and if he is not, by reason of wide experience, familiar with the many peculiar conditions of this class of work,

he may find difficulty in adopting a specification from other sources which will properly safeguard the municipal interests and be fair to the contractor. In such cases a broad general specification is of value as a guide, and such a specification based on the best current practice in street paving is contained in this pamphlet. Mr. Whinery, recognizing the wide difference of opinion among engineers as to many details of practice and standards, has not laid down the conditions covering these points in a dogmatic spirit. Throughout the pages there are numerous explanatory footnotes giving the author's reasons for the wording used or outlining alternative methods which might be employed.

The general spirit of the specifications is to lay down the methods and standards of material to be used leaving the engineer to assume the responsibility for the results. This requires rigid enforcement of the provisions of the contract, but in the author's opinion is better than a specification framed to secure only the required results without regard to the methods or materials employed, or on the other hand, a specification which attempts to lay down the methods and place the responsibility of the results on the contractor.

The specifications here given include the introductory general clauses, foundations of concrete, paving stone and broken stone, bituminous or asphalt pavements both sheet and block, granite, brick and wood block pavements, and a broad general specification for new and untried pavements laid under service guarantee only.

CONTRIBUTIONS

Rolling Rails in a Universal Mill.

Chicago, June 26, 1907.

To the Editor of the Railroad Gazette:

In your issue of June 7 you published a new section for 100-lb. rails designed by Capt. R. W. Hunt, which has been adopted by a large railroad system. Capt. Hunt says that this section is designed to overcome the imperfections due to the difficulty in making the metal fill out the thin flanges, which necessitates rolling the steel at a much higher temperature than would be necessary if the flanges were made thicker, as he proposes. This may be true, but the proposed section will not cure the difficulty.

The trouble with the wide rail flange is in the delivery from the rolls, the angle made by the face of the flange with the axis of the rolls being such that true rolling action is impossible; so that, with the exception of perhaps one or two passes, the metal in the flange gets very little work other than the churning of the lower roll on the face of the flange. Moreover, if the defects in the flange are due to the high finishing temperature, why does not the head develop still greater defects, since the finishing temperature of the head is much higher than that of the flange?

The weakest part of the American rail has always been in the flange, in spite of the fact that the sections are unbalanced; that is, the center of gravity of the section is nearest the flange. In a paper read before the Western Society of Engineers, May 29, 1907, the writer called attention to the defect in the standard rail sections in this regard; but the proposed section is even a greater offender in this respect.

In any beam subject to bending, the distance of the outer fibers from the neutral axis should be the same, both above and below the neutral axis, in order to have no part of the section on one side subjected to a higher stress than on the other side. In other words, the center of gravity of the section should be in the center of the figure. This is fundamental. The proposed section departs so far from this principle that the metal in the head will be subjected to a stress 24 per cent. higher than in the flange, so that, although the rail has been made deeper, its efficiency as a beam has been actually reduced. To be sure, this will relieve the metal in the flange from some of its duty, but it will be at the expense of the metal in the head.

If the metal in the flange is inferior to the metal in the head, then there is only one remedy, and that is to give the metal in the flange more work. This points to the utilization of a universal mill of the Grey type, such as is in operation in Differdingen, Germany, for rolling broad-flange beams. Such a mill is now being built by the Bethlehem Steel Company for rolling beams in this country. The Bethlehem Steel Company considered the rolling of rails in such a mill, but they felt that the development of the Grey mill for producing structural shapes was a sufficient burden to undertake, for the present at least. Thus the idea of rolling rails in a universal mill is not new, and has been proposed by Mr. Henry Grey, the inventor of the Grey mill.

In considering the rolling of rails in a universal mill, the question will arise as to the possible tonnage capacity of such a mill as compared with the present three-high mill. This can be answered by making the horizontal rolls, and perhaps the vertical rolls as well, three-high in the proposed universal mill, so that the metal in the rail, in all of its parts, would receive exactly the same amount of work. A three-high universal mill for rolling thin skelp is now in operation at the National Tube Works, McKeesport, Pa.

J. W. SCHAUB,
M. Am. Soc. C. E.

The Italian Railroads.

Rome, Italy, May 22, 1907.

To the Editor of the Railroad Gazette:

In your generally so well informed paper I am sorry to notice a paragraph about the present state of Italian railroads, which, I am glad to say, is absolutely unfounded. The incident about the King of Italy having to abandon a trip because he could not find a spare engineman is too amusing, and you yourself express doubt about its truth. I am glad to say it was not true.

The Mayors of Genoa, Milan and Turin met, but they met for the purpose of spurring the government to build a new, more direct line between these cities; and the project has been given careful consideration. The proposal to buy more rolling stock was made in November, 1905—rather a long time ago—and a very large proportion of the new material has already come into service, and the rest will be completed and put in use before autumn.

The wages of the *personnel* have all been increased from 10 to 20 per cent., and a very good feeling now has been cemented between our employees, the administration in general, and its able Director-General, Commendatore Riccardo Bianchi, who is absolutely idolized by his friends, and even respectfully admired by his political opponents.

On the whole, I am glad to say, Italian railroads are now on an excellent basis, and the service has become quite normal and satisfactory, notwithstanding the enormous increase in the traffic—fully 22 per cent.—in comparison with 1905, and the inevitable difficulties arising from the welding together of four different railroad systems, with more than 120,000 employees, with different regulations and habits, and accustomed even to different signals. For several months no complaints have been made against the service, which is settling down to a normal and active pace.

LUIGI LUIGGI,
Administration Councillor, State Railroads.

The Highest Railroad Station.

Newark, Del., June 3, 1907.

To the Editor of the Railroad Gazette:

There are a number of railroad stations in Peru that are higher than the one at Corona, Colo. Vincocaya, on the Arequipa & Puno R. R., is 14,360 ft. On the Central Railroad of Peru there are several.

Chicla	12,215 ft.
Casapalca	13,606 "
Yauli	13,420 "
Oroya	12,178 "
Cerro de Pasco at the end of branch from Oroya is	13,974 "
Oroya is the lowest point on that road.	
The lowest point on the Central system is on the dock in Callao; it is	8.7 "
The highest is in the Galera Tunnel	15,666 "

All of these are standard gage railroads.

JAS. R. MAXWELL.

Sixty-six Miles an Hour for Twenty-four Hours.

New York to Chicago in 13 hours, 45 minutes, would mean a speed unheard of for that distance, namely, 66 miles an hour; but that is the rate which was made with an automobile in England last week on a three-mile racing track in a 24 hours' continuous run, the total distance traveled being 1,581¾ miles. This run of a day made by the same man, equals the distance from New York by the New York Central, the Rock Island (via Englewood) and the Union Pacific to Thummel, Neb., 126 miles beyond Omaha, and nearly to Central City; or from Jersey City by the Pennsylvania and the Burlington to within eight miles of Holdrege, Neb. The following details are from the *New York Times*:

In the 24 hours ended at 6 o'clock Saturday evening, June 29, S. F. Edge, in his six-cylinder Napier motor car, traveled 1,581 miles and 1,310 yards over the Brooklands racing track at Weybridge, and nothing approaching that speed had ever been maintained for 24 hours by motor car, railroad train or any other locomotive apparatus. Mr. Edge undertook to cover 1,440 miles in 1,440 minutes, and bettered it by 141 miles 1,310 yards. Never once did Edge's speed fall under 60 miles an hour. Many times the daring rider had to stop on account of punctured tires to have a wheel replaced with lightninglike quickness by expert mechanics. Two cars accompanied him, driven by relays of drivers. The cars swayed on their springs like hammocks, now and again bumping over obstacles with a jerk that would have sent an unwary rider headlong. The feeding of Edge was entrusted to the mechanician who accompanied him. He gave tabloids and coffee nibs. Edge thinks with a racing car he could make 85 miles an hour for 24 hours.

In the ninth hour the distance traversed was almost 72 miles;

in the fourteenth hour 78 miles and 450 ft. The Brooklands track is at Weybridge. It is pear shaped, the two long sides being each one mile long. It was built specially for automobile speeding and is 100 ft. wide. In the curved portions the outer half is banked, the outer edges being perpendicular. The roadway is of concrete. It is impossible to walk up the banking higher than 15 ft. from the top. Around the course are entry boxes equipped with telephones. A special staff, an ambulance car, and a breakdown gang are always in attendance. For spectators there are three inclosures, with a total seating capacity of 30,000 and a holding capacity of 500,000. The track is practically an inverted coliseum, for while in the Roman amphitheater the spectators surrounded the arena, at Weybridge the arena surrounds the spectators. The entrance to the inclosures is by means of three tunnels under the track.

Changes in the Rules of Interchange.

The Arbitration Committee of the Master Car Builders' Association this year recommended a number of changes in the Rules of Interchange which were adopted as a whole by the Association. We give below the principal revisions referring to the numbers of the rules in force during the past year.

Rule 2.—The following paragraph is added: "In case cars are rejected by the receiving road and returned to the delivering company all the defects objected to must be designated on a return card of the following form, placed on the car adjacent to the destination card:

RETURN CARD.

..... Car No. . . . .

from ..... Ry.,

to ..... Ry.,

for the following defects: .....

.....

.....

.....

.....

.....

.....

Inspector.

Rule 21.—Omit "For wheels cast after Aug. 31, 1904," on the drawing accompanying the rule.

Rule 22.—Changed to read: "Axles broken or having seamy or pitted journals, fillets in back shoulder worn out, or collars broken off or worn to ¼ in. or less under fair usage."

Rule 29.—Changed to read: "Torn air hose, defective, missing or worn-out parts of brakes, not elsewhere provided for, which have failed under fair usage, except missing material on cars offered in interchange. Owners responsible."

Rule 32.—Changed to read: "Missing air-brake hose or missing or broken air-brake fittings, etc. Delivering company responsible."

Rule 34.—Omit the words "or air-brake pipes, but no air-brakes."

Rule 36.—Omit that part of the rule referring to date.

Rule 46.—Heading covering combination of defects changed to read: "Combination of defects which denotes unfair usage if occurring at the same end of the car."

Rule 48.—Changed to read: "Damage to coupler, accompanied by damage to either combined front and back coupler stop, filling block draft timber or its substitute, or end sill."

Rule 50.—Changed to read: "Damaged combined front and back coupler stop or filling block, accompanied by damage to either coupler or end sill."

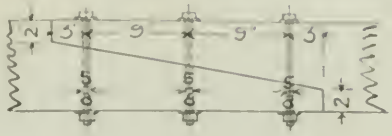
Rule 53.—Changed to read: "Damaged end sill, accompanied by damage to either coupler, coupler pocket, combined front and back coupler stop, filling block, draft timber or its substitute, or longitudinal sill."

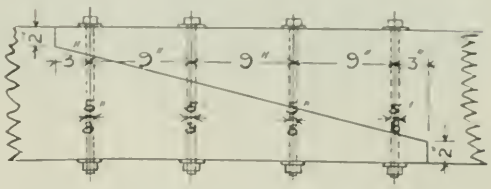
Rule 56.—Footnote regarding American continuous draft key changed to include also the draft rod.

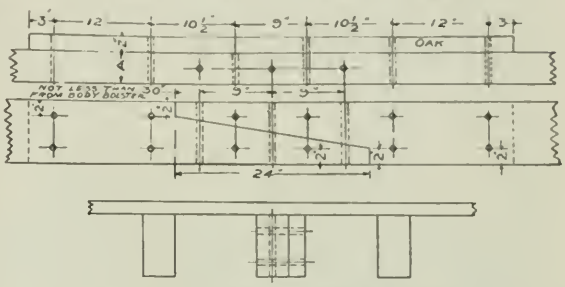
Rule 65.—Changed to read: "The splice may be located either side of body bolster, but the nearest point of any splice must not be within 12 in. of same, excepting center sills, which must be spliced between body bolster and cross-tie timbers and not within 30 in. of either. The splicing of two adjacent sills, *except center sills*, at the same end of car or the splicing of any sill between cross-tie timbers, will not be allowed.

"Steel sills may be spliced as shown in Figs. A, B and C at any point, and one or more sills may be spliced at same end of car."

The form of splicing wooden sills shown herewith is approved.







Rule 72.—Changed by the addition after the word "car" in the third line the words "or if the light weight is obliterated."

Rule 89.—Schedule of prices for wheels and axles revised as follows:

	New.	Second-hand.	Scrap.
One 36-in. cast-iron wheel	$10.50	$7.75	$5.25
One 33-in. cast-iron wheel	9.00	7.00	4.75
One 33-in. steel or steel-tired wheel	23.00	17.25	5.00
One axle, 100,000 lbs.	21.50	14.75	7.75
One axle, 80,000 lbs.	17.75	10.00	6.50
One axle, 60,000 lbs.	14.00	7.75	5.25
One axle, 50,000 lbs. (or under)	11.50	6.25	4.25

Also omit sentence reading: "All steel or steel-tired wheels of the different makes to be charged at current market prices, less freight charges."

Rule 91.—The prices charged under this rule have been revised to bring them more nearly on a level with current market prices. Prices have been inserted for the different parts of the 10-in. air-brake equipment as well as the 8-in. The following are the principal changes:

	Charge.	Credit.
Castings, rough iron, per pound	$0.02	$0.00 9/10
Castings, rough, malleable, per pound	.03½	.00½
Coupling, dummy	Eliminate.	
Coupler, M. C. B., complete, new, malleable iron 5x5 shank	Eliminate.	
" M. C. B., complete, new, steel, 5x5 shank	8.75	.....
" M. C. B., complete, new malleable iron, 5x7 shank	Eliminate.	
" M. C. B., complete, new, steel, 5x7 shank	9.50	.....
" body, one, new, malleable iron, 5x5 shank	Eliminate.	.90
" body, one, new, steel, 5x5 shank	6.50	1.05
" body, one, new, malleable iron, 5x7 shank	Eliminate.	1.00
" body, one, new, steel, 5x5 shank	7.75	1.15
" knuckle, one, new, open, omit charge, credit remain	.....	.40
" Knuckle, one, new solid	2.00	.45
Other individual malleable, wrought or steel parts	.04	.....
Door for end of box or stock car, wooden, each, applied, no credit for scrap	1.95	.....
" for end of box or stock car, ventilated (wooden frame with iron rods), each, applied, no credit for scrap	3.30	.....
" for side of box or stock car, wooden, each, applied, no credit for scrap	3.65	.....
" for side of box, or stock car, ventilated (wooden frame with iron rods), each, applied, no credit for scrap	5.50	.....
" (new item) for side of carriage, automobile or furniture car, wooden, each, applied, no credit for scrap	5.00	.....
" for side of stock car, with iron rods, each, applied, no credit for scrap	4.40	.....
" for roof of coke car, wooden, each, applied, no credit for scrap	2.45	.....
" for roof of stock car, wooden, each, applied, no credit for scrap	.85	.....
Half-door, for side of box or stock car, each, applied, no credit for scrap	2.50	.....
Journal bearings, brass or bronze, lined or unlined, per pound, applied	.20	.15
Journal bearings, filled, brass or bronze, shell, per pound, applied	.15	.11

(The weight charged for new journal bearings

for 7-in. journals and over, but not 8 in. long, shall be 10 lbs.; for scrap bearings, 6 lbs. The weight charged for new journal bearings for journals 8 in. long and less than 9 in. long shall be 13 lbs.; for scrap bearings, 8 lbs. For new journal bearings for journals 9 in. long or over, but not 10 in., 20 lbs.; for scrap bearings, 12 lbs. For new journal bearings for 100,000-lb. capacity cars 15½x10 in. the weight shall be 25 lbs.; for scrap bearings, 15 lbs.		
Labor per hour	.25	.....
Lumber, as specified, per ft.	.03½	.....
Steel for springs, rough, per lb.	.05	.00¾
Steel, pressed and sheet, per lb.	.03½	.00½

Rule 97.—Change word "channels" to "structural steel."

Rule 105.—Increase charge for altering height of one end of one car from $1 to $1.10 net.

Rule 106.—Changed as follows: Cut out item reading, "coupler stops, all, at one end of car, replaced, 3 hours," and change the next two items to read as follows:

Coupler, with stem attachments, coupler springs, one or more follower plates, American continuous draft key, American continuous draft rods, one or *more* coupler stops, renewing or replacing, any or all, at same end of car, at same time	3 hrs.
Coupler, with pocket attachments, coupler spring, one or more follower plates, one or *more* coupler stops, coupler pocket, coupler pocket rivets, renewing or replacing any or all, at some end of car, at same time	4 "
Siding, removed and replaced, per lin. ft.	15 cts.
Siding, removed and replaced, where nails are set and holes puttied	20 cts.
Each side or intermediate sill spliced, when *longitudinal* sills have to be replaced, as above	6 hrs.
When necessary to remove lead to replace body center plate, bolt or bolts, one or two draft timbers or draft timber bolts, at one end of car	3 hrs.
Removing temporary advertisements tacked on car, per car	50 cts.
Removing temporary advertisements, pasted, glued or varnished on cars, per car	$1.00

Under the head of "Repairs of Steel Cars," increase the rate per hour for straightening or repairing parts from 20 cents to 25 cents.

Rule 112.—All the items for air-brake repairs are increased slightly and an additional sentence added to the rule as follows: "No labor to be charged for adjusting brakes."

Rule 113.—Prices for car bodies advanced as follows: The settlement prices of new eight-wheel cars shall be as follows, with an addition of $27.50 for each car equipped with an 8-in. air-brake equipment and $35 for 10-in. air-brake equipment. The road destroying a car with air-brakes may elect to return the air-brake apparatus, including such attachments as are usually furnished by the air-brake manufacturer, complete and in good condition:

BODIES.

Wood.

Box car, 8-wheel, 40 ft. long or over	$440.00
" " 36 ft. long or over, but under 40 ft.	385.00
" " 34 ft. long or over, but under 36 ft. long	360.00
" " 32 ft. long or over, but under 34 ft. long	330.00
" " under 32 ft. long	265.00
" ventilated, 8-wheel, 40 ft. long or over	470.00
" ventilated, 8-wheel, 36 ft. long, but under 40 ft.	415.00
" ventilated, 8-wheel, 34 ft. long, but under 36 ft.	385.00
Flat car, 8-wheel, plain, 40 ft. long or over	200.00
" 8-wheel, plain, 32 ft. long or over, but under 40 ft.	155.00
" " plain, under 32 ft. long	110.00
Gondola car, 8-wheel, drop-bottom, 40 tons capacity or over	330.00
" 8-wheel, drop-bottom, 30 tons capacity or over but under 40 tons	300.00
" 8-wheel, drop-bottom, 25 tons capacity or over, but under 30 tons	275.00
" 8-wheel, drop-bottom, 20 tons capacity or under	200.00
" " hopper-bottom, 50 tons capacity	440.00
" " hopper-bottom, 40 tons capacity or over, but under 50 tons	360.00
" 8-wheel, hopper-bottom, 30 tons capacity or over, but under 40 tons	330.00
" 8-wheel, hopper-bottom, 25 tons capacity or over, but under 30 tons	290.00
" 8-wheel, hopper-bottom, 20 tons capacity or less	220.00
" " plain, 50 tons capacity and over	350.00
" " " 40 tons capacity, but under 50 tons	300.00
" " " 30 tons capacity, but under 40 tons	275.00
" " " 25 tons capacity, but under 30 tons	250.00
" " " under 25 tons	140.00
Stock car, 8-wheel, 34 ft. long or over	330.00
" " 32 ft. long or over, but under 34 ft.	300.00
" " under 32 ft. long	265.00

The lengths of cars above mentioned, refer to the lengths over the end sills.

In the case of double-deck stock cars, $25.00 may be added to the prices given above for stock cars.

Where the capacity of the car is 60,000 lbs. or over, 10 per cent. should be added to the above prices for the car bodies.

When cars of 60,000 lbs. capacity or over, and so stenciled, have trucks with journals 4 in. or over in diameter when new, $10 per car shall be added to the figure as given above for the values of car bodies, when equipped with metal bolsters.

When cars are equipped with metal center sills, $40 shall be added to the values of bodies for cost of such metal sills.

Steel.

Box car wooden body, metal underframe, 8-wheel, 50 tons capacity, 38 ft. 6 in., or over, over end sills	$825.00
wooden body, metal underframe, 8-wheel, less than 50 tons capacity, 36 ft. or over	740.00
Flat car, wooden floor, metal underframe, 8-wheel, 50 tons capacity, 40 ft. over end sills	770.00
Flat car, wooden floor, metal underframe, 8-wheel, 40 tons capacity, 40 ft. over end sills	590.00
Gondola car, all metal, 8-wheel, hopper bottom, 50 tons capacity, 33 ft. over end sills	825.00
Gondola car, all metal, 8-wheel, drop-bottom, 50 tons capacity, 40 ft. over end sills	815.00
Gondola car, all metal, 8-wheel, plain, 50 tons capacity, 40 ft. over end sills	790.00
Gondola cars, wooden body, metal underframe, 8-wheel, flat bottom, 40 ft. over end sills	790.00
Gondola car, wooden body, metal underframe, 8-wheel hopper bottom, 32 ft. over end sills, but under 40 ft.	650.00
Flat car, wooden floor, metal underframe, 8-wheel, 40 tons or over, but under 50 tons, 34 ft. long end sills, but under 40 ft.	510.00
Stock car, 8-wheel, wooden body, metal underframe, less than 50 tons capacity, 36 ft. long or over	715.00

TRUCKS.

50,000 lbs. capacity, with metal transoms and wooden bolster, pr pair	$215.00
60,000 " " " or under, with wooden bolster, per pair	215.00
60,000 " " or under, all metal, per pair	315.00
80,000 " " or under, but over 60,000 lbs., all metal, pr pair	400.00
100,000 " " or under, but over 80,000 lbs., all metal, pr pair	425.00

Prices include brake-beams complete, truck levers, dead-lever guides and bottom connection rods.

For trucks with steel or steel-tired wheels an additional allowance of $112 per car shall be made.

All trucks in service of 60,000 lbs. capacity or over, which consist entirely of metal, with the exception of the spring plank, shall be known hereafter as all-metal trucks.

Rule 114.—Changed to read: "In the case of wooden cars, the depreciation due to age shall be estimated at 6 per cent. per annum upon the yearly depreciated value of the bodies and trucks only. In the case of all-steel cars and cars with steel underframes, the depreciation shall be 5 per cent. per annum for the bodies of all-steel cars; for bodies of cars with steel underframes the depreciation shall be at the rate of 5½ per cent. per annum, with the exception of flat cars with wooden floors, which shall be 5 per cent. per annum. The depreciation on the value of trucks of steel cars shall be 5 per cent. per annum. Allowances for depreciation shall in no case exceed 60 per cent. of the value new. The amounts $27.50 and $35 for air-brakes shall not be subject to any depreciation."

Rule 115.—Paragraph added reading: "In the case of cars equipped with racks for carrying coke and other purposes, and also stock cars fitted with feeding and watering attachments, the actual cost of these equipments shall be added to the standard settlement price for such cars."

Rule 129.—Changed to read: "Companies shall promptly furnish to each other, upon requisition, and forward free over their own road, material for repairs of their cars injured upon foreign lines, excepting that the company having car in its possession at the time shall provide from its own stock the following:

"Lumber, forgings, hardware stock, paint, hairfelt, piping, air-brake material and all M. C. B. standard material.

"Requisitions for such material shall specify that same is for repairs of cars, giving car number and initial of such car, together with pattern number or other data to enable correct fitting of requisition."

Ten-Wheel Locomotive for the Chicago & North-Western.

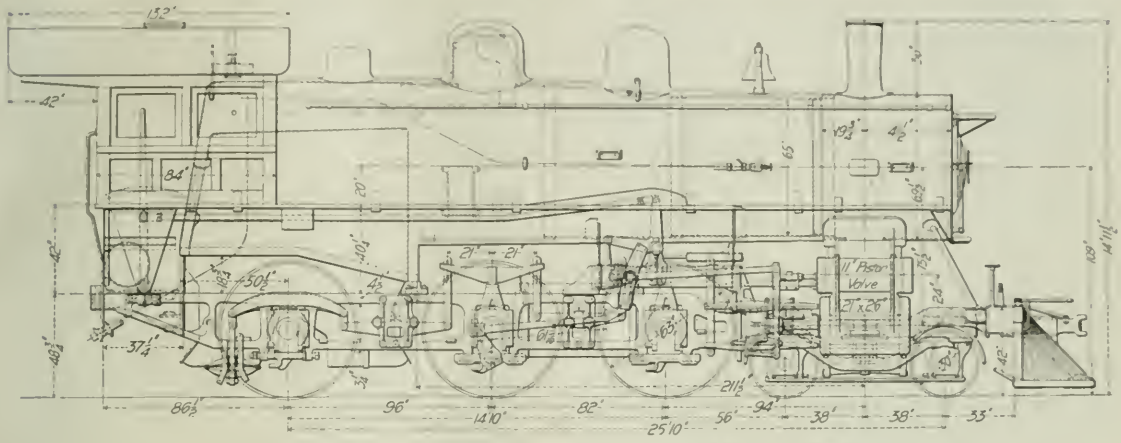
The Schenectady Works of the American Locomotive Company have recently delivered an order of 30 ten-wheel locomotives to the Chicago & North-Western Railroad, five of which are equipped with the Walschaert valve gear. These engines are for all-round freight service, and except for the valve gear are of the same specification as the class R-1 engines of that road, which have for several years been their standard engine for this class of service. To the best of our knowledge, however, these are the first engines on the Chicago & North-Western to be equipped with the Walschaert valve gear, which is another proof of the increasing opinion among railroads in favor of this type of gear.

The illustration shows clearly the application, which differs from any arrangement used on previous locomotives built by this company.

The link is supported in a steel casting bolted to the end of the cross-tie or yoke located between the front and middle pair of driving-wheels and extending beyond the driving-wheels. Connecting this cross-tie and the guide yoke and outside of the driving-wheels is a steel plate 1¼ in. thick and 10 in. deep. The reverse shaft bearing is bolted to the top of this plate just back of the center of the forward driving-wheels, and the backward extending arm of the reverse shaft is connected to the radius bar by means of a lifting link.

Another interesting feature in this design is the use of corrugated firebox side sheets. As will be seen from the boiler card, the side sheets are provided with a series of vertical corrugations throughout the length of the sheet to within the last three rows of staybolts at the front and back end, making a waved sheet. The staybolts are located at the top of the waves or in that portion of the sheet which is furthest from the fire. It is a well-known fact that the expansion and contraction that takes place in a firebox shell, due to changes of temperature, causes cracking of the sheets, and it is claimed for this arrangement that the corrugations afford sufficient elasticity to overcome those strains which finally result in the rupture of the sheet. Moreover, in the ordinary flat plate the heads of the staybolts project beyond the face of the plate so that they are more highly heated than the plate and unequal expansion takes place between the head of the bolt and the plate, causing leaks around the head of the bolt. With this arrangement the head of the bolt is somewhat protected from the fire so that the plate and the head of the bolt are more uniformly heated. In addition to these vertical corrugations in the side sheet there is a large and bulging corrugation 2 in. deep, turned on a radius

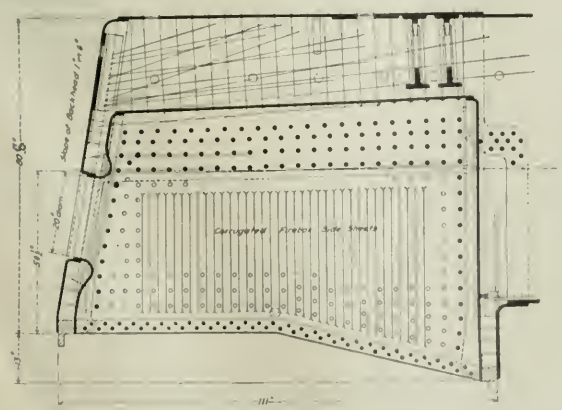
Ten-Wheel Freight Locomotive for the Chicago & North-Western; Built by the American Locomotive Co.



Side Elevation, Ten-Wheel Freight Locomotive; Chicago & North-Western.

of 2¾ in. in the back head surrounding the fire door. This is a rather unusual form and is one that ought to relieve the flanging at that point of much of the stress due to poor circulation and varying temperatures that are apt to result in the cracking which is so difficult and expensive to remedy.

As for the corrugations in the side sheets, this is a survival of an old practice that has been made successful on this road in some way, probably through persistence in its use on the ground of its theoretical correctness. A number of years ago the use of corrugated side sheets was quite common on some roads, but owing to lack of skill in forming the plates or the lower grade of the steel, or a combination of the two, it was not found that any advantage was gained and this form of sheet was abandoned. That it should possess the advantages claimed for it there is no doubt, provided sufficient care is taken in the forming so that undue internal stresses are not set up.



Longitudinal Section Through Firebox, 10-Wheel Freight Locomotive; Chicago & North-Western.

In view of another locomotive recently built by the same company at another works of about the same tractive power as this one, it may be interesting to make some comparisons of the boiler capacities. Referring to the Pacific (4-6-2) passenger locomotives for the Atlanta & West Point Railroad having 22-in. by 28-in. cylinders and with the same boiler pressure of 200 lbs., we find that there is but 1,100 lbs. difference in tractive power to be exerted on six driving wheels in each case, and that they carry but 4,000 lbs. difference in load. Instead, however, of the 1,100 lbs. extra tractive power belonging to the engine with the heavier load, it belongs to the one with the lighter one. In the working of the engines it will probably be found that the Pacific passenger locomotive with the higher calculated tractive power and lower weight is exerting, for the greater portion of its run, a much lower pull than the freight engine, which therefore really needs the increased weight in its practical working. But the greatest difference is to be found in the boilers. They have diameters of 72½ in. and 66¾ in. respectively. The Pacific engine has 278 tubes 2¼ in. in diameter and 20 ft. long, with 3,261 sq. ft. of heating surface. This 10-wheeler of the North-Western, although the boiler is the smaller, has 334 tubes of 2 in. diameter, 16 ft. long, and with but 2,808.4 sq. ft. of heating surface. This, as far as heating surface is concerned, is what would be expected from the dimensions; but, when this tube heating surface is equated to an equivalent firebox heating surface by the Vaughan formula, we find that that of the Pacific engine equals 729.8 sq. ft. while that of the 10-wheeler is equal to 703 sq. ft. Here is a difference of but 26.8 sq. ft. of what may be called effective heating surface, while the actual difference is 453 sq. ft. Of course, a large portion of this apparent discrepancy is due to the difference in number and size of the tubes in the two boilers. But still it does exist and it is an interesting question, the solution of which would be of great economic value, to decide upon the best diameter and length of tubes to be used in a locomotive boiler. Certainly it is not a matter that can be decided off-hand on any academic considerations or even from any practical data that is now available. This is considering the matter purely from the standpoint of cost, as represented by that of installation, maintenance and operation and disregarding the question of construction which sometimes regulates the length of tubes, so as to meet a desired arrangement of wheels and weights.

The boiler illustrated in connection with this Chicago & North-

Western locomotive is one that has been in use upon that road for several years with very satisfactory results.

The following are some of the principal dimensions of these engines with the ratios between a portion of them:

Cylinder, diameter	21 in.
Piston stroke	26 "
Wheel base, driving	14 ft. 10 "
" " total engine	25 " 10 "
" " total engine and tender	57 " 9 "
Weight on drivers	134,000 lbs.
" of engine	176,000 "
" of engine and tender	315,500 "
Heating surface, firebox	150.79 sq. ft.
" " tubes	2,808.4 "
" " total	2,959.19 "
Grate area	46.27 "
Journals, main driving	9 in. x 12½ in.
" coupled, driving	8½ " x 12½ "
" tender	5½ " x 10 "
Boiler, diameter	66⅜ "
Firebox, length	102½ "
" width	65¼ "
" thickness crown, side and back sheets	⅜ in.
" thickness tube sheet	½ in.
" water spaces	4 in.
Steam pressure	200 lbs.
Tubes, number	337
" diameter	2 in.
" length	16 "
Nozzles, single, diameter	5 in., 5¼ in., and 5½ in.
Stack, diameter	14 in. and 16½ "
Stock, above rail	14 ft. 11⅜ "
Wheels, diameter, driving	63 "
Wheels, diameter, truck	30 "
Valves, type	Piston
" travel	5¾ in.
" lap	1 "
" lead	1/8 in.
Tank capacity, water	7,500 gals.
Tank capacity, coal	10 tons
Tractive effort	30,900 lbs.

$$\frac{\text{Weight on drivers}}{\text{Total weight}} = 0.76$$

$$\frac{\text{Weight on drivers}}{\text{Tractive effort}} = 4.37$$

$$\frac{\text{Total weight}}{\text{Tractive effort}} = 5.7$$

$$\frac{\text{Tractive effort x diameter of drivers}}{\text{Heating surface}} = 660$$

$$\frac{\text{Heating surface}}{\text{Grate area}} = 64$$

$$\frac{\text{Firebox heating surface}}{\text{Total heating surface}} = 5.09$$

$$\frac{\text{Firebox heating surface}}{\text{Tube heating surface}} = 5.37$$

$$\frac{\text{Weight on drivers}}{\text{Total heating surface}} = 46$$

$$\frac{\text{Total weight}}{\text{Total heating surface}} = 59.48$$

$$\frac{\text{Volume of cylinders}}{\text{Heating surface}} = 284$$

$$\frac{\text{Grate area}}{\text{Volume of cylinders}} = 4.45$$

Volume of cylinders	10.4 cu. ft.
Tube heating surface equated for firebox heating surface (Vaughan formula)	703.0 sq. ft.
Total equated firebox heating surface	853.79 "

Examination of Telegraphers for Railroad Work.*

Upon arrival of the applicant at headquarters, he is taken in charge by the chief operator and examined as to his ability as a telegrapher. Due allowance is made for natural nervousness of the candidate under examination and every opportunity is afforded him to show what he can do. To meet the standard he has to copy three train orders in succession of different phraseology. They must be of legible penmanship and correct without a scratch or fumble, interlineation or alteration, at a rate of speed from 23 to 30 words per minute, averaging five letters per word, and he must correctly transmit and repeat back the same at same average speed. Otherwise he is rejected. Sometimes several applicants in a day are rejected. After passing examination in telegraphy, his letters of recommendation or service cards from previous employers are called for and a copy of same made. They must show a clear record for the previous five years. His credentials are returned to him. If he has no credentials, he is required to wait until his previous employers are communicated with by wire and his record established. Letters of recommendation are verified by mail or wire to insure their being genuine.

The applicant is required to fill out three application blanks, one for the superintendent of telegraph and signals, one for the general superintendent and one for the claim agent. These blanks have a printed form on reverse side for the chief operator's report of examination, that is, proficiency in telegraphy and standing on sight, hearing and colors.

To pass a normal physical examination, an applicant must be able to read with each eye separately printed letters ½ in. long, composed of lines an eighth of an inch wide on a chart at a distance of 24 ft. He must hear the tick of a watch with each ear separately a distance of 36 in. Where the ratchet acoumeter is used the examinee must call off the clicks numerically as they are produced by the examiner, first slowly, then rapidly, first in regular time singly, then by twos and threes with a pause between each two groups of clicks at the required distance. He must group in each class to which they belong five different shades of the following colors (using the Thomson yarns): red, green, blue, yellow, pink, brown and white. The Williams lantern is also used in making an examination on colors. The examinee, at a distance of 20 ft., must call off the names of the different colors as they are given by flash light in rapid succession at the option of the examiner. The lenses vary in diameter, the largest representing switch lights at a distance of 150 ft., the next 600 ft. and the smallest 1,300 ft.

It is found that 10 per cent. of the applicants are disqualified by reason of defective eyesight, 3 per cent. by defective hearing, and 6 per cent. by defective color perception.

If the applicant's record is found to be acceptable, a book of rules is given him to study, and afterwards a pamphlet entitled "Operators' Examination," in which he must answer upwards of 200 questions in writing bearing on the duties of a telegrapher. These answers are checked over and the writer advised of any that are wrong, which he must correct. This is termed his second examination.

After this is done, he is subjected to a third examination which is oral, lasting from four to six hours, on rules considered essential to safety of passengers and trains.

All station helpers and apprentice telegraphers from points along the system who have not previously been present on a similar occasion are brought to headquarters to listen to this oral examination. They hear the important rules explained, the questions, the answers, the comments, the important troubles which telegraphers have had on the road and throughout the country during the last 15 years, the cause and remedy, and the general instructions which have been issued to guard against these troubles are related to them. No applicant, however, is assigned to duty as a telegrapher until, in addition to the foregoing, he has himself passed a satisfactory written and oral examination. The examination of the other man is for him simply a preparation. In this way he goes to work not as a green hand but as one who has had 15 years of experience.

After passing examination on rules, he is seated at the telegraph examination table, furnished with train order signal, train order manifold, carbon sheets and stylus and required to receive orders in regular form in accordance with the rules on which he has just passed examination, displaying his train order signal, giving the proper responses, repeating the orders, etc., and drilled in this way until he can handle the orders rapidly and correctly and without any prompting. This done, he is ready for duty. If he is to be an agent, or perform clerical work, or fill high position as a telegrapher, he is sent to the division superintendent for inspection that the latter may know him before he goes to work. Otherwise he is sent direct to the agent at the station at which he is to serve.

No one under 21 years of age is made an agent, and none are appointed telegraphers under 18 years of age. If the position is one requiring bond, notice is immediately sent to the comptroller. In case of appointment to an important position as ticket agent or ticket seller, the approval of the general passenger agent is also obtained. Promotion to the position of agent is made from the ranks of telegraphers; when possible, brains being equal, preference is given to seniority of service. Train despatchers are generally made by promoting telegraphers in train despatcher's office. Candidates for telegraphers in despatcher's office are selected from the best material on the division.

When an agent is desired for one of the larger stations the traffic department is conferred with.

In addition to the personal record blank, a personal record is kept of every one connected with the telegraph and signal department from apprentice up, showing date of appointment, capacity, station, term of service, promotions, suspensions, errors, dismissals, etc. A telegrapher leaving the service for any cause is given a service letter addressed to himself stating the time and character of service and specifying the reason for leaving.

It takes from one to three days for a telegrapher to complete his examination. One day is sufficient for an experienced energetic man.

It has been our experience that a man who has reached the age of 18, after having passed the required examination, is fully qualified to handle train orders. In proportion to the number of men employed over 21, as against the same number between 18 and 21, the men over 21 are in the majority of those who have caused trouble in the operation of train movements.

The discipline of telegraphers is accomplished through the tel-

* A paper read before the Railway Telegraph Superintendents' Association at Atlantic City, June 19, by H. C. Hope, Superintendent of Telegraph and Signals, Chicago, St. Paul, Minneapolis & Omaha.

egraph and signal department and the division officers. It is the duty of the travelling telegrapher to observe how all matters pertaining to the telegraph and signal service are being maintained, to see that all signal lamps and batteries are cared for in a way to obtain the best results, that blocking between adjoining stations by signalmen, keeping of block records, handling of train orders and block cards and operation of block signals is properly done, correcting and instructing those who need it and making regular and systematic inspection reports to headquarters covering each office within his district. It usually takes three days for operators coming from other railroads having similar rules to ours to qualify and get acquainted with our methods, requirements, etc.

Each agent, telegrapher and apprentice telegrapher is furnished with a pamphlet entitled, "The Monitor," containing 100 questions and answers bearing upon matters pertaining to passenger traffic.

The Northern Pacific's Own Valuation.

The Northern Pacific has filed with the Interstate Commerce Commission statements and figures showing what it would cost to duplicate the railroad property and the cost of improvements. The table showing the estimated cost of reproducing the Northern Pacific Railroad at present follows:

	Miles.	
Main line and second tracks	2,860.67	
Branch line, spurs and sidings	4,834.12	
		7,694.79
Engineering, 5,785 miles at $1,500		$8,677,500
Right of way and station grounds		106,890,088
Grading		71,174,744
Tunnels		4,383,948
Bridging		20,344,934
Ties		13,810,326
Rails		27,563,754
Fastenings		3,656,095
Switches		1,181,250
Ballasting		8,238,758
Track laying		7,573,550
Fencing right of way		759,450
Cattle guards		289,250
Signal apparatus		167,862
Telegraph lines		1,445,013
Station buildings and fixtures		2,511,264
Roundhouses		3,972,125
Machinery and tools		1,100,000
Docks, wharves		1,454,450
Water stations		1,966,900
Fuel stations		636,350
Warehouses		2,886,076
Miscellaneous structures		2,299,668
Seattle terminal facilities		2,457,000
Ferry equipment		617,000
Legal expenses		289,250
General expenses		289,250
Interest		35,632,295
Contingencies		12,994,717
Total		$345,262,867
Average cost per mile		59,734
Average cost per mile, not including land		41,257

Right of Way and Station Grounds.

Large terminals.	Acres.	Total value.
Superior	982.62	$1,552,020
Duluth	600.91	5,155,204
Duluth Union Depot	6.94	420,625
St. Paul	676.97	9,579,177
Minneapolis	284.61	5,065,082
Spokane	422.31	7,240,293
Tacoma	680.84	12,160,000
Seattle	461.03	30,167,050
Butte	233.76	2,000,000
Everett	124.68	374,040
Bellingham	67.86	339,300
South Bend	35.63	249,419
Aberdeen and Hauquiam	69.83	698,300
Total	4,637.99	$75,000,501
Other right of way and station grounds	152,185.00	31,889,589
Total	156,822.92	$106,890,988
Average cost, right of way and station grounds, per acre		$209.53
Average cost, right of way and station grounds, per mile		$5,533

The cost of improvements on the estate of the Northern Pacific—total 7,694.79 miles—has been $302,815,326, and their present value is $288,695,095.

Annual Meeting of the Freight Claim Association.

The Freight Claim Association, which is composed of 330 railroads, steamship companies and fast freight lines, held its sixteenth annual session at Denver, commencing June 19th, 170 different carriers being represented. The first two days of the session were taken up in discussing and adopting the reports of the Committees on Constitution and By-Laws and Rules, perfecting and amending the constitution and the rules, the object being to simplify and expedite the manner and methods under which claims shall be handled, and determining the proportions in which claims shall be divided, and in perfecting the method of arbitrating claims when proper divisions are not agreed upon by the interested carriers. That is the corner stone of the Association, as without some plan by which claims in dispute between carriers could be arbitrated and finally disposed of the Association would be worthless.

The third day was largely devoted to the discussion of the principal business of the Association, which was the adoption of a new plan, which had been considered at a special meeting of the Association held at Cincinnati in February last, for the purpose of improving the methods now in force in relation to the making of the investigation and settlement of freight claims. After discussion the matter was finally voted upon, the vote being taken by roads, and the plan received the necessary two-thirds vote of those present. Under the constitution of this Association no rule or bylaw can be adopted unless it receives the vote of two-thirds of the members present. Below is a copy of the new plan, which takes effect September 1 next on all claims presented on and after that date.

[illegible]

When claim is presented it shall be investigated and settled on its merits and in conformity with legal liability by carrier to whom presented.

Provided, when claim arises from fire, flood, wreck, act of [illegible] of public enemy, act of public authority, act of shippers, or [illegible] of goods, disaster on land or water, or marine loss or damage, papers must be submitted for authority to Freight Claim Officers of carriers deemed liable.

(*a*) Settling carrier shall investigate claim to establish validity and apportion liability.

Inquiry shall be addressed direct to agent of interested carrier whenever practicable, and to Freight Claim Officer only after failure to obtain information from agent or when necessary from nature of inquiry.

(*b*) When agent of another carrier fails to answer within twenty (20) days from date of inquiry, copy of inquiry, with request for reply, shall be sent by express, postal mail, or messenger, to Freight Claim Officer of delinquent carrier. When answer is not received within thirty (30) days to such request to Freight Claim Officer regarding a paid claim, paying carrier may, provided liability is not in its opinion located, charge full amount of claim to delinquent carrier, or if there are two or more delinquent carriers, then to delinquent carrier nearest paying carrier in direction of destination, and shall forward all papers relating to the claim to such delinquent carrier, who shall take the place of settling carrier, and make further investigation and distribution of amount of the claim.

(*c*) Claim shall be apportioned according to rules and rulings of the Freight Claim Association.

(*d*) Distribution Statement, Form —, shall be securely attached by paying carrier to each claim. When one carrier only is interested, statement and claim papers shall be set to it. When two or more other carriers are interested, original statement and claim papers shall be sent to most distant carrier and copy of statement showing disposition of claim papers to each other interested carrier. When paying carrier is an intermediate carrier, claim papers shall be sent to last interested carrier in direction of destination. Any interested carrier shall have the right to obtain papers from carrier with whom they are filed.

(*e*) When an amount charged in accordance with preceding paragraphs is for any reason unsatisfactory to debited carrier, it may be recharged to paying carrier within one year from date of first charge, and shall not again be charged until authorized or arbitrated. When interested carriers cannot agree on such recharge, amount shall be carried by paying carrier and case referred to Arbitration Committee for decision. Provided, that an amount not so recharged within one year as aforesaid shall not be subject to recharge except by agreement.

(*f*) No carrier shall be charged with an amount exceeding one hundred dollars ($100.00) on any one claim, until claim papers have been submitted to its Freight Claim Officer, and authority for such charge given.

(*g*) Claim in which non-member line is interested does not come under this rule.

(*h*) Fast Freight Line ogranizations handling claims shall be considered as carriers.

The following covers the accounting features of the plan tentatively adopted at Cincinnati:

SETTLEMENT OF INTERLINE CLAIMS BETWEEN CARRIERS.

The following plan, having been endorsed by a committee of the Association of American Railway Accounting Officers, is recommended to members of The Freight Claim Association:

On or before the 10th of each month, or weekly by special agreement, if necessary, to avoid a large accumulation), paying carrier shall render a statement on Form — of amounts due from each debtor carrier, with claim papers and distribution statements, to Freight Claim Officers as provided for in Freight Claim Association Rules, by express, postal mail or messenger. Draft may be made on or after the 25th of month for total of statement, or for balances as may be agreed upon by the interested carriers, which shall be paid by debtor carrier upon presentation.

While the plan is by no means perfect, it is believed by a large majority of the Association that it will bring about more expeditious methods in the settlement of interline claims and to a great extent wipe out the large suspense accounts, which are now being carried by nearly every railroad in the country.

A rule in relation to what constitutes delivery of cars to connecting line was adopted by the Association, having been agreed upon by a joint committee composed of representatives of the American Railway Association, Master Car Builders' Association, and the Freight Claim Association. The rule is as follows:

"Cars shall be considered as having been delivered to connecting railroad when placed upon track agreed upon and designated as the interchange track for such deliveries, said cars to be in safe, serviceable condition and accompanied or preceded by regular waybill or running slip, the receiving road to be the judge in cases not provided for in the Master Car Builders' rules. All defects existing at time of delivery to be designated by receiving road when car is first tendered, the liability for per diem for value of car and contents to commence immediately upon placing car on track for delivery and continue until car has been inspected and accepted or rejected by receiving line."

The committee on arrangements, consisting of Messrs. Writer, Tucker, Wing, H. A. Johnson, Jones and C. A. Johnson, of the

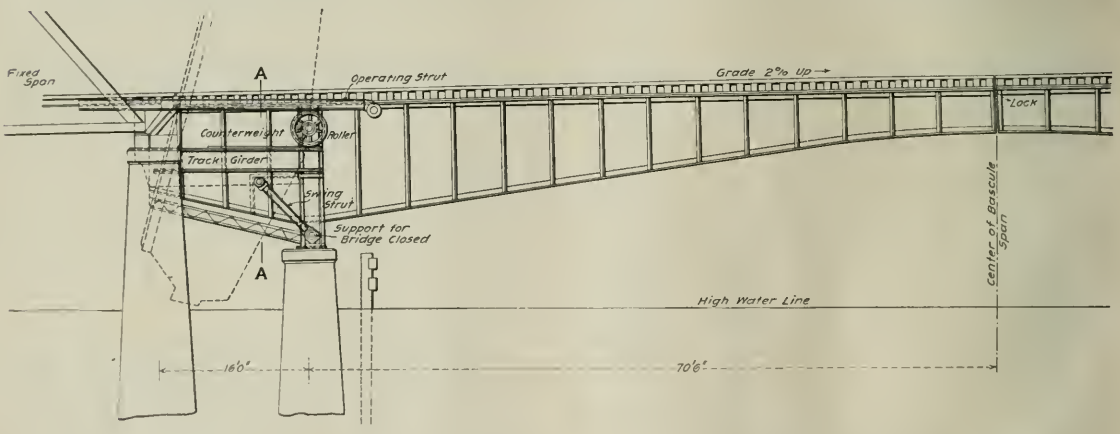
Colorado railroads, provided an elaborate programme for the entertainment of the members of the Association and their families, and most royally carried out the plans. A single pass, good for a month and bearing nine signatures, passed the members and their families over all the Colorado roads.

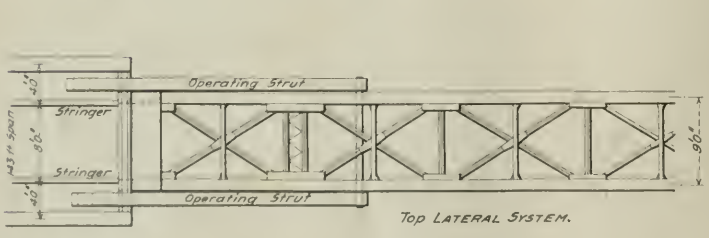
The next meeting of the Association will be held at Atlantic City in June, 1908. The officers elected were: R. C. Richards (C. & N.-W.), Chicago, President; W. S. Battle, Jr., (N. & W.), First Vice-President; J. S. Tustin (Mo. Pac.), Second Vice-President; W. P. Taylor (R., F. & P.), Secretary.

Rall Bascule Bridge over the Illinois River at Peoria.

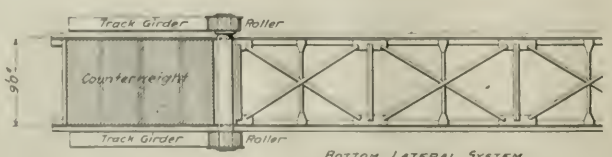
A double-leaf bascule bridge of the Rall type, the second of this type of bridge to be built, was completed recently at Peoria, Ill. The first Rall bridge is on the Pittsburg, Fort Wayne & Chicago line of the Pennsylvania Lines West of Pittsburg, across the Miami and Erie canal at Delphos, Ohio. It is a single-leaf, double-track span, 26 ft. $2\frac{1}{2}$ in. between supports, and has been in service several years. The Peoria bridge is the draw span for the Illinois river crossing of the McKinley Interurban Syndicate. It consists of

Rall Bascule Span in the Illinois River Bridge at Peoria for the McKinley Interurban Syndicate.

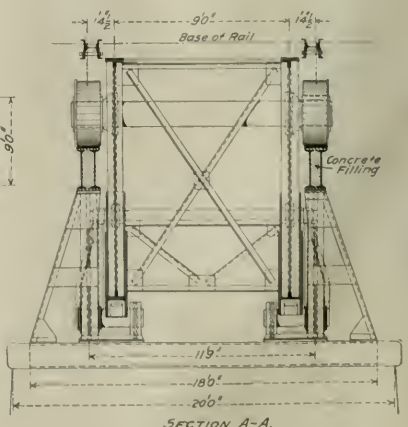




Top Lateral System.



Bottom Lateral System.



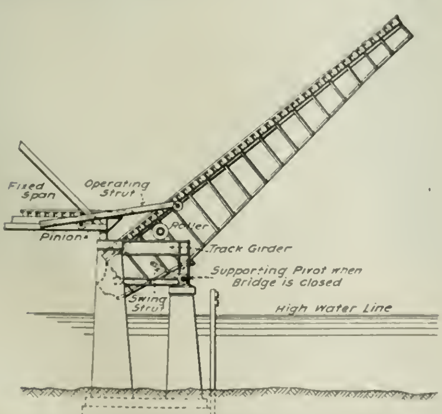
Section A-A.

Details of Rall Lift Bridge at Peoria.

four riveted through truss spans 142 ft. 10 in. center to center of piers, and the bascule span, which is 17[illegible] ft. center to center of back piers. The span between supports is 141 ft. and the clear opening at right angles to the river channel is 12[illegible] ft. It is a double-leaf deck bridge requiring no tail pits, as the grade is high above the water line, the head room at high water being 10 ft. 6 in.

Photographs and general drawings of the bascule span are shown herewith. The features peculiar to this type of lift bridge are as follows: The leaf is so counterweighted that the center of gravity coincides with the center of the roller shaft around which the leaf rotates. Each leaf has a pair of swing struts connected to the pier at one end and to the main girders at the other; also a pair of operating struts, which in the closed position are just outside of and approximately parallel to the top of the girders. On the bottom face of each operating strut is a rack which gears with a pinion back of the back pier, shown in the sketch of bridge in half-open position. These pinions are driven by a 25-h.p. motor, there being one for each leaf.

Rail Bascule Bridge in Open Position.



Sketch Showing Lift in Half Open Position.

In the closed position the bridge rests upon fixed supports on the piers and the rollers are lifted slightly above the track, and therefore are relieved of any load. When the leaf starts to open it first rotates around the point of fixed support until the rollers come to bearing on the track girders. Then as the pull on the operating struts continues, the swing struts, moving in the arc of a circle, draw the tail downward, and the entire leaf rolls back horizontally along the track girders as it revolves. The bridge is opened and closed in three quarters of a minute. Including the insertion of the tail and rail locks for both leaves, a complete operation requires two minutes. The operating machinery is below the deck, nothing showing above except the operator's house and the [illegible].

The advantages claimed for this type of bascule bridge are summarized as follows:

1. For the bridge closed the length of span is a minimum and equal to the distance center to center of river piers.

2. The length of travel of the bridge is a minimum, being just sufficient so that the tail part containing the counterweight will clear the river pier when the bridge is fully open.

3. The shop work on the bridge proper is simple and of a character that can readily be turned out by a bridge shop having ordinary facilities.

4. The wheels or rollers on which the bridge moves are solid steel castings having smooth treads. These castings may be made of any proportions that will be suitable. There are no rivets to give out. There is nothing to bind and the motion is smooth and noiseless.

5. The track girders for the Peoria bridge are double 24-in. I-beams with flange plates on top and bottom and track plates riveted to the top.

6. Should it be desirable to remove or repair the wheels it can readily be done, as the bridge in the closed position does not bear upon the wheels. For the same reason the track girders also can easily be removed or repaired without disturbing traffic over the bridge.

7. Besides the foregoing advantages, this type of bridge is very economical both as to quantities and cost.

The bascule bridge was designed and the superstructure built by the Strobel Steel Construction Company, Chicago. The engineer for the McKinley Syndicate is Ralph Modjeski, Chicago. Four additional bridges of the Rall type, with through instead of deck girders without pits, are being built by the Strobel Company at Indiana Harbor, Ind. Two are for the Lake Shore & Michigan Southern, one for the Baltimore & Ohio and one for the Pennsylvania Lines. They are single-leaf, double-deck spans, 86 ft. between supports.

The Elliot Junction Collision.

The British Board of Trade has published its report on the disastrous rear collision which occurred in a snowstorm in Scotland, December 29, when 22 passengers and employees were killed; and the accident appears to have been due principally to the fact that the engineman was under the influence of liquor. The report was issued late in April, but it is dated February 26. It says nothing about the punishment of the engineman, but from a recent press despatch it appears that he was sentenced to five months' imprisonment on a charge of manslaughter. This sentence was subsequently reduced by the court to three months. The place where this collision occurred was Elliot Junction, on the Dundee & Arbroath Joint Railway, owned jointly by the Caledonian and the North British companies. The negligent driver, George Gourlay, is 60 years old and has been in the service 47 years, with a good record.

While the explanation of the collision is thus in a sense quite simple, the 50-page report of Major J. W. Pringle gives many circumstances which will be of interest to the American reader. Major Pringle gives his conclusions under seven heads: (1) the situation on the line; (2) the driver and his conduct; (3) a discussion of the different explanations offered to account for the collision; (4) precautionary methods which might have been adopted; (5) minor matters; (6) summary of conclusions, and (7) proposals for the prevention of such collisions.

The train was running from northeast to southwest, and the engine was moving backward. The coal, piled high on the tender, interfered somewhat with the engineman's view ahead. The train had started from Arbroath about 3.14 p.m., and after running 1½ miles it struck a standing train at Elliot Junction, having passed distant and home signals which were against it. Owing to the severe and unusual snow and wind, block working had been suspended and the train was running under a "time interval and caution" rule, the requirement being practically that enginemen run constantly under control. The standing train had been held at Elliot Junction because of the derailment of a freight train a short distance ahead. The station master had just decided to take the passengers out of the standing train, but the collision occurred before this purpose could be carried out.

It appears that Engineman Gourlay had been repeatedly warned that block working had broken down, both wires and poles having

failed. The preceding train had been gone from Arbroath 10 minutes.

In discussing the time interval rule Major Pringle says that safety is dependent, firstly, on the preservation of a time interval, and, secondly, caution on the part of engine drivers. He lays no responsibility on the leading train.

The chief guard of this passenger train was riding in his van next to the engine, and says that he could see nothing at all out of his window; for the last half of the journey from Arbroath the speed was increased, he estimated, from 20 miles an hour to 25 or 30.

The Government inspector tries to fix the exact time that the collision occurred, and makes detailed comparisons of clocks, but, as in most other cases of this kind, his conclusions concerning the accuracy of different clocks and, as deduced therefrom, the speed of the train, are of little or no value.

The signals approaching Elliot Junction are 35 to 40 ft. high with the sky for a background. The engineman made some claim that the signals were off, but the distant signal had not been used since the night before, so it is hardly possible that it was workable at this time. Many of the signals drooped, and three minutes after the collision the home signal drooped 10 deg., but it was clearly a danger signal.

Under the head of explanations, Major Pringle considers first the suggestion that Gourlay had lost his way; but there are many landmarks along the line, and this theory is untenable. The coal on the tender made an obstacle, but with such high semaphore signals the view is not seriously obstructed. Running with the tender ahead is objectionable, but Major Pringle does not lay down an absolute rule condemning the practice; though the management of the road is warned that it is resorted to more frequently than is necessary; it should be discouraged. The reason that this engine was not turned was that the turntable was obstructed by snow, but the inspector holds that if the station agent or the engineman had really been determined to have the engine turned, it would have been reasonably possible, though the trackmen were overworked at all points and many switches and crossovers, covered deep with snow, had been neglected. Several other enginemen had run their engines backward that day with success.

After the collision Gourlay was pinned down in his cab for half an hour. He was then taken out and soon after given by some one three-quarters of a glass of brandy. Shortly afterward a policeman noticed his apparently intoxicated condition and called three physicians to examine him. These doctors concluded that this brandy which he took after the collision was not sufficient to fully account for the alcoholism observed. Before leaving Arbroath, Gourlay's train had been standing at or near the station about three or four hours, and at one time the cab of the locomotive was filled with passengers. Gourlay had drank out of a bottle in the cab, apparently brought there by some passenger, and he had been treated to 3 pence worth of whisky at the Victoria bar, which was close to the platform. A porter and two other men who saw Gourlay in the cab at one time thought he had been or was going to be sick. Yet when he ran his engine around the train, just before starting, he performed the operations with all reasonable steadiness and care. In the face of the conflicting evidence Major Pringle finds it "a difficult and invidious task" to decide as to Gourlay's condition. The inspector says:

> His previous record and character, as well as his behavior on the downward journey, prove that he was normally a careful driver. There must be some reason to account for the unusual carelessness shown on the upward journey. If it is true that he took no more than two half glasses of whiskey, whilst waiting at Arbroath, it is evident that this amount of alcohol could not have caused the effects noticed by Morrison, Briggs and Whitton. There is nothing to show that he was out of health, or suffering from any illness, which would account for the strangeness in his appearance and conduct which they observed. He was accustomed to work his train from Arbroath to Dundee as an express, without stopping at any intermediate stations. It is possible that he did not fully understand the special instructions given to him on this occasion. Confusion of ideas or deadening of faculties may account for his conduct. The evidence suggests no cause for such confusion, or lack of alertness, other than the bemusing effects of either extreme cold or of alcohol. The cold, admittedly severe, more especially in the unprotected position of tender first, could hardly, in so short a time as two or three minutes, have alone produced such a serious effect on a robust constitution. I have, therefore, most reluctantly, been forced to accept the alternative, and give it as my opinion that the lack of intelligence or of caution and alertness, displayed by driver Gourlay on this occasion were in part, at all events, induced by drink, the effects of which may possibly have been accentuated, after he left Arbroath, by exposure to weather.

Considering now possible precautionary measures, Major Pringle decides that when block working has broken down all semaphores should be kept at danger, and the signals to enginemen be given by hand. There is no general rule on the Joint line, and some of the signalmen did this while others did not. At Elliot Junction the home signals were used to admit trains to the station. This should not have been done. All of the arms were in an imperfect position. Where a driver, reaching a home signal, is not near enough to see a flag in the signal box a flagman should be appointed to stand at the signal. In a blinding snowstorm fogmen with torpedoes should be stationed at the distant signals, but this was not done in this case, and it appears that the Joint line has always done without fogmen. The explosion of a torpedo at the distant signal would, in all probability, have prevented this collision by arousing Gourlay. The claim that the guard of the standing train at Elliot Junction should have sent out a man with torpedoes is not admitted. Major Pringle holds that a train protected by home and distant signals, as in this case, need not send out a man.

Under his fifth head Major Pringle criticises a general inefficiency which he found in many things. Telegraph and telephone communication was interrupted, but the station agents, inspectors and others took little care to keep in touch with each other by extemporized methods. The derailed freight train blocked one track at 8 a.m., but systematic single-track working on the other track was not established until 2 p.m. Certain superintendents interested were not advised of this disaster until after 11 p.m. The Joint line is 17 miles long. There are 95 men employed on the track; but this was the worst storm known in 15 years, and somebody ought to have engaged additional men, if possible. Snow plows were run over the road backward because turntables were not properly cleared of snow. The Joint line has no cars or engines of its own, and the separate roads each send their own men over it. This leads to division of responsibility and to poor discipline. Wrecking cars and even jacks are insufficient and not properly located. Evidence of lack of discipline appeared from the presence of passengers in the cab of the engine at Arbroath; and the proximity of the Victoria bar is "a very undesirable feature."

Under the sixth head driver Gourlay is found to have received repeated and very explicit instructions to drive with caution and to stop at all stations. He passed the distant and home signals at Elliot Junction without having applied his brake, and ran 400 ft. beyond the home signal. The proper place for him to come to a full stop was about 300 ft. farther. It is evident that he was not prepared to stop at the platform. He broke the rules in leaving his engine while waiting at Arbroath, and his disregard of discipline, with other circumstances, forces the inspector to "conclude, most unwillingly, that his conduct was to some extent due to the effects of alcohol." He had been on duty about nine hours. The inspector then goes on to summarize other points mentioned above; and next, taking up his seventh section, considers, first, speed indicators, which are largely used on Continental railways and which in some countries are required on all engines. Speed indicators have been improved so that now they are reliable, but there is no evidence that they would be useful in the prevention of collisions like this. The driver himself must determine the speed which particular circumstances call for.

A third man in the cab is next considered, but the expense of this would be a serious obstacle, and there is not much space available in the cab. Unless the complete control of the steam and brake gear is placed in the hands of the third man, it will be difficult to hold him primarily responsible for safety; and if we do thus hold him, then he will be in exactly the same position as a driver is at present, and the office of driver would practically become a sinecure; therefore, Major Pringle does not support this suggestion. It would be better to adopt automatic stops. These are now in use on the underground railways in London, and have been found reliable at speeds as high as 35 miles an hour. Other railroads are trying automatic fog machines and bells and whistles on engines. None of these arrangements, however, have yet stood the test of time sufficiently long to be at present accepted as fully reliable. It has been proposed to have larger and stronger poles for the electric wires, so as to prevent the failure of block working; but Major Pringle thinks the only practicable remedy would be to have poles set nearer together. Putting wires under ground is the best remedy, but that would be very costly, and only in exceptional circumstances would the expense be justified.

Salaries on Hungarian State Railroads.

The Hungarian State Railroads have recently adopted a new scale of salaries for their officials. With each salary is an allowance for house rent, and this allowance varies with the localities where the employee is stationed. The officials of lowest class are to receive $320 to $480 per year, with allowances of $80 to $160 for rent. Such of them as are graduates of technical schools have a minimum salary of $460. There are two classes of engineers, with $580 salary and $180 house money for the lower and $760 salary and $200 house money for the higher class. Moreover, engineers of the latter class are entitled to an advance of $60 a year after five years and another $60 after 11 years' service. A "chief engineer" has $1,000 a year and $250 house money. Three grades of superintendents have $1,080, $1,200 and $1,320 a year, with $210 to $300 house money; "general superintendents" get $1,440, $1,560 and $1,680 salary, with $320 to $360 house rent; a general manager, $2,400 salary and $500 house rent; while the President has $3,000 salary and $600 house rent. The offices are not quite the same as those designated by these names in this country.

Four New York Public Service Commissioners.

William R. Willcox was born at Smyrna, N. Y., in 1863. He was educated at the University of Rochester and at Columbia Law School. In 1900 he was a candidate on the Republican ticket for Congressman from the Thirteenth district, but was defeated by a small majority. Later he was appointed to the New York City Park Commission by Mayor Low. While in this office he did much to establish public playgrounds, gymnasiums and parks. He was appointed Postmaster of New York City in 1905. Mr. Willcox is President of the Grand River Irrigation & Development Company and of the Willcox Canal Company.

Thomas Osborne, of Auburn, N. Y., was born in that city in 1859. He was educated in the Auburn public schools and Adams Academy at Quincy, Mass., and graduated from Harvard University in 1884. He then began work in his father's farm tool factory, of which later he became the head. He was a member of the Auburn Board of Education from 1885 to 1888, and also from 1893 to 1896. He was a delegate to the Democratic National Convention in 1896 and ran for the office of Lieutenant-Governor on the Independent Citizen Union Ticket in 1898. From 1902 to 1905 he was Mayor of Auburn. Mayor Osborne has always been greatly interested in prison reform and in the workings of the Civil Service law. In a speech which he made before the Civil Service Reform this spring, he showed with earnestness and breadth of view the difficulties which strict enforcement of civil service tenure places on officials whose primary concern is efficient administration.

T. M. Osborne.

W. R. Willcox.

M. S. Decker.

James E. Sague.

James E. Sague, of New Hamburg, was born in Poughkeepsie, N. Y., in 1862. He was educated at the public schools and graduated as a Mechanical Engineer from Stevens Institute in 1883. He began railroad work on the Chicago, Burlington & Quincy, and afterwards went to the Erie. He spent two years on the Jamaica Railroad in the West Indies, and then went to the Schenectady Locomotive Works of the American Locomotive Company. He was Chief Mechanical Engineer of this company for six years, and was then made Assistant Vice-President and finally First Vice-President in charge of Engineering and Manufacture. He resigned this position on March 1 of the current year.

Martin S. Decker, of New Paltz, is now Assistant Secretary of the Interstate Commerce Commission. He was born at Rosendale in 1858. After a public school education he began work as a telegrapher. He later studied law and held several positions in Ulster County, when he was made Assistant Secretary to the Interstate Commerce Commission in 1887, and has frequently taken evidence as a Deputy Commissioner.

The Italians have made the discovery that one of the results of sundry reductions of railroad rates, accompanied by increases in wages of employees, both prescribed by law, has been an increase in the percentage of working expenses. Thus, gross earnings increased 23½ per cent. from 1895 to 1901, and 37 per cent. from 1901 to 1907; but meanwhile wages increased 12½ per cent. in the first period and 45 per cent. in the last, when the advances in pay and reductions in rates took place. The working expenses, which were 66 per cent. of the gross earnings in 1895 and 67½ per cent. in 1901, will be 70 per cent. the current year (ending with June). The pay of employees absorbs 49 per cent. of the earnings this year. Of the increase of earnings in the first period, 22 per cent. went to the employees; in the second period, 45 per cent. The chief changes in wages were made before the state began to work the railroads two years ago.

American Society for Testing Materials Specifications for Steel Rails.

At the annual meeting of the society in 1906 the report of Committee A on standard specifications for steel rails was referred back to the committee with instructions to report at the next annual meeting proposed standard specifications for steel rails which would give promise of correcting as far as possible the defective quality of rails obtained under existing specifications. A sub-committee consisting of W. A. Hostwick, P. E. Carhart, Charles B. Dudley, E. F. Kenney, Edgar Marburg, George E. Thackray and W. R. Webster, was appointed to prepare these specifications, which were accepted at the last meeting and referred to letter ballot for adoption.

STANDARD SPECIFICATIONS FOR STEEL RAILS.

(1) (a) The entire process of manufacture and testing shall be in accordance with the best current practice, and special care shall be taken to conform to the following instructions:

(b) Ingots shall be kept in a vertical position in the pit heating furnaces until ready to be rolled or until the metal in the interior has time to solidify.

(c) No bled ingots shall be used.

(d) There shall be sheared from the end of the blooms formed from the top of the ingots not less than — per cent., and if, from any cause, the steel does not then appear to be solid, the shearing shall continue until it does.

(2) Rails of the various weights per yard specified below shall conform to the following limits in chemical composition.

	—Per cent.—				
	50 to 59 lbs.	60 to 69 lbs.	70 to 79 lbs.	80 to 89 lbs.	90 to 100 lbs.
Carbon	0.35-0.45	0.38-0.40	0.40-0.50	0.43-0.53	0.43-0.55
Phosphorus shall not exceed	0.10	0.10	0.10	0.10	0.10
Silicon shall not exceed	0.20	0.20	0.20	0.20	0.20
Manganese	0.70-1.00	0.70-1.00	0.75-1.05	0.80-1.10	0.80-1.10

(3) One drop test shall be made on a piece of rail not less than 4 ft. and not more than 6 ft. long, selected from every fifth blow of steel. The test shall be taken from the top of the ingot. The rail shall be placed head upwards on the supports, and the various sections shall be subjected to the following impact tests under a free falling weight:

Weight of rail, lbs. per yard.				Height of drop
45 to and including			55	15 ft.
More than	55	" "	65	16 "
	65	" "	75	17 "
	75	" "	85	18 "
	85	" "	100	19 "

If any rail break when subject to the drop test, two additional

tests, taken from the top of the ingot, will be made of other rails from the same blow of steel, and if either of these latter tests fail, all the rails of the blow which they represent will be rejected, but if both of these additional test pieces meet the requirements, all the rails of the blow which they represent will be accepted.

(4) The number of passes and speed of train shall be so regulated that on leaving the rolls, at the final pass the temperature of the rail will not exceed that which requires a shrinkage allowance at the hot-saws, for a 30-ft. rail of 100 lbs. section, of $6^{11}/_{16}$ in., and $^1/_{16}$ in. less for each 5 lbs. decrease of section. These allowances to be decreased at the rate of .01 in. for each second of time elapsed between the rail leaving the finishing rolls and being sawn. No artificial means of cooling the rails shall be used between the finishing pass and the hot-saws.

(5) The drop testing machine shall have a tup of 2,000 lbs. weight, the striking face of which shall have a radius of not more than 5 in., and the test rail shall be placed head upwards on solid supports 3 ft. apart. The anvil block shall weigh at least 20,000 lbs., and the supports shall be part of, or firmly secured to, the anvil. The report of the drop test shall state the atmospheric temperature at the time the test was made.

(6) The manufacturer shall furnish the inspector, daily, with carbon determinations for each blow, and a complete chemical analysis every 24 hours, representing the average of the other elements contained in the steel, for each day and night turn. These analyses shall be made on drillings taken from a small test ingot.

(7) Unless otherwise specified, the section of rail shall be the American standard, recommended by the American Society of Civil Engineers, and shall conform, as accurately as possible, to the templet furnished by the railroad company, consistent with paragraph No. 8, relative to specified weight. A variation in height of $^1/_{64}$ of an inch less, or $^1/_{32}$ of an inch greater than the specified height, and $^1/_{16}$ in. in width will be permitted.

(8) The weight of the rails will be maintained as nearly as possible, after complying with paragraph No. 7, to that specified in contract. A variation of one-half of 1 per cent. for an entire order will be allowed. Rails shall be accepted and paid for according to actual weights.

(9) The standard length of rails shall be 30 ft. Ten per cent. of the entire order will be accepted in shorter lengths, varying by even feet to 24 ft., and all No. 1 rails less than 30 ft. shall be painted green on the end. A variation of one-fourth of an inch in length from that specified will be allowed.

(10) Circular holes for splice bars shall be drilled in accordance with the specifications of the purchaser. The holes shall accurately conform to the drawing and dimensions furnished in every respect, and must be free from burrs.

(11) Straightening.—Care must be taken in hot-straightening the rails, and it must result in their being left in such a condition that they shall not vary throughout their entire length more than 5 in. from a straight line in any direction when delivered to the cold-straightening presses. Those which vary beyond the amount or have short kinks shall be classed as second-quality rails and be so stamped.

The distance between supports of rails in the gagging press shall not be less than 42 in.

Rails shall be straight in line and surface when finished—the straightening being done while cold—smooth on head, sawed square at ends, variation to be not more than $^1/_{32}$ in., and, prior to shipment, shall have the burr occasioned by the saw cutting removed, and the ends made clean. No. 1 rails shall be free from injurious defects and flaws of all kinds.

(12) The name of the maker, the weight of rail and the month and year of manufacture shall be rolled in raised letters on the side of the web, and the number of blow shall be plainly stamped on each rail where it will not subsequently be covered by the splice bars.

(13) The inspector representing the purchaser shall have free entry to the works of the manufacturer at all times when the contract is being filled, and shall have all reasonable facilities afforded him by the manufacturer to satisfy him that the finished material is furnished in accordance with the terms of these specifications. All tests and inspections shall be made at the place of manufacture prior to shipment.

(14) No. 2 rails will be accepted up to ten (10) per cent. of the whole order. Rails that possess any injurious defects, or which for any other cause are not suitable for first quality, or No. 1 rails, shall be considered as No. 2 rails; provided, however, that rails which contain any physical defects which impair their strength shall be rejected. The ends of all No. 2 rails shall be painted white in order to distinguish them.

Mr. Webster in presenting the specifications, said:

If the important factors that have a direct bearing on the quality of the finished rail are considered, most of the conflicting opinions can be harmonized. The committees at work on the problems are doing this. They are endeavoring to secure good uniform methods of manufacture by specifying chemical composition, amount of discard from top of ingot, finishing temperature in rolling, limit of camber in rails coming to the gag press for cold straightening, and drop tests. They are nearer together now on these requirements than ever before, and it is to be hoped that a specification will soon be arrived at, by interchange of views, which will be acceptable to all.

It must be admitted that the best rails are produced from steel low in phosphorus, rolled with light reductions and finished at proper low temperature; but the sections now in use make it almost impossible to continue the work of rolling on the head to a low enough temperature to produce the fine grained structure desired. Therefore, a good starting point for discussion would be in reference to section.

In a recent discussion it was claimed that the old committee of the American Society of Civil Engineers kept in mind the importance of low-finishing temperature, in designing their rails, and gave sections best suited for that purpose. As a matter of fact, the effect of the heat treatment of steel was not properly appreciated at the time the committee made its report, in 1892, and the sections do not permit of a low enough finishing temperature in rolling, owing to the wide, thin flanges. This, to a large extent, has caused the great trouble with 100-lb. rails rolled to these sections. Other 100-lb. sections gave trouble, and on March 25, 1901, I wrote to the American Society of Civil Engineers, asking for a new rail committee to investigate and report on standard rail sections. The committee was appointed in 1902. It is still struggling with the problem. In the arguments against the appointment of such a committee it was claimed that sufficient evidence had not been produced to show that the heavier rail sections were not giving as good results as the lighter. Those present to-day must admit that the results of the past five years have given conclusive evidence that a change in section is advisable.

It has been the invariable experience in changing from a light to a heavy section in any class of rolled steel, that difficulties have been met and modifications have been made in the methods of rolling, in order to get as good a structure in the heavier section as was formerly obtained in the lighter section. In ordinary sections other than rails, it was a comparatively easy matter to overcome the trouble and get a good structure; but the thin flange of the rail and the higher carbons called for in the heavier sections further complicate matters.

If a rail with the same width of head as the present American Society of Civil Engineers 100-lb. rail is required, the head will have to be made thicker and the radius under the head larger, in order to prevent the sides of the head from shearing or breaking off, as at present, and more metal put in the web and flange in order to carry the heat and thus allow the head to be finished at the proper low temperature. This would mean a rail of 120 to 125 lbs. per yd. I believe we are coming to heavier rails before we get rid of our present troubles.

In all justice, it must be admitted that a fair percentage of breakages is caused by the great increase of wheel loads since 1892, increase in speed of trains, use of large capacity steel cars; also that we do find poor track, poor rail joints, driving wheels not properly counterbalanced, flat wheels, etc. These conditions will no doubt be improved, but they must be considered in deciding on the rail for the future.

Open-hearth steel rails of the present weight and section, rolled under the present conditions of manufacture, cannot be relied on to overcome all troubles. Most of the basic open-hearth steel manufactured in this country is much lower in carbon than is required for rail steel, and it is therefore much easier to control the uniformity of such steel. The common practice of Bessemer steel rail mills is to allow 10 points leeway in carbon, and some of the basic open-hearth mills claim to work within these limits, but even as high as 18 points leeway has been asked. It is easier to work within narrow limits of carbon in the acid open-hearth steel process than in the basic.

What is wanted is a steel as nearly uniform in carbon and other chemical elements as possible without inflicting too great hardship on the manufacturer. We desire full expression of opinion from the basic open-hearth steel manufacturers as to just what chemical requirements and limits they would agree to work to in rail steel.

It would be a very simple matter to roll a thousand tons of extra heavy rails of basic open-hearth steel, and one thousand tons of the same section of Bessemer steel, with enough metal in the web and flange to finish them in rolling at the lowest possible temperature without injuring the metal in the flange. In other words, approach as nearly as possible the rolling conditions of the old bullhead rail, which has been rolled with only 4½ in. shrinkage allowance in a 30-ft. rail. Let the chemical composition, per cent. of discard, and conditions of manufacture be in accordance with best modern practice. The expense of preparing rolls and rolling such rails would be trifling in comparison with the information obtained, and the rails would be better than any heavy rails ever rolled.

Recommended Uniform Car Service Rules.

The following uniform car service rules were adopted by the National Association of Car Service Managers in annual convention at Cincinnati, Ohio, May 28-30, 1907, and were recommended for adoption by all railroads. The first set of similar rules was recommended by this association in 1902. These were revised in 1904 and have been further revised this year. They are, however, substantially the same as those twice previously recommended. The proposed rules follow.

RULE 1
CARS SUBJECT TO RULES.

(A) Cars held for or by consignors or consignees, for loading, unloading, forwarding directions, or for any other purpose are subject to the following car service rules.

(B) Cars loaded with live stock, and through consignments not held for orders are not subject to these rules.

RULE 2.
TIME ALLOWED

(A) On all commodities for loading or unloading, forty-eight (48) hours (two days) will be allowed.

(B) On cars re-consigned, held or stopped in transit upon request of consignor or consignee, or by reasons attributable to them, twenty four hours, one day, will be allowed.

(C) When cars are interchanged with minor railroads or industrial plants performing their own switching service, they handling cars for themselves or other parties, an allowance of twenty four (24) hours (one day) will be made for switching in addition to the regular time allowed for loading or unloading, the time to be computed from first 7 a. m. following delivery upon interchange tracks until return thereto.

(D) Freight in bond will be allowed forty-eight (48) hours (two days) for removal after permit to receive goods is issued to consignee by Collector of Customs.

(E) Cars containing freight consigned locally to the ocean or gulf ports, will be subjected to the forty-eight (48) hour car service rule, except that on shipments for coastwise movement via steamers and all freight for foreign export a maximum of ninety-six (96) hours will be allowed when the terminal agent is advised within forty-eight (48) hours after arrival of freight that such disposition will be made of same, the railroad reserving the right to unload the cars at any time it may see proper.

RULE 3.
COMPUTING TIME.

NOTE.—In computing time, Sundays and legal holidays are excluded.

(A) Time will be computed from the first 7 a. m. after cars are placed on public delivery tracks for loading.

(B) Time will be computed from the first 7 a. m. after notice of arrival when cars are held for orders, and from first 7 a. m. after placing on public delivery tracks when cars are held for unloading.

(C) On cars to be delivered on private tracks time will be computed from the first 7 a. m. after placing on such tracks, or after notice to consignee of readiness to so place the same.

(D) The placing of a car upon a private track, or notice to consignee of readiness to so place the same, shall be considered notice of delivery.

(E) Prompt notice shall be given by agents to consignees of the arrival of all freight subject to these rules.

RULE 4.
CAR SERVICE CHARGES.

(A) At the expiration of time allowed a charge of $1.00 per car per day or fraction thereof will be collected for detention of all cars held for loading or unloading, or subject to order of consignor, consignee or their agents.

(B) When both cars and tracks are owned by the same private party no charge will be made while cars are on such private tracks.

RULE 5.
PLACING CARS.

(A) Cars containing freight to be delivered on public delivery tracks or private sidings shall be placed immediately upon arrival, or as soon thereafter as the ordinary routine of yard work will permit. When delivery cannot be made on specially designated tracks, on account of such tracks being fully occupied, or for any other reason beyond the control of the carriers, delivery shall be made at the nearest available point.

(B) Cars for unloading shall be considered placed when such cars are held awaiting orders from consignor or consignee, or for the payment of freight charges, or surrender of bill of lading.

(C) The delivery of cars consigned or ordered to private tracks shall be considered to have been effected when such cars have been placed on the tracks designated, or if such tracks be full, when the railroad tenders cars by giving written notice of their arrival.

(D) Cars for loading shall be considered placed when such cars are placed, or held upon orders of shippers.

(E) If a car is placed for unloading and is reloaded by the same party each transaction shall be considered as independent of the other. If loading is begun before unloading is completed, car must be recorded as released from unloading, and placed for loading at the time loading is begun, and the time for loading will be computed from first 7 a. m. thereafter.

(F) When empty cars placed for loading on orders are not used, car service will be charged from first 7 a. m. after placing or tender, until released, with no time allowance.

RULE 6.
DECLINING TO RECEIVE CARS FROM CONNECTING LINES.

In cases where any railroad is unable or unwilling to receive freight tendered by another to be placed for delivery, it shall promptly notify the line tendering of its inability to receive, in order that proper notice may be given to consignee or consignor that delivery cannot be effected, and that request may be made for other disposition of the freight. Should such freight not be disposed of within [illegible] allowed after notice has been served upon consignee or consignor in accordance with the above car service will be charged.

RULE 7
CLAIMS.

Claims for relief or refund of charges accruing under these rules should in each case plainly state upon what ground any refund or relief is requested. Paid expense bills must be attached to claims for refund.

Car service charges may be refunded, waived, or cancelled under the following conditions:

(A) In case of overcharge or error in the assessment of charges.

(B) In case of failure on the part of the delivering railroad to properly handle freight, when such failure is directly responsible for the charges.

(C) In case extreme cold weather, rain or snow interferes with or prevents the loading or unloading of freight within the time allowed by these rules.

(D) In the event of unavoidable failure or breakdown of the machinery necessarily used in the loading or unloading of cars, when charges directly result from such failure, or breakdown, a refund of fifty (50) per cent. may be made.

(E) In case fires or strikes interfere with or prevent loading or unloading of freight, a refund or cancellation of fifty (50) per cent. may be made.

(F) In case freight cannot be disposed of by sale for sufficient amount to realize both freight and car service charges.

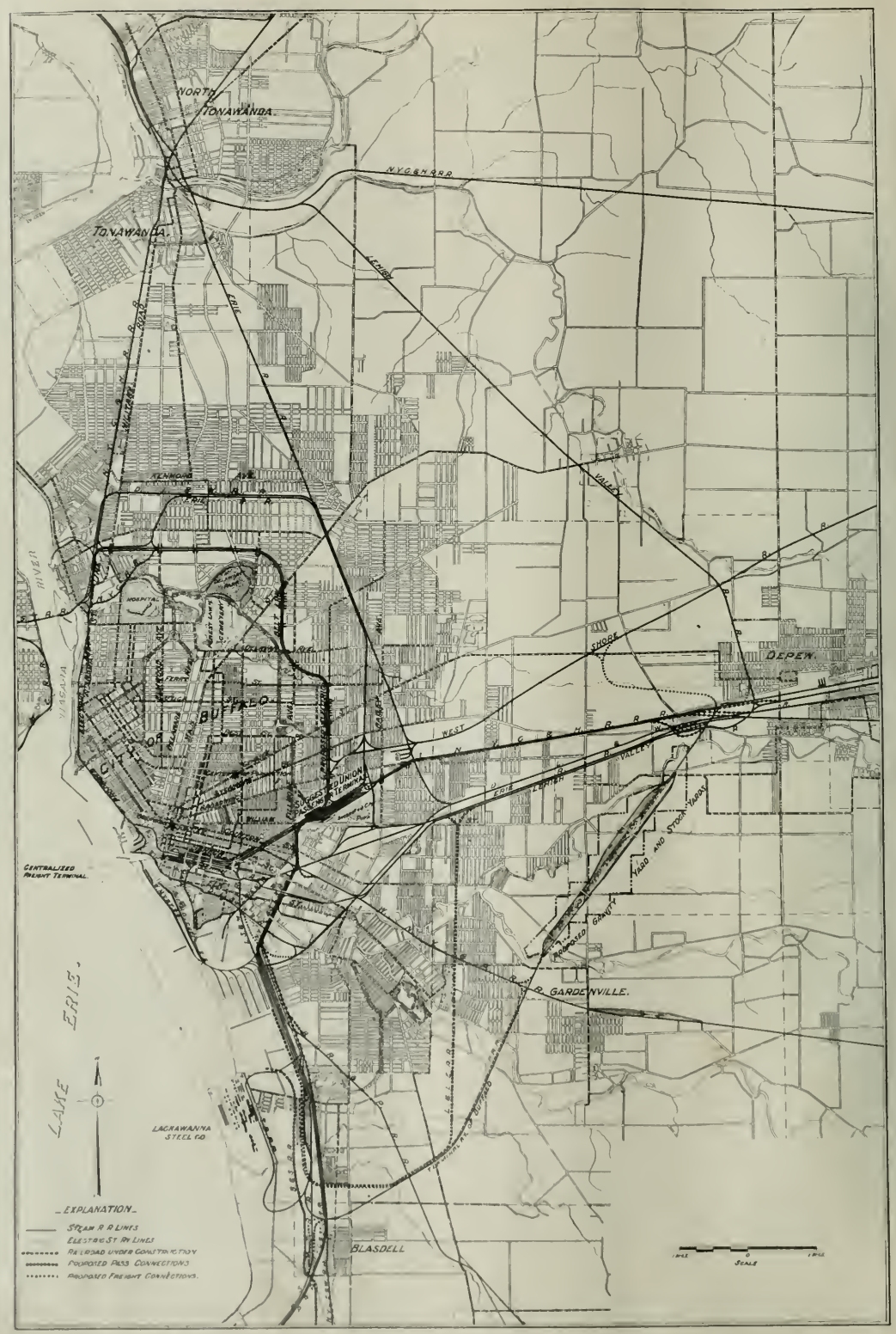
(G) In case of bad order, cars held on minor o rindustrial railroads for repairs, refund or cancellation of fifty (50) per cent. may be made.

Proposed New Union Passenger Station at Buffalo.

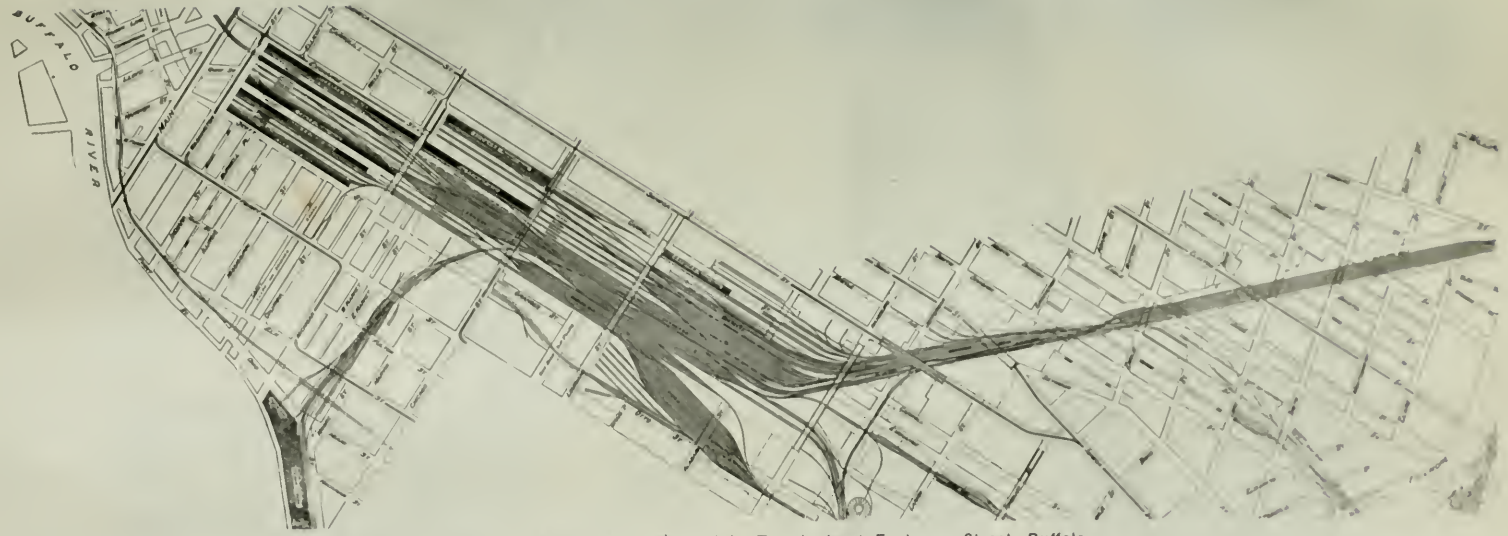
For more than 20 years the city of Buffalo and the 13 railroads entering that city have been trying to agree on a plan for a Union passenger station and the consolidation of the local freight terminal facilities. Numerous commissions have been appointed by the Mayor and the merchants of Buffalo to consult with the railroads and to formulate plans for the consolidation of the freight and passenger terminals. No less than six different sites have been considered. Three years ago the city commission which was then serving recommended, with the approval of all of the railroads, a plan for a Union station at the foot of West Genessee street. A definite offer was made to the city by the railroads that they would unite in the construction of a Union station on this site provided the city would undertake the opening and changing of a number of streets and canals. This offer was not accepted and for a time the agitation rested. There were serious objections to this site from an operating standpoint, chiefly the lack of room for adequate future expansion, but as it seemed to have many advantages in location by reason of its being near the business center and the center of population the railroads agreed to accept the plan.

Many studies have been made for the location of a Union passenger station on what is known as the Exchange street site extending as far west as Main street and south to Perry street. This ground is at the present time occupied by the freight and passenger terminals of the New York Central lines and the Erie. The principal objections to this site, however, are: (1) The necessity of scattering the present local freight terminals to remote parts of the city; (2) lack of room for future expansion; (3) interference between freight and passenger traffic due to grade crossings, and the fact that such a station would require an arrangement of stub tracks. Other sites have been suggested at Lafayette square, Driving Park and Eagle street, but none of these meets any of the requirements.

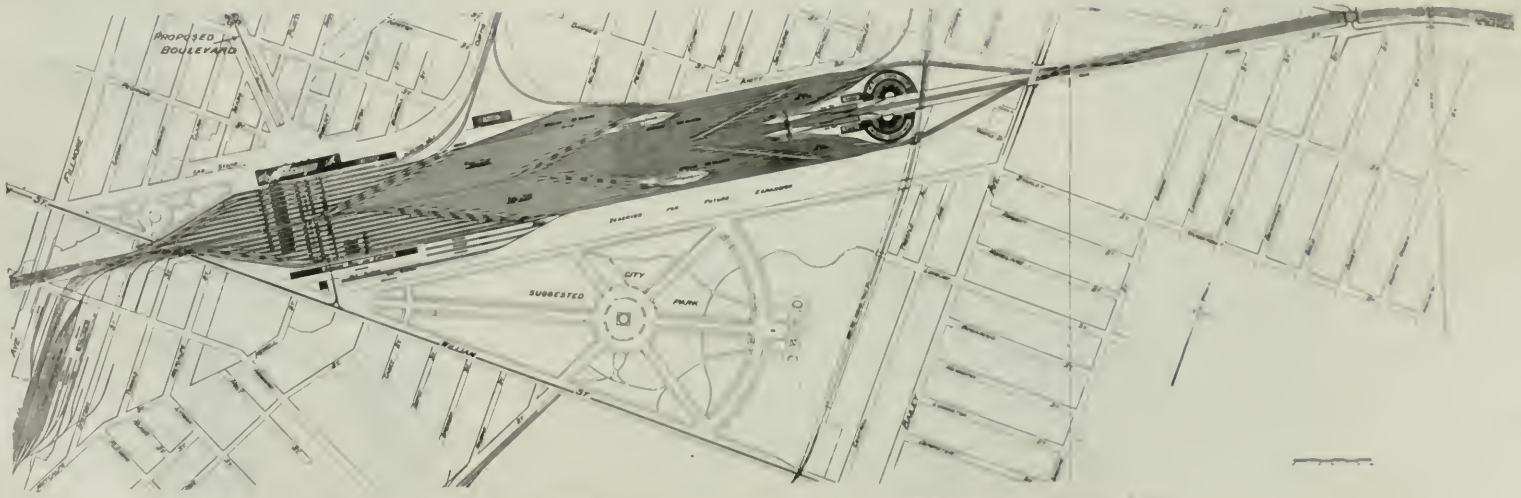
After the failure to agree with the city on the terms under which the Genessee street site could be acquired, the municipal commission resigned in disgust and it was not until about a year ago that the present commission, consisting of Henry J. Pierce, Carl Machener and W. H. Gratwick, was appointed. The railroad companies appointed a committee consisting of W. J. Wilgus (New York Central), Samuel Rea (Pennsylvania Railroad), and J. M. Graham (Erie). On June 11, 1907, this joint committee submitted a report recommending the construction of a Union station on the so-called Fillmore site, and with the report presented a proposed plan for a Union passenger station at that point and for the consolidation of the local freight terminals at Exchange street on the ground now occupied by the passenger and freight stations of the New York Central Lines and the Erie. While these plans are little more than a preliminary study, they indicate the advantages to all concerned of the entire rearrangement of the passenger and freight facilities in Buffalo. The Fillmore site has long been considered by most of the railroads as the most advantageous location in the city, and even before the Genessee street site was agreed upon its adoption had been strongly urged. It covers a large tract of land now occupied by the East Buffalo freight and stock yards of the New York Central lying between William street and Bailey avenue. It is about 1½ miles long and contains 300 acres free from intersecting streets. The New York Central is now building a large new yard near Gardenville on the Terminal Railway of Buffalo, on the completion of which all of the East Buffalo facilities will be transferred there. The ground thus to be vacated will then be available for the Union passenger station. While a passenger station built here would be farther from the business center of the city than the present passenger station, it would be much more



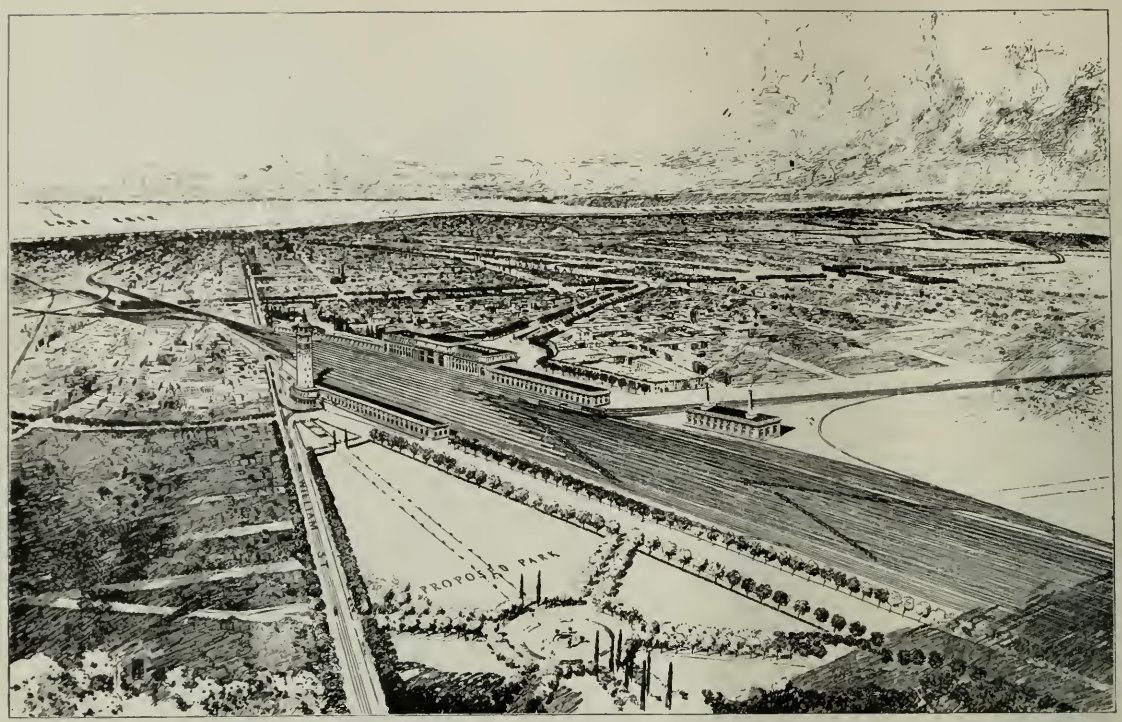
Key Map of Buffalo Showing Railroad Connections and Location of Proposed Union Passenger Station.



Plan of Proposed Consolidated Freight Terminals at Exchange Street, Buffalo.



Plan of Proposed Union Passenger Station and Connections at Fillmore and William Streets, Buffalo.



Perspective View of Proposed Union Station and Yard at Buffalo.

North Front of Proposed Union Station at Buffalo.

convenient to the largely growing population in the east, south and northern sections of the city. By widening William street and opening a new boulevard from the intersection of Broadway and Fillmore parkway to and under the passenger station to a connection with William street two fine thoroughfares would be opened between the business section of the city and the new terminal. Fillmore parkway intersects all of the streets in the residential section west of Main street and would thus afford convenient communication with the new terminal without the necessity of passing through the congested business streets. A further scheme for making the station more accessible is the electrification of the present Belt Line, which could be used as a distributing loop for suburban trains of all of the railroads making local stops at the intersections with the principal streets. A large station could be built at the Terrace convenient to the business and residential sections, and at this station passengers could buy through tickets and check baggage before taking a belt line train to the Union station. Similar facilities could be provided at other important stations.

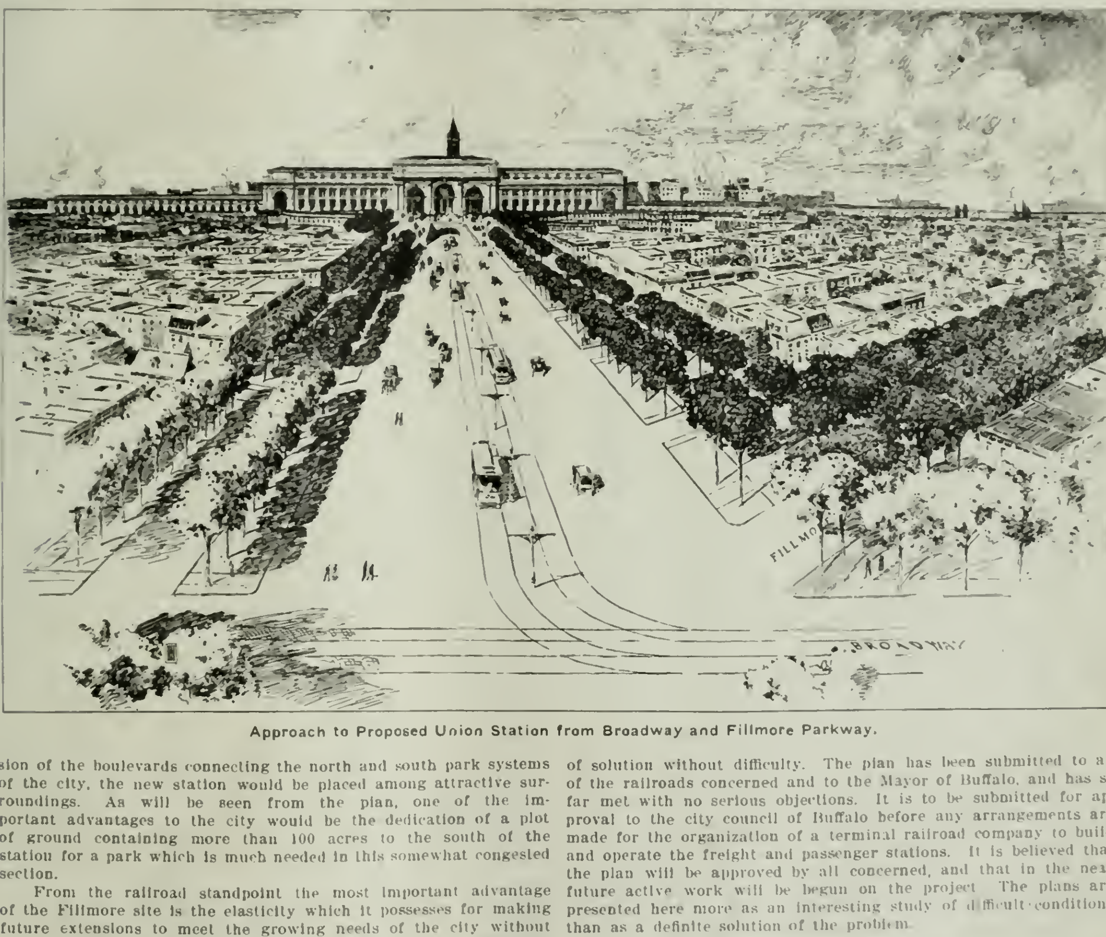
The street-car system could be easily adjusted to the conditions so that on the average no more time would be consumed in reaching the station from the residential sections than is now required to reach the present isolated stations. With the extension of the boulevards connecting the north and south park systems of the city, the new station would be placed among attractive surroundings. As will be seen from the plan, one of the important advantages to the city would be the dedication of a plot of ground containing more than 100 acres to the south of the station for a park which is much needed in this somewhat congested section.

From the railroad standpoint the most important advantage of the Fillmore site is the elasticity which it possesses for making future extensions to meet the growing needs of the city without any radical changes or reconstruction. Ample ground is available for adding future facilities which would take care of business for many years to come. Another point hardly less important is the fact that the station could be built without the least interference to traffic on any of the roads. The ground would be available for building even before all of the present yards are transferred to Gardenville, and the entire station and yards could be completed without interfering in any way with the present passenger or freight terminals of any of the roads. When completed and occupied the present terminals could be abandoned and the reconstruction and consolidation of the freight stations begun.

The adoption of this site for a Union passenger station will permit the centralization of the local freight terminals of all the railroads near the [illegible] of the city on an area of approximately 100 a[illegible] Washington, Scott and Hamburg streets. Buffalo would then have [illegible] terminals which, for convenien[illegible] of location [illegible] retail merchants and manufacturers and efficient operating features would not be equalled in any other city in the country. The business streets connecting with the freight houses and team tracks lead to the shipping districts without any steep grades or grade crossings of railroad tracks. A great saving of time and money to shippers would be made possible by this consolidation as mixed shipments for various lines could be delivered with a minimum loss of time.

In connection with the freight houses and team tracks the studies show large storage yards with independent switching leads and an absence of interruption of operation by passenger trains together with direct connections to the main outlying yards of the several railroads.

The accompanying maps and sketches of the proposed passenger station show the general features of the scheme as proposed. While they are, of course, tentative, they are the result of a careful study of all of the conditions, and it is believed that the many details of freight and passenger connections in and out are entirely possible of solution without difficulty. The plan has been submitted to all of the railroads concerned and to the Mayor of Buffalo, and has so far met with no serious objections. It is to be submitted for approval to the city council of Buffalo before any arrangements are made for the organization of a terminal railroad company to build and operate the freight and passenger stations. It is believed that the plan will be approved by all concerned, and that in the near future active work will be begun on the project. The plans are presented here more as an interesting study of difficult conditions than as a definite solution of the problem.



Approach to Proposed Union Station from Broadway and Fillmore Parkway.

Dry Battery for Block Signal Wires.*

In 1905 we placed 16 dry cells on the block wire at each of two stations, Brookfield and Waukesha. On account of earth currents at Waukesha we used one of our other telegraph wires for a return, arranging the keys at both stations with front and back contacts, removing the circuit closers, and arranging the circuit to close on the back stop without the battery and on the front with the battery, in a manner well known to you all. This circuit, including two 50-

*A paper by [illegible] J. Fry (C., M. & St. P.), read at the annual meeting of the Railway Telegraph Superintendents.

ohm sounders, measured 271 ohms. Each cell, when put in service, measured 1.5 volts and .125 ohms internal resistance. At Brookfield we set the battery on a shelf which had been used for gravity battery and left in a somewhat unclean condition. At the expiration of 23 months each cell measured 1.31 volts and 2 ohms internal resistance. At Waukesha we placed the battery far back on a new and clean shelf in the telegraph table, with a closed door. After 23 months each of these cells measured 1.38 volts and .68 ohms internal resistance. We are inclined to attribute the difference in condition of these cells to the condition of the shelves on which they were placed, because the service performed by each has been about the same. We estimate each system of cells has been used approximately 120 times a day, 3,600 times a month, and, if continued, this would amount to 43,200 times a year. We also estimate the keys were closed 3,360 times a day, making dots and dashes necessary to form letters and figures, which, for one month, would amount to 100,800 times, 1,209,600 times a year, or 2,419,200 times in two years. From the way this circuit works now we know it will continue to work two years, and, perhaps, longer. Taking these two systems together we had, to begin with, 32 cells and 48 volts. At the end of 23 months we had 20.96 and 22.08 volts, respectively, or 43.04 volts, a loss of, approximately, 5 volts. The 32 cells cost $5.12.

To secure the same voltage with gravity battery would have required 48 cells at an initial cost of 42 cents per cell, or $20.16, to which we add the expense for maintenance at $1 per cell per year, making a total of $68.16 for one year, and $116.16 for two years.

For each additional two years the expense for maintenance would be $5.12 and $96, respectively, for dry and gravity cells.

At present about two gravity cells per mile are used on block wires on many of the Western and some of the Eastern roads. Many of the block stations are closed during the night, and the arrangement of the dry cells to provide for the extended sections at night will, we assume, take double the number of dry cells, or four per mile, to accomplish the same results.

Assuming the life of the dry cells properly installed and maintained to be two years, we will estimate the maintenance only on a 100-mile block wire circuit for a period of 10 years, as follows:

One hundred miles, at 2 cells per mile gravity, would require 200 cells. To secure the same voltage we should need 133 dry cells, but on account of the longer sections at night 266 dry cells would be necessary.

For a term of 10 years each gravity cell would cost $10, while the dry cell only 80 cents, or comparatively,

Gravity	$2,000.00
Dry	212.80

I would not recommend cutting down the number of dry cells to the same voltage, but would recommend using twice as many dry cells as you would use of gravity, and thus secure 50 per cent. more current to start with, and sufficient to hold up the service near the end of each two years. I estimate the total expense as follows:

200 gravity cells, 10 years	$2,000.00
2,000 dry cells, 10 years	320.00
A saving of	$1,680.00

This would make a saving of $168 per year, or $1.68 per mile per annum.

In addition to this we do not need battery cupboard space in our stations, and are free from the accumulation of dirt, etc., accompanying gravity battery, and save the services of the lineman at each battery station four times a year, which is now an expense of about $10 per battery station per year.

We are about to equip two block wire circuits, one 285 miles and the other 125 miles long, with the dry batteries. A special key and a two-lever three-point switch have been designed to take the place of the old standard telegraph key and one-lever two-point switch, for the purpose of preserving in a block wire all the good features. While we eliminate the only objection to the present arrangement, namely, the operator at one station is unable to extend the circuit between the stations on each side of him without cutting his entire set out. This will prevent the signals passing any office and overcome the danger of operators making mistakes which are liable now when the circuit is cut through as above referred to.

In addition to using dry battery for our block wires, I shall submit a proposition to the telegraph company before long for the use of dry cells on our short branch lines, where there are only two or three offices, and where but a small amount of business is transacted. We are also using the dry cell exclusively in connection with our private line telephone systems, and use it in connection with our synchronizing self-winding clocks; also in our office bell and buzzer service; in fact, we use the dry cell wherever we can, to the exclusion of all others.

Beet Sugar Production.

The following statistics of beet sugar production are taken from a recent report to the Department of Agriculture:

By States, for 1906.

State and year.	Factories in operation.	Area harvested, acres.	Average yield of beets, per acre, short tons.	Beets worked, short tons.	Sugar manufactured. Pounds.	Sugar manufactured. Tons of 2,000 lbs.	Estimated average extraction of sugar, per cent.	Average: Sugar in beets, per cent.	Average: Purity coefficient of beets.	Average: Length of campaign, days.
California	8	60,141	11.17	671,571	185,480,000	92,740	13.81	16.7	82.7	115
Colorado	15	110,943	13.41	1,487,383	334,386,000	167,193	11.24	14.7	80.3	132
Idaho	4	19,950	11.48	229,023	56,798,000	28,399	12.40	16.9	86.8	95
Michigan	16	93,384	8.57	803,309	177,214,000	88,607	11.00	14.5	83.2	85
Nebraska	2	13,650	9.77	133,387	30,754,000	15,377	11.53	13.7	80.6	136
Utah	5	24,108	15.88	382,769	80,848,000	40,424	10.56	14.5	81.8	123
Wisconsin	4	15,560	10.19	158,600	35,220,000	17,610	11.10	13.6	83.0	83
States with but 1 factory: Arizona, Illinois, Kansas, Minnesota, Montana, New York, Ohio, Oregon, Washington	9	37,738	9.75	368,070	66,524,000	33,262	9.04	14.4	81.2	86
Total and average ..	63	376,074	11.26	4,236,112	967,224,000	483,612	11.42	14.9	82.2	105
Totals and Averages by Years, for 1901 to 1905.										
1905	52	307,364	8.67	2,665,913	625,841,228	312,921	11.74	15.3	83.0	77
1904	48	197,784	10.47	2,071,539	484,226,430	242,113	11.69	15.3	83.1	78
1903	49	242,576	8.56	2,076,494	481,209,087	240,604	11.59	15.1	...	75
1902	41	216,400	8.76	1,895,812	436,811,685	218,406	11.52	14.6	83.3	94
1901	36	175,083	9.63	1,685,689	369,211,733	184,606	10.95	14.8	82.2	88
Averages, 1901-1905..	..	227,841	9.13	2,079,089	479,460,033	239,730	11.53	15.0	82.3	82

The total sugar production of the world is given as follows:

Country.—Cane sugar.	1902-3. Tons.*	1903-4. Tons.*	1904-5. Tons.*	1905-6. Tons.*	1906-7. Tons.*
United States:					
Louisiana and Texas.	329,226	234,800	350,000	342,000	243,000
Hawaii	391,062	328,103	380,576	383,225	390,000
Porto Rico.	85,000	130,000	145,000	213,000	255,000
Total, U. S.†	805,288	692,903	875,576	938,225	888,000
Cuba	998,878	1,040,228	1,163,258	1,178,749	1,250,000
Other West Indies	260,163	268,306	244,837	300,618	291,000
Mexico	112,679	107,547	107,038	107,529	115,000
Central America	21,500	21,450	19,768	18,516	19,000
South America	579,022	601,134	590,382	700,001	654,000
Total, America	2,777,530	2,731,568	3,000,859	3,243,638	3,217,000
Asia	2,839,596	2,841,547	3,284,775	2,861,819	3,385,446
Africa	277,473	321,706	232,101	283,364	295,000
Oceania	133,126	163,328	216,213	230,000	249,000
Europe	28,000	28,000	18,592	14,512	15,000
Total cane-sugar ..	6,055,725	6,086,149	6,752,540	6,633,333	7,161,446
Beet sugar.					
United States	195,463	208,135	209,722	283,717	‡433,010
Canada	6,696	6,710	8,034	11,419	11,367
Total America	202,159	214,845	217,756	295,136	444,377
Europe:					
Germany	1,762,461	1,927,681	1,598,164	2,415,136	2,250,000
Austria-Hungary	1,057,692	1,167,959	889,373	1,509,879	1,335,000
France	833,210	804,308	622,422	1,089,084	755,000
Russia	1,256,311	1,206,907	953,626	968,000	1,450,000
Belgium	224,000	209,811	176,466	328,770	280,000
Netherlands	102,411	123,551	126,551	207,180	190,000
Other countries	325,082	441,116	332,098	415,000	440,000
Total Europe	5,561,257	5,881,333	4,708,700	6,933,649	6,700,000
Total beet sugar..	5,763,416	6,096,178	4,926,456	7,228,785	7,144,377
Total production	11,819,141	12,182,327	11,678,996	13,862,118	14,305,823

*In long tons of 2,240 lbs. except in the case of European beet sugar production, which has been reduced to metric tons of 2,204 lbs., or orders estimated by Licht. Other data are mainly from Willett & Gray, but in the case of British India official estimates of production have been substituted.

†Not including the Philippine Islands, which are included under Asia.

‡Equal to 481,971 short tons, or 1,350 tons greater than the preceding shown in table on page 104.

GENERAL NEWS SECTION

NOTES.

The Baltimore & Ohio has begun suit in Fayette county, Pennsylvania, to contest the constitutionality of the law of that state limiting passenger fares to 2 cents a mile.

The members of the Western Passenger Association have voted to make no more contracts for special trains for picnic parties—a decision which probably has a string to it

By the People's Line of steamers between New York and Albany the one-way fare is now $2 instead of $1.50, as in former years. The round trip fare has been advanced to $3.50

The Governor of New Jersey has signed a bill, passed by the legislature last winter, regulating demurrage on freight cars. The law requires railroads to give consignees three days' free time for unloading.

Press despatches one day last week reported malicious tampering with automatic block signals on two roads, the Philadelphia & Reading and the Atchison, Topeka & Santa Fe. In both cases trains were repeatedly stopped without cause.

Eight Colorado railroads have filed quo warranto proceedings in the district court at Denver against the Railway Commission and the State Treasurer, demanding that the commission be ousted from office and the law declared unconstitutional.

In a fire at Southwick, Mass., July 1, at the ice station of the New York, New Haven & Hartford, 40 freight cars were burned up, together with icehouses and machinery, involving a loss, including that on 75,000 tons of ice, aggregating $200,000.

A press despatch from Little Rock says that certain suits filed by Prosecuting Attorney Rhoton against the St. Louis, Iron Mountain & Southern for issuing mileage books to members of the 1905 legislature have been compromised by the railroad company agreeing to pay $12,500.

The new State Railroad Commission of New Jersey already has before it 17 complaints against the railroads. These are to be investigated as soon as inspectors are appointed. The members of the commission are J. W. Congdon, of Paterson (President); B. D. Dudley, of Orange, and E. Wilson, of Red Bank.

On Saturday, June 29, the new turbine steamship "Yale," of the Eastern Steamship Co., made the trip from New York to Boston in 12 hours 16 minutes, or at an average speed of 21¼ knots per hour. It is said that the best run ever before made between New York and Boston took 15 hours. The tide was against the "Yale" all the way.

On July 1 the New York Central made advances of about 10 per cent. in season-ticket rates between New York and Mount Vernon, White Plains and other stations on the Harlem division. Between Yonkers and 155th street, on the Putnam division, the single-trip rate has been reduced from 25 cents to 15, and the round trip from 40 cents to 25.

The Attorney-General of Missouri has requested the railroads of the state to cancel state passes now in the hands of persons other than railroad employees, so that the three-months' test of the two-cent law recently begun may be a fair one. Attorney-General Hadley says that if these passes continue in force no true estimate of the workings of the two-cent law can be made. There is no anti-pass law in Missouri.

The Trunk lines have issued a revised freight classification, to take effect August 1, in which a large number of items, said to be two-thirds, have been changed, many of them in such a way as to increase the freight rate. In a column article printed in a New York daily paper, designed to show that the increases are material, we find, however, hardly any evidence of important increases, except that the minimum weight for carloads is, in some cases, increased.

Reduced Passenger Fares.

Two-cent fares were adopted on all the principal railroads of Illinois, July 1, in accordance with the law of that state. The newspapers say that the railroads have decided not only to refrain from contesting the law until after some months' trial, but that they also intend soon to reduce interstate rates to a level with the rates prescribed by state laws. In Illinois passengers paying cash on trains, when they might have bought tickets, may still be charged 3 cents a mile. The order of the Virginia State Corporation Commission to sell tickets at 2 cents a mile has not been obeyed by the principal railroads of that state. A despatch from Norfolk says that the Norfolk & Western, the Chesapeake & Ohio and the Atlantic Coast Line began July 1 selling tickets with a coupon attached, entitling the buyer to a refund in case the price charged for the ticket should be finally decided unlawful.

The Engineers' and Constructors' Club.

This society, limited in membership to the engineers composing the organization of Dodge & Day, has been formed in Philadelphia to discuss subjects relating to engineering and construction, and to give all members the benefit of the experience gained by each in his particular line of work. Four meetings have been held and papers have been presented on Civil Engineering Preliminaries for an Interurban Trolley, by Charles Reed Marsh, Electric Welding, by J. H. Gravell; Gas Producers and Internal Combustion Engines, by John E. Zimmermann, and on Concrete Piling by Julian C. Smith. The proceedings of the club, giving the papers presented and the discussions, will be published regularly.

The Summer Season in Sioux City.

Sioux City, June 25.—Four railroads were rendered inoperative to-day when several thousand honey bees swarmed on the handle of an important switch in the terminal yards. A train of cars lay across the yards and obstructed traffic, but none of the two score of idle trainmen dared approach the switch. Aid came through a small boy, who declared that his father could capture bees. He was hailed as a saviour and despatched for his father. The latter showed up in half an hour and calmly loaded the bees into a wash boiler, and the wheels of commerce again revolved.—*Press Despatch.*

Two Ways of "Moving" Freight.

The freight agents of the Southern Pacific in California and Oregon have been rousing consignees to unload freight cars more promptly and figures have been published showing the degree of success attending their efforts. At Portland, April 1, the number of cars on hand waiting to be unloaded was 674; and on May 1, 823, but on June 11 this number was reduced to 216. At San Francisco the number of cars April 1 was 1,860; on May 1, 2,358, and on June 12, 1,640. At Sacramento and Los Angeles the number on June 12 was a little larger than on the 1st of May.

The foregoing was issued by a press bureau connected with the railroad. Another item on a cognate subject comes in the press despatches of June 20, and gives the interesting information that consignees in San Francisco who have wanted their cars badly enough to pay $50 each for having them expedited, have had no difficulty in getting prompt delivery. According to this despatch a former employee of the Southern Pacific, named Manvais, on payment of the sum named, telegraphed to Sparks, a division terminus in Nevada, and by dividing his fees with somebody at that point got the desired cars switched out and sent forward. The report says that Manvais did such an extensive business that he had to hire a secretary.

A Sane Gubernatorial Candidate.

Henry M. Whitney, outcast by Mr. Roosevelt, is a possible Democratic nominee for the governorship of Massachusetts. A part of a public speech of his on June 22 is as follows:

"The policy that has controlled the management of the railroads of the country, both east and west, has been a policy that has inured to the benefits of shippers of freight everywhere. And these shippers of freight who reside furthest from the centers of trade have received the greatest proportional benefit from it. Any change of policy brought about by government control or government ownership would, in my judgment, seriously menace all New England industries.

"I believe that it is everywhere admitted that the consolidation of the railroads has been productive of general benefit to the public. It happens that there is now under discussion a consolidation of railroad interests in New England, the largest and most important of any that have ever taken place in New England. * * *

"If we can safely be guided by the light of experience, there is no reason for distrusting the effect of this proposed consolidation upon the interests of the people of Massachusetts. I speak in this matter wholly as a citizen of Massachusetts. I have said that I had no part or lot in the arrangements for the exchange of stock. Had

I been consulted about it I should have advised the parties in interest to go about it in a more open manner. I think it was a tactical mistake in not having so proceeded.

"But the real question is, after all, whether this consolidation is or is not for the benefit of the people. I believed that the consensus on the part of the business men generally throughout the state would be well-nigh unanimous in its favor."

Censoring Railroad Messages.

The telephone service as well as the telegraph needs constant censoring, for the double reason that the telephone equipment is more expensive, and more easily accessible to those to whom "talk is cheap." The telegraph censor will probably find that the best means of checking telephone use is to have a record kept of stations or lines that are often reported busy, and get after the persons who use those lines and cut short their talk.—*F. E. Bentley, Terminal R. R. Association, St. Louis.*

Railroad Consolidation in Argentina.

Negotiations are being made for a consolidation of the Buenos Ayres & Pacific and the Argentine Great Western, together with the Argentine Transandine, which is under construction. If such a merger is carried out the resultant company will control a line from Buenos Ayres across Argentina to a connection with Chilean railroads, which will bring it to Valparaiso on the Pacific coast. The Buenos Ayres & Pacific runs from Buenos Ayres to Villa Mercedes, about 400 miles, where it connects with the Argentine Great Western. The latter goes as far as Mandoza, 200 miles west of Villa Mercedes. The Transandine is building from Mandoza across the Andes, and most of the work has been finished, the most important still undone being several miles of tunnels. The Argentine Great Western a short time ago arranged to operate the Transandine, and the Buenos Ayres & Pacific and the Argentine Great Western have jointly guaranteed the interest on the Transandine bonds. The plan for the merger of the companies is as follows:

The Buenos Ayres & Pacific is to take over both the other companies and agree to pay the Argentine Great Western interest charges, 6 per cent. dividends on the Argentine Great Western preferred stock and additional distributions on a rising scale in proportion to the dividends paid on Buenos Ayres & Pacific common stock. The Argentine Great Western common stock will rank with the Buenos Ayres & Pacific second preferred; it will receive 6 per cent. dividends and will also share with the Argentine Great Western preferred in receiving additional payments. The Buenos Ayres & Pacific has £6,950,000 ($34,750,000) debenture stock, £1,200,000 ($6,000,000) 5 per cent. cumulative first preferred, £1,000,000 ($5,000,000) 5 per cent. non-cumulative second preferred, and £6,000,000 ($30,000,000) common stock. The company also guarantees dividends on £5,059,718 ($25,298,590) stock of subsidiary companies. The Argentine Great Western has £3,975,517 ($19,877,585) debenture stock, £1,312,500 ($6,562,500) preferred, and £2,937,500 ($14,687,500) common stock.

Cigarettes Worse Than Whisky.

In April last the Pittsburgh Railways Company of Pittsburg, operating 490 miles of track and 1,800 cars, issued a notice to employees that for the betterment of the service and the safety of the public, it would thenceforth be the policy of the company to not retain in its employ men who use intoxicating liquors or cigarettes or are in the habit of gambling. Concerning this notice General Superintendent John Murphy, writing to the *Sunday School Times*, says:

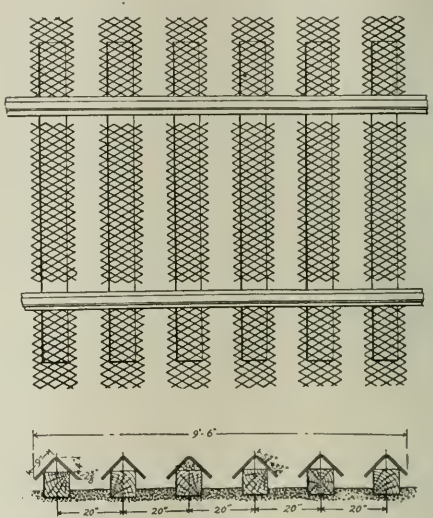
Being an officer of a company that carries over two hundred and twenty-five million passengers yearly, it becomes my moral and legal as well as my public duty to use all reasonable means to protect the lives and further the comfort of this large number of passengers. Having for some time back noticed that our accidents were increasing, upon investigating the cause I satisfied myself that the standard of our men who did not use liquor or tobacco (the latter in the form of cigarettes) was much above that of those who used either. I therefore deemed it my duty to abate the evil so far as lay in my power to do so, and tried to uproot it and cast it out through discipline, but found this method inadequate and ineffectual. I then went further, and concluded the desired end could be attained only by removing from the service or refraining from employing all men addicted to the objectionable habits alluded to.

It is my aim and intention to pursue this policy without abatement, since I have let it proved beyond all doubt that it has raised the standard of our men. I have been criticized for the stringency of the order, especially the prohibition of the use of cigarettes; but on the other hand I have the assurance of our division superintendents (of which we have 12), aided by my own observations, that persons addicted to the use of cigarettes, especially young men, are the most careless in their duties and less able to perform them than men using liquor in moderation. I may also mention that in 17 years' experience as manager of public utility corporations I have had occasion to promote many of our men from the rank of conductors and motormen to officers, and in no case has a man using whisky come up to the requirements.

An Expanded Metal Cattle Guard.

An expanded metal cattle guard has been designed by F. W. Stewart, General Manager of the Climax Stock Guard Co., Chicago. It is made in sections 2 ft. long and 18 in. wide, bent to a trough shape, each side thus being 9 in. wide and 24 in. long. These sections are set one over each tie, extending 4 in. above and 2⅜ in. below the top. The ballast between ties is removed to a depth of about 6 in., making it even more difficult to cross the guard. When cattle attempt to cross their feet go into these shallow pits, and the projections from the expanded metal, striking their legs in a tender part, make it painful to proceed. The guard, however, does not prevent them from withdrawing their feet. The mesh of the expanded metal may be made any size desired.

The tie spacing may be anything desired, that in the drawing being 20 in.; also any number of ties may be covered. Track work and tie inspecting may be done without removing the guard. Each



A New Expanded Metal Cattle Guard.

section is fastened in place with from eight to 15 staples. If a section should be crushed or mashed out of shape it may be restored and again put in service with little expense or trouble. It is cheap in first cost and if galvanized or properly painted, will last a long time. These guards have had numerous tests with satisfactory results. They are light and are shipped in bundles, so that they occupy little space, and the freight rate on them is low.

Fire Test of a Concrete-Block Building.

A fire test of a concrete-block business building, by actual conflagration, occurred at Nashville, Tenn., a short time ago. It was the five-story Montgomery building, built of two-piece concrete blocks by the Granitoid Construction Co., of Nashville, the blocks being made under the American hydraulic system. According to the report, at one time during the fire the upper walls of the building as well as the concrete ornamental cornice and top courses, were almost at a white heat, appearing to be transparent, but notwithstanding the great volumes of water poured on them while in this condition, little or no damage resulted, except for a few chips in the sills of the windows and the blocks adjacent to such openings. The walls remained intact. This was an excellent demonstration of the fire-resisting qualities of concrete blocks made of the materials used in the construction of this building, namely, crushed limestone, granite screenings and Portland cement. The building was stocked with highly inflammable material, being occupied as warerooms by a firm of furniture dealers. The building was valued at $35,000, but the damage was estimated at not over $8,000.

The walls of the building are 16 in. thick, with a 50 per cent. air space, except the top story, which is 12 in. thick, with a 40 per cent. air space. The headquarters of The American Hydraulic Stone Co., under whose system the blocks were made, are at Denver, Colo.

Abyssinian Railroad Fails.

The Abyssinian Railroad, being unable to pay dividends, has applied for liquidation. M. K[illegible], a Frenchman, has been appointed receiver and will conduct the negotiations for carrying out the construction of the extension of the line to Adis Abeba, the capital of Abyssinia.

The Abyssinian Railroad runs from the port of Djibutil, French Somaliland, to Dire Dawa, about forty miles from Harar, in Southeast Abyssinia, a distance of about [illegible] miles.

It was opened for traffic December 20, 1902. The total receipts in 1904 amounted to about $[illegible] and the total expenses, including financial charges, to about $[illegible], leaving a deficit of about $[illegible]. The line had the effect of diverting to Djibutil the Abyssinian trade which used to pass through the port of Zaila, British Somaliland. Last year France, Great Britain and Italy negotiated a joint treaty with Abyssinia, the main features of which are a guarantee of the integrity of the Abyssinian empire, the open door, commercial equality for all countries and the continuation of the construction, under French auspices, of the railroad from Dire Dawa to Adis Abeba, Great Britain and Italy naming representatives on the railroad directorate. King Menelik, in agreeing to the international control of the railroad, made the reservation that it should in no way limit his sovereign rights.—*New York Tribune.*

"Put Knocks in the Box."

This, according to the Chicago reporters, is what the Burlington road has invited its passengers to do. A locked box, with an opening in the lid, is fixed in the observation cars on trains 47 and 48 between Chicago and St. Paul, and passengers are invited to drop into the box any suggestions they may have to offer concerning the quality of service on the trains. One swallow does not make a summer, but one complaint box appears to have been sufficient, in this case, to lead the industrious reporters to herald this new "enterprise" of the Burlington as having been put in vogue throughout the company's lines. If now, this enthusiastic passenger department would invite growlers to growl into a box, or something of the sort, at all the small stations and on the non-luxurious trains, and would publish the results, some interesting reading might be brought out.

Service on Public Commissions.

Legislated out of existence, the New York Rapid Transit Commission will pass into our municipal history as one of the most remarkable civic bodies ever created with a special end in view. It has been a fine example of public service. Many of our best citizens, on this Commission, have been willing to give unstintingly of their time and talents in order to help on the progress of New York. Governor Hughes has had difficulty in securing the type of men he desired to appoint to the new commission. The salary of the position is ample; but the labor that will have to be faced is great. Very much—perhaps too much—will be expected of the new Commission. This is why some whom the Governor sought to induce to serve have declined. They are not afraid of work, but they do not like to undertake impossible tasks; and they think that the public is now in a mood to demand impossibilities. * * * More than this, a salary of $15,000 does not now look so tempting as it did when its purchasing power was greater. Then, too, in order to earn it, a great deal of hard and confining work will have to be done. This prospect might well deter a man not in robust health, as it surely would a lover of ease, but even this is not the greatest difficulty. Competent men, otherwise willing, dread the criticism and unfair attack which, they say, more and more befall those who try to work for the public. Criticism of men on public commissions of all sorts is more constant and searching than it used to be. This is due, not so much to the development of a carping temper in people, as to the increased facilities for making and distributing comment, forming and echoing judgment. The complaint of one aggrieved citizen is now caught up in the press and talked about by thousands, in a way once wholly impossible. But to have his best work found fault with, his real achievements minimized, and his failures magnified, is what any man must look forward to who consents to serve on a Rapid Transit Commission, a Board of Education, or a Public Service Commission. But what of it? It should all be taken as simply a part of the day's work.—*Evening Post,* New York.

More Safety Appliance Law Violations.

Attorney-General Bonaparte has brought suits against 32 railroads to recover penalties for violation of the safety appliance law. These prosecutions are based on information reported by the safety appliance inspectors of the Interstate Commerce Commission. The roads made defendants are as follows: Alabama Great Southern; Baltimore & Ohio (10 violations); Chicago & Eastern Illinois; Chicago Great Western ([illegible] violations); Chicago, Rock Island & Pacific (21 violations); Big Four; Chesapeake & Ohio; [illegible] & Cincinnati [illegible] & [illegible] & [illegible]; [illegible] & Southwestern; [illegible] Harrisburg & San Antonio; Georgia Railroad; Great Northern; Illinois Central ([illegible] violations); Kansas City Southern ([illegible] violations); Louisville & Jeffersonville Bridge Company; Nashville, Chattanooga & St. Louis; [illegible] Railway ([illegible] violations); Pennsylvania Railroad; Philadelphia & Reading; Mobile & Ohio; New York, New Haven & Hartford; Northern Pacific; St. Louis & San Francisco; St. Louis, Iron Mountain & Southern; Southern; Terminal Railroad Association of St. Louis; Texas & Pacific; Wabash; [illegible] & [illegible] River; Yazoo & Mississippi Valley. About two months ago similar suits were brought against [illegible] railroad companies for similar violations.

INTERSTATE COMMERCE COMMISSION RULINGS.

Privileges in Transit Must be Published to be Effective.

In an opinion by Commissioner Clements the Commission has dismissed the complaint of R. R. Shiel & Co. against the Illinois Central and others, holding that the privilege of stopping in transit hogs shipped from western points to the East in order that they may be sorted and reconsigned under the through rate from point of origin cannot be enforced against carriers in favor of any single place or shipper in the absence of lawfully established tariffs making such privilege open to the public at large. To whatever extent long previous existence of lower rates in actual use may justify a presumption that they are sufficiently high, the mere publication of such rates, under which there has been no appreciable movement of traffic, is not conclusive proof that they are reasonably remunerative to the carriers. All privileges accorded on shipments in transit which affect the value of the service performed must be published in the tariffs, and reparation based on breach of contract for a privilege which was not mentioned in the tariffs must be denied the shipper because its allowance without publication was in violation of law. The facts bearing on the question of the reasonableness of the rates at issue have not been sufficiently developed to afford a proper basis for satisfactorily determining that question.

Coal Rates to Dallas, Tex.; Principle of Rate Comparison.

The Interstate Commerce Commission has announced decision in the case of Dallas Freight Bureau vs. Gulf, Colorado & Santa Fe and others (opinion by Commissioner Harlan). Rates to Dallas, Tex., from certain mines on the carriers' lines in Indian Territory and southern Arkansas have lately been increased from $1.25 to $1.50 a ton on slack coal and from $1.85 to $2.10 a ton on mine-run coal. On complaint that the present rates on such coal are unreasonable and request that the lower rates be restored, the Commission decides that following former decisions of the Commission on the reasonableness of coal rates of these carriers in adjacent territory, the rates from the mines that now take the $2.10 and $1.50 rates to Dallas should not for the future exceed $1.90 on mine-run and lump and $1.40 on slack coal. For the mines that now take rates of $1.85 and $1.25 to Dallas there should be some corresponding reduction, but as to these mines no order is now made.

The Commission further says that while the revenue per ton-mile over other routes on other lines and to other destinations is often suggestive in arriving at a proper estimate of the reasonableness of a rate over a route complained of, it is by no means conclusive. Varying conditions existing on different lines must of necessity justify differences in rates for hauls of the same distance. The real question in any complaint is between the particular points in question. In testing such a rate the rates on the same or adjacent lines in the immediate territory where the same conditions exist are of much greater significance and afford a much more accurate basis.

Classification of Different Kinds of Brick; Principle of Classification.

In an opinion by Commissioner Lane, the Commission has announced decision in the case of the Stowe-Fuller Co. against the Pennsylvania Company, Pennsylvania Railroad, and the Baltimore & Ohio. The complaint in this case was directed solely against present differences in the carriers' rates on fire, building and paving brick from Empire, Strasburg, and other points in Ohio to New York City and other eastern destinations, but no attack was made on the reasonableness of the rates on either kind of brick except as involved in the claim that any difference in the rates for the different kinds is unlawful. The Commission holds that no such distinction between these three classes of brick, which are made of the same material, come out of the same kiln, are nearly alike in color, and are of the same size and weight, exists as justifies a difference in rates. To hold otherwise would be to promote false billing by

the shippers and to require carriers to make an almost impossible examination of the use to which each shipment of these brick was put. The Commission further says that classification must be based upon a real distinction from a transportation standpoint. Aside from the difficulty in learning what use the brick were to be put to, the Commission cannot regard a classification as scientific, or a difference in rates as well based, which is altogether founded upon a distinction that has no transportation significance. Such a differentiation, if permitted and extended throughout the various classes of freight, would lead to an almost endless multiplication of rates which could find no excuse save the use which might be made of the article transported.

Territorial Classification Upheld.

In an opinion by Commissioner Prouty, the Commission decides the case of Desel-Boettcher Co. vs. Kansas City Southern and others. For the purpose of naming rates to various points in Texas, stations on the Kansas City Southern are grouped in territories as follows: South from Kansas City all stations up to, but not including Siloam Springs, are in Kansas City territory, while Siloam Springs and stations for a certain distance south are embraced in Little Rock territory. The carriers transferred Siloam Springs from Little Rock territory into Kansas City territory. The complainant alleged that this change, resulting in an advance of the rates on green apples in carloads from 49 cents to 58 cents per 100 lbs. from Siloam Springs to Houston, Tex., was unwarranted. The Commission holds that group rates must of necessity result in a certain amount of discrimination, but they should produce as little discrimination as possible; and that, upon the facts of this case, the change of Siloam Springs from the Little Rock group to the Kansas City group did not result in undue discrimination.

Passenger Rates on the St. Louis & North Arkansas Upheld.

In an opinion by Commissioner Clements the case of the Railroad Commission of Arkansas vs. the St. Louis & North Arkansas Railroad is decided. The petition of the Railroad Commission prayed for a reduction in the interstate passenger fares of this company between Arkansas points and interstate points. The complaint against the railroad company is dismissed and the Commission holds that the defendant road being unfinished, without through connections, not extravagantly managed, under the necessity of making extensions by public authority and in need of equipment and extension, and not earning sufficient to more than meet its operating expenses, and fixed charges not having been shown to be excessive, should not be required to transport interstate passengers at the same rates per mile as are finished, well-equipped and prosperous roads.

Moultrie Gets Better Rates.

The Interstate Commerce Commission, in an opinion by Commissioner Clements, has announced its decision in the case of Southern Grocery Company and Holmes-Hartsfield Company vs. Georgia Northern Railway and others. The complaint alleged that the carrier's rates, which are higher from Louisville, Cincinnati, Memphis and Nashville to Moultrie, Ga., than from the same points of origin to Tifton, Valdosta, Quitman, Thomasville and Fitzgerald, Ga., are unreasonable. The Commission decides that the circumstances and conditions surrounding transportation of freight by the carriers from such points of origin to Moultrie are not substantially dissimilar from those from such points of origin to said other nearby Georgia points, and that the practice of charging such higher rates to Moultrie is unjustly discriminatory, unreasonable and unlawful; and the Commission further decides that the just and reasonable practice would be to charge for such transportation to Moultrie the same rates from such points of origin as are charged therefrom to Tifton, Valdosta, Quitman, Thomasville and Fitzgerald. An order in accordance with such decision is entered.

The South Versus New England Again On Cotton Rates.

The Interstate Commerce Commission in an opinion by Commissioner Prouty has announced its decision in the case of the China & Japan Trading Co. and others against the Georgia Railroad and other lines forming through routes to the Pacific coast. The carriers' rates on cotton-piece goods from New England mills through Pacific coast points to the Orient is $11.25 for 40 cu. ft. of measured space, equivalent to about 85 cents per 100 lbs. Through rates on the same articles from Southern mills over the same route is $1.25 per 100 lbs. On complaint that this adjustment is unreasonable in itself and also discriminates against Southern mills in favor of New England mills, the Commission holds that the complaint is not sustained. The evidence of complainants strongly tended to show that an illegal agreement to advance rates on cotton-piece goods was made by transcontinental lines, and that the advanced rates were put in under that agreement; but it is not necessary to pass upon that question, because even if it were answered in favor of complainant the Commission would still be of opinion that this would afford no ground for either reducing the rate from Southern mills or awarding reparation. The mere fact that the advance was the product of an unlawful combination will not justify the setting aside of such rate if the Commission is of the opinion that such rate is not unreasonably higher than the previous rate.

Lower rates from New England than from the South on cotton products were upheld by the Commission in the case of Enterprise Manufacturing Co. et al. vs. Georgia Railroad et al. decided May 1, 1907. This decision was quoted in part and commented on in the *Railroad Gazette* of June 28, 1907, under the editorial, "The Working of the Rate Law."

TRADE CATALOGUES.

Chicago, Burlington & Quincy.—A pamphlet issued by the passenger department takes as its text, "How can you afford not to visit Yellowstone Park?" and makes out a strong case. It points out that it is not necessary in touring the Yellowstone to endure such hardships as many think of as being inseparable from the trip; also that the park is not merely a show place to be rushed through, guide book in hand, in a few days, but is also an excellent region for rest, both climate and diversions being salubrious. The pamphlet, which includes a large map of the park, then goes on to describe in detail the hotels, the coaching tours and excursions, the fishing and the natural phenomena for which the park is best known. It also gives suggestions as to what to wear and take and the cost of tours from different cities of the Middle West. Another of the company's folders describes a two weeks' tour via Denver and Colorado Springs through the Yellowstone Park and return.

Flexible Metallic Hose.—Bulletin 25 of the New York Flexible Metallic Hose & Tubing Co., New York, illustrates and describes "Nyflexmet" lead covered flexible metallic hose and tubing. This form of hose is built up of spirally twisted, ribbon-like strips of pliable steel or copper, having the edges formed into interlocking lips, the joints of which are packed with asbestos or rubber. For special purposes where it is required to resist corrosion, as for example, gas mains, it is furnished with an outer casing of lead. For water mains and similar purposes it is made with both an inner and outer lead tube. All sizes from ¼ in. to 12 in. internal diameter are furnished and the lightest construction is made to stand a pressure of 500 lbs. per sq. in.

Coupler Repair Parts.—The McConway & Torley Co., Pittsburg, Pa., has prepared a small pamphlet containing illustrations and information for ordering all repair parts for Janney, Kelso and Pitt couplers, and also Buhoup three-stem buffer equipment. The pamphlet is intended for distribution among car repairmen and purchasing agents to aid them in ordering repair parts direct from the makers instead of from irresponsible outside companies whose product is often of inferior quality and not perfectly interchangeable. It will be sent to anyone interested on application.

The Bucyrus Co., South Milwaukee, Wis., has reprinted the President's message on the Panama Canal, communicated to Congress last December, in a handsome book which it is distributing. The printing is in brown on cream paper, with paragraph headings in red, and there are fine half-tone illustrations, also in brown. The cover is flexible brown board with gold embossed lettering, tied with brown silk cord. There is also a map of the Isthmus showing the canal route. The Bucyrus Co. has furnished all the steam shovels thus far ordered by the Canal Commission.

MANUFACTURING AND BUSINESS.

It is said that the Pullman Company is figuring on plans for a steel car plant at Hammond, Ind.

The Union Refrigerator Transit Co. has ordered Neponset insulating paper for repairs and new work on refrigerator cars. The paper is made by F. W. Bird & Son, East Walpole, Mass.

Clarence Price has been elected a Vice-President of the American Car & Foundry Company, New York. William M. Hager, Assistant Secretary, has been elected Secretary, succeeding D. A. Bixby.

G. M. Genter, Jr., has been appointed Assistant Engineer in charge of estimating and drafting in the reinforced concrete department by the General Fireproofing Company, Youngstown, Ohio.

H. M. Beugler, formerly Superintendent of Railways for Ford Bacon & Davis' operating department, operating the Newman properties in Houston, Tex., Memphis, Little Rock, Birmingham, Nashville, Knoxville, has gone to Dodge & Day, Philadelphia and New York.

The exhibit of the American Blower Co., Detroit, Mich., at the Atlantic City conventions contained a mystifying novelty which attracted much attention. A high-pressure blower, running at speed and emitting a blast of air at high velocity, held suspended about 4 ft. from the outlet and at an angle of 45 deg. from the perpendicular, a light sphere about 12 in. in diameter. Observers were asked to explain why the sphere remained at that point instead of flying off into the ocean, but it is claimed no satisfactory solution was advanced by the engineers and others who saw it.

Iron and Steel.

About 3,000 tons of steel will be needed for the new shops of the St. Louis & San Francisco, at Springfield, Mo.

It is reported that the Atchison, Topeka & Santa Fe has given an order to the Bethlehem Steel Corporation for 10,000 tons of rails to be delivered in 1908. The price, it is said, is above $30 a ton.

OBITUARY NOTICES.

Daniel Jones, formerly Comptroller of the Philadelphia & Reading, died on June 24 at his home at Oaklane, Pa. Mr. Jones was 61 years old, and had been retired on a pension in January, 1905.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Canadian Pacific.—A. D. MacTier, General Fuel Agent, has been appointed Assistant to the Vice-President, with office at Montreal. Thomas Britt has been appointed Acting General Fuel Agent, with office at Montreal.

Central of Georgia.—Charles Steele and George G. Haven have resigned from the Board of Directors. Oakleigh Thorne, Marsden J. Perry and William F. Sheehan have been elected Directors.

Chicago, Milwaukee & St. Paul.—Walter P. Bliss has been elected a Director, succeeding Herman S. Leroy.

Delaware & Hudson.—Clifford Stanley Sims, who succeeded A. I. Culver as Second Vice-President and General Manager, was born in 1868 at Prairie Ridge Plantation, Ark. He was educated at Mount Holly, N. Y., and in 1885 immediately after graduation began railroad work in the Engineering department of the Pennsylvania. In 1888 he was made assistant supervisor of the Pennsylvania Lines West at Cleveland, Ohio. Two years later he was appointed Assistant Engineer of Maintenance of Way at Fort Wayne, Ind., and in 1894 was made Acting Assistant Engineer of Motive Power. Next year he was promoted to be Engineer of Maintenance of Way at Toledo, Ohio, and in 1896 was transferred to Allegheny, Pa., with the same title. Three years later he was made Engineer of Maintenance of Way of the Chicago Terminal division, and in 1901 was appointed Superintendent there. The next spring he went to the Baltimore & Ohio as General Superintendent at New York, and in 1903 was made General Manager. In 1905 he went to the Erie, where he remained until he went to the Delaware & Hudson.

C. S. Sims.

New York Public Service Commissions.—The Commissioners appointed for the First district, consisting of New York, Kings, Queens and Richmond counties, are: William R. Willcox, of New York, Chairman; William McCarroll, of Brooklyn; Edward M. Basselt, of Brooklyn; Milo R. Maltbie, of New York, and John E. Eustis, of The Bronx. The Commissioners for the Second district, which includes all the other counties in the state, are: Frank W. Stevens, of Jamestown, Chairman; Charles Hallam Keep, of Buffalo; Thomas Mott Osborne, of Auburn; James E. Sague, of New Hamburg, and Martin S. Decker, of New Paltz.

Illinois Central.—See Yazoo & Mississippi Valley.

New York, New Haven & Hartford.—Charles M. Pond and Lewis C. Ledyard, of New York, and Richard Olney, of Boston, who were recently elected Directors, have resigned.

Yazoo & Mississippi Valley.—I. G. Rawl, Vice-President of the Illinois Central, has been made also Vice-President of the Yazoo & Mississippi Valley, in charge of construction and operation.

Operating Officers.

Chicago & Alton.—William L. Derr, Superintendent at Bloomington, Ill., has resigned to become General Superintendent of the New York City Railway.

Chicago, Milwaukee & St. Paul.—J. H. Foster, Superintendent at Marion, Iowa, has been appointed Assistant General Superintendent at Minneapolis, succeeding H. B. Earling, promoted. W. B. Foster, Superintendent of the River, Chippewa Valley and Wabash divisions, succeeds J. H. Foster. H. T. Van Vliet, Superintendent of the Hastings and Dakota divisions, succeeds W. B. Foster, with office at Minneapolis. G. A. Van Dyke succeeds Mr. Van Vliet, with office at Minneapolis.

Illinois Central.—See Yazoo & Mississippi Valley.

New York Central & Hudson River.—Clinton Lloyd Bardo, who was recently appointed Superintendent of Grand Central Station and the Electric division, was born at Montgomery, Pa., in 1867. He began railroad work in 1885 as an operator on the Pennsylvania. The next year he worked as operator on the Philadelphia & Reading, and then went to the Tidewater Oil Company as operator and supply agent in the Construction department at Mauch Chunk, Pa. In 1887 he went to the Lehigh Valley as operator, being later made train despatcher. In 1892 he was appointed Assistant Trainmaster of the Wyoming division, and after a few months was made Trainmaster of that division. He was transferred to the New York division in 1901, and in 1904 went to the New York Central as Freight Trainmaster of the New York division. He was appointed Assistant Superintendent of this division in 1905, where he remained until his recent promotion.

C. L. Bardo.

St. Louis, Iron Mountain & Southern.—John William Dean, who was recently appointed Superintendent at De Soto, Mo., was born on January 15, 1867, in Lafayette County, Mo. After a public school education, he began railroad work in 1878 as a messenger boy on the Chicago & Alton. He served as operator, brakeman and agent on the Kansas City, Springfield & Memphis, now part of the Frisco Lines, and then went to the Missouri Pacific as operator and despatcher. After being operator and brakeman on the Southern Pacific, he went in 1887 to the Atchison, Topeka & Santa Fe as operator. He was made successively despatcher, chief despatcher, yardmaster and Trainmaster, and then in 1902 was made Trainmaster of the Denver & Rio Grande. After being appointed Superintendent of Terminals on this road, he went to the Colorado & Southern in 1903 as Superintendent. From 1904 to 1905 he was Superintendent of Terminals at Mexico City of the National of Mexico, and then went to the Illinois Central as Trainmaster of Ter-

J. W. Dean.

minals. He went to the St. Louis, Iron Mountain & Southern in September, 1905, as Superintendent of Terminals at Little Rock, Ark., and on February 1, 1906, was appointed Superintendent at Van Buren, Ark., where he remained until his recent transfer.

Norfolk & Western.—The lines of this company are now operated in two general divisions. A. C. Needles, heretofore General Superintendent of the entire road, has been appointed General Superintendent of the Eastern General division, consisting of all lines east of Bluefield, W. Va., including Bluefield terminals, with office at Roanoke, Va. George P. Johnson, Superintendent at Portsmouth, Va., has been appointed General Superintendent of the Western General division in charge of all lines west of Bluefield, including Bluefield terminals, with office at Bluefield. E. A. Blake, Superintendent at Roanoke, Va., succeeds Mr. Johnson. James P. Carey, Assistant Superintendent at Bluefield, succeeds Mr. Blake.

Northern Pacific.—B. E. Palmer, Assistant General Superintendent at Tacoma, Wash., has been appointed General Superintendent of Western lines, from Trout Lake, Mont., west. J. G. Cutler, General Superintendent of the Washington & Columbia River, has been appointed Superintendent of the Northern Pacific at Pasco, Wash.

Tehauntepec National.—J. N. Galbraith, General Manager, has resigned. W. B. Ryan, Vice-President, has been appointed also General Manager. H. W. Morris, Assistant to the General Manager, has been appointed Assistant to the Vice-President and his former office has been abolished. The offices of both are at Rincon Antonio, Oaxaca.

Washington & Columbia River.—See Northern Pacific.

Yazoo & Mississippi Valley.—F. B. Harriman, General Manager of the Illinois Central, has been appointed also General Manager of the Yazoo & Mississippi Valley.

Traffic Officers.

Northern Pacific.—S. B. Calderhead, General Freight and Passenger Agent of the Washington & Columbia River, has been appointed General Agent of the Northern Pacific, with office at Walla Walla, Wash.

Philadelphia & Reading.—E. B. Crosley has been appointed Coal Freight Agent, with office at Philadelphia, succeeding John H. Jones, retired.

St. Louis & San Francisco.—E. T. Willcox, Division Freight Agent at Birmingham, Ala., has been appointed Assistant General Freight Agent at Memphis, Tenn.

Seaboard Air Line.—C. D. Wayne, chief clerk in the General Passenger Agent's office, has been appointed Assistant General Passenger Agent, with office at Portsmouth, Va.

Washington & Columbia River.—See Northern Pacific.

Engineering and Rolling Stock Officers.

Illinois Central.—H. R. Safford, Assistant Chief Engineer of this company and of the Yazoo & Mississippi Valley and of the Indianapolis Southern, has been appointed to the new office of Chief Engineer of Maintenance of Way of the three companies, with office at Chicago, and the office of Assistant Chief Engineer has been abolished.

Indianapolis Southern.—See Illinois Central.

Yazoo & Mississippi Valley.—See Illinois Central.

LOCOMOTIVE BUILDING.

The Portland & Seattle, being built by the Northern Pacific, is in the market for five switching locomotives.

Stanley, Merrill & Phillips have ordered one consolidation locomotive from the Baldwin Locomotive Works.

The Illinois Steel Company, Chicago, has ordered one heavy four-wheel saddle tank switching locomotive from the Baldwin Locomotive Works.

The Minnesota Land & Construction Company, Duluth, Minn., has ordered three locomotives from the American Locomotive Company.

The Galveston Wharf Co., Galveston, Tex., has ordered eight six-wheel switching locomotives from the American Locomotive Co., with cylinders 19 in. x 26 in.

The Sierra Madre Land & Lumber Company, as reported in the *Railroad Gazette* of February 15, has ordered two consolidation locomotives from the American Locomotive Company.

The Henry Cowell Lime & Cement Co., Cleveland, Ohio, is said to have ordered two four-wheel saddle tank locomotives and two six-wheel switching locomotives from the Baldwin Locomotive Works.

The Virginia & Southwestern, as reported in the *Railroad Gazette* of June 14, has ordered three simple consolidation locomotives from the American Locomotive Company for September, 1907, delivery.

General Dimensions.

Type of locomotive	Simple consolidation
Weight on drivers	154,300 lbs.
Weight, total	171,000 "
Diameter of cylinders	21 in.
Stroke of pistons	26 "
Diameter of drivers	51 "
Boiler, type	Straight top
" working steam pressure	200 lbs.
" heating surface	2,562.7 sq. ft.
" tubes, number	350
" " material	Shelby steel
" " outside diameter	2 in.
" " length	15 ft.
Firebox, length	120¼ in.
Firebox, width	40⅝ "
Grate area	34 sq. ft.
Tank capacity for water	6,000 gals.
Coal capacity	11 tons

Special Equipment.

Air-brake	Westinghouse
Boiler check	Phillips
Boiler lagging	Johns-Manville
Injector	Nathan simplex
Lubricators	Franklin
Piston rod packing	United States
Valve rod packing	United States
Safety valve	Crosby
Sanding devices	Coates
Sight-feed lubricators	Nathan Bull's-eye
Steam gages	Crosby
Tires—driving wheel	Latrobe

CAR BUILDING.

The New York City Railway is figuring on some new street cars.

The Duluth, Missabe & Northern is figuring on eight passenger cars.

The Northwestern Elevated, Chicago, is in the market for 40 cars.

The Oregon & Eureka is in the market for 10 flat cars of 60,000 lbs. capacity.

The Missouri, Oklahoma & Gulf is in the market for 200 coal cars of 80,000 lbs. capacity.

The Marquette & Southeastern has ordered 20 flat cars from the Hicks Locomotive & Car Works.

The Chicago & Eastern Illinois has ordered 2,000 drop bottom coal cars of 100,000 lbs. capacity.

The Chicago, Burlington & Quincy is asking prices on 2,000 steel gondola cars of 100,000 lbs. capacity.

The Pere Marquette, it is understood, has ordered 800 freight cars from the American Car & Foundry Company.

The Chicago, Lake Shore & Eastern has ordered 400 steel underframe box cars of 100,000 lbs. capacity from the Western Steel Car & Foundry Company.

The Tampa & Sulphur Springs Traction Company, Tampa, Fla., has ordered six double truck, 42-ft. open cars from the McGuire, Cummings Manufacturing Company.

The Armour Car Lines, Chicago, as reported in the *Railroad Gazette* of June 28, has ordered 35 tank cars of 80,000 lbs. capacity from the Bettendorf Axle Co., for September delivery. These cars will be 31 ft. long and 9 ft. wide, over all. The special equipment includes Bettendorf bolsters.

The Morris & Co. Tank Car Line, Chicago, as reported in the *Railroad Gazette* of June 28, has ordered 10 tank cars of 80,000 lbs. capacity from the Bettendorf Axle Co., for September delivery. These cars will be 31 ft. long and 9 ft. wide, over all. The special equipment includes:

Bolsters	Bettendorf
Brake-beams	Damascus
Draft rigging	Cardwell
Dust guards	Harrison
Journal boxes	Bettendorf
Trucks	Bettendorf

The Buffalo & Lake Erie, as reported in the *Railroad Gazette* of June 14, has ordered 25 combination baggage and passenger cars, with seating capacity for 50 people, from the Cincinnati Car Company. These cars will weigh 43 tons, and will measure 56 ft. 7 in. long, 9 ft. 4 in. wide and 13 ft. high, over all. The bodies will be of wood and the underframes of steel. The special equipment includes:

Brakes	Westinghouse
Couplers	Tomlinson
Curtain fixtures	Protected groove
Curtain material	Pantasote
Draft rigging	Tomlinson
Heating system	Hot water
Journal boxes	Symington
Light	Holophane globes
Springs	Triple elliptic
Trucks	Baldwin

The Arms Palace Horse Car Co., Chicago, as reported in the *Railroad Gazette* of June 7, has ordered 10 express horse cars of

50,000 lbs. capacity from the Pullman Co. for September delivery. These cars will weigh [illegible] lbs. and measure [illegible] ft. long, [illegible] ft. wide and 8 ft. 6 in. high, inside measurements. The special equipment includes:

Brake beams	National Hollow
Brake shoes	Streeter
Brakes	Westinghouse
Brasses	Hewitt
Couplers	Tower
Draft rigging	[illegible]
Journal boxes	Franklin
Paint	Heath & Milligan
Roofs	[illegible]
Springs	Pittsburg Spring & Steel Co.
Trucks	Pullman
Wheels	Standard Steel Co.

RAILROAD STRUCTURES.

BETHLEHEM, PA.—At a recent meeting of the Commissioners of Lehigh and Northampton counties, the Bethlehem Borough officials, and the Lehigh Valley Transit Company, it was decided to build a new concrete arch 60 ft. wide and 175 ft. long to cost $100,000, to replace the bridge at Broad street.

CHANUTE, KAN.—It is said that the Atchison, Topeka & Santa Fe is about to build at this place the shops which it has had under consideration for a long time.

HARTFORD, CONN.—The terminals, yards and shop building of the Central New England, now part of the New York, New Haven & Hartford, were recently damaged by fire; loss $75,000.

LONDON, ONT.—The Grand Trunk, it is said, has plans ready, and has appropriated $50,000 for extensions to its shops here.

NEWCASTLE, N. B.—Local reports state that the Intercolonial has appropriated a large sum of money for bridge alterations on its lines.

RICHMOND, IND.—The Pennsylvania has bought land as a site on which it will put up a new freight house at a cost of $20,000.

ST. JOHN, N. B.—The New Brunswick Government has under consideration plans for a cantilever bridge to carry two tracks for electric cars, and a highway for street travel over, the St. John river at its mouth, to replace the present suspension bridge.

TAMPA, FLA.—The Tampa Northern has given a contract to H. L. Parker for a new freight house 55 ft. x 190 ft., to cost $22,000. The work to be finished by September.

TORREON, MEX.—The Mexican Central, it is said, will shortly start work on a new passenger station here. The proposed structure may also be used by the Mexican International.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

ARKANSAS, LOUISIANA & GULF.—Preliminary surveys have been made by this company for its proposed line from Pine Bluff, Ark., south to Monroe, La., 133 miles, with a branch from Crossett to Rolfe Junction, nine miles. Most of the right of way has been secured. Grading contracts are reported let to J. Harris, of Monroe, for 3½ miles; and to J. A. Purdue & Co., of Pine Bluff, Ark., for 20 miles. Additional contracts covering about 42 miles are to be let shortly. (April 26, p. 598.)

ATCHISON, TOPEKA & SANTA FE.—The Arizona & California is reported finished and in operation from Wickenburg, Ariz., west to Parker on the Colorado river, 113 miles. Track was laid last year for 80 miles. Bids were recently opened for building a bridge over the Colorado river, to be ready for use by July, 1908. On the section west of the river grading is under way in California to Bengal, 92 miles, where connection is to be made with the main line of the Santa Fe. (March 15, p. 379.)

ATLANTA, GRIFFIN & MACON.—Local reports state that contracts were recently let, and that work is to be started at once on this line, projected from Atlanta, Ga., south to Macon, 90 miles. Surveys are also being made from Macon south to Albany, 100 miles. The office of the company is at Macon. (March 15, p. 379.)

BAUXITE & NORTHERN.—An officer writes that this company has grading finished and track laid for about one-third of the distance on the line it is building from Bauxite, Ark., north to Bauxite Junction, on the St. Louis, Iron Mountain & Southern, 2½ miles. The work included a bridge, which has been finished.

CHESAPEAKE & OHIO.—This company has stopped work on a number of important improvements. Contractors, Langhorne, Carpenter, Lane and Matthews were directed to cease work on their double-tracking contracts July 1. It is said that no more funds are at present available, and that continuance of work would depend on selling bonds at unfavorable prices. Two thousand men are affected by this order.

CHICAGO, INDIANAPOLIS & EVANSVILLE.—This company, which was incorporated in Indiana in 1905, to build a line from Evansville, Ind., north to Indianapolis and [illegible] Chicago, [illegible] miles, with a branch from [illegible] north to South Bend, [illegible] miles, has executed a contract to secure funds to carry out the work. Contracts are reported let to the [illegible] Construction Company, of Indianapolis, to build the entire main line. The necessary franchises, it is said, were secured some time ago. W. M. K[illegible] & Co., of Kansas City, are the financial backers of the project. The officers are: William K[illegible], President; J. B. [illegible], Vice-President; C. A. Dunnean, Secretary, and R. Z[illegible], Treasurer, Indianapolis, Ind. (June 14, p. 878.)

COLORADO, OKLAHOMA & SOUTHEASTERN.—An officer writes that the projected route of the proposed line is from Weatherford, Okla., on the Chicago, Rock Island & Pacific, northwest via [illegible] to Woodward, on the Atchison, Topeka & Santa Fe, 9[illegible] miles. A branch is also projected from the main line at [illegible] west to Gage, on the Atchison, Topeka & Santa Fe, 30 miles. P. A. McCartney, Chief Engineer, Lufkin, Tex.

GRASSY CREEK & ELKHORN.—Organized to build a line from Grassy Creek, Ky., south to the mouth of Elkhorn creek, 16 miles, surveys under way. The incorporators include: W. F. Rapp and O. W. Litner, of Ironton, Ohio, and Leon Isaacson, of New York.

HEARD COUNTY.—Incorporated to build a line from Roanoke, Ala., on the Central of Georgia, northwest to Newnan, Ga., also on the Central of Georgia, 40 miles. Most of the right of way has been secured. Dr. J. W. Daniel, President, and Dr. W. S. Trent, Secretary, Franklin, Ga.

HOUSTON & BRAZOS VALLEY.—Work has been started on an extension of this road, formerly the Velasco, Brazos & Northern. The proposed route is from Anchor, Tex., north to a connection with the Trinity & Brazos Valley, near Houston. (April 2, p. 581.)

LORAIN & ASHLAND.—All the right of way for the proposed extension of this road from Wellington, Ohio, south to Loudonville, 39 miles, it is said, has been obtained, and work is to be started shortly. The company is planning to build about 62 miles this year. (March 15, p. 386.)

MEXICAN SOUTHERN.—A concession has been granted by the Mexican Government to James P. Taylor, of Mexico City, to build a line from Gomacho, on the Mexican Central, in the northern part of the state of Zacatecas, via Tecolote and Cedros to Bonanza; also to build a branch from Cedros to Mazapil and Salaverna. According to the terms of the concession, surveys must be started within six months, and 22 miles built each succeeding year until the entire road is finished; and all the work must be completed within six years. (May 31, p. 759.)

MEXICAN ROADS (ELECTRIC).—A concession has been granted to Dr. J. W. Lim, of Torreon, by the state of Coahuila, to build an electric line from Torreon east to Matamoras, about 6½ miles. Surveys are now being made and work, it is expected, will be started soon.

MINNEAPOLIS & ST. LOUIS.—The Minnesota, Dakota & Pacific, under construction from Conde, S. Dak., west to Le Beau, on the Missouri river, 115 miles, on which track was laid last year to Northville, 24 miles, is now in operation to Cresbard, 42 miles. (March 15, p. 387.)

MINNESOTA, DAKOTA & PACIFIC.—See Minneapolis & St. Louis.

MISSOURI ROADS.—A company is being organized by Frank Russell and other St. Louis capitalists to build a line to develop coal fields in Boone County.

MISSOURI RIVER & NORTHWESTERN.—This company, operating 34 miles of road from Rapid City, S. Dak., west to Mystic, recently incorporated the Wyoming Western, to build from Mystic, S. Dak., west to Buffalo, Wyo., 200 miles. The new company has a capital of $4,000,000 and offices at Rapid City. C. S. Crouch, V. E. Crouch, C. E. Fulton, J. S. Gantz and E. L. Hurlburt, all of Rapid City, are incorporators.

NASHVILLE, SHELBYVILLE & DECATUR.—Application has been made by this company for a charter to build a line from Nashville, Tenn., south to Decatur, Ala., about 115 miles. The incorporators include: W. G. Hill, H. C. Dyer and H. B. Cowan, of Shelbyville, W. Z. Dozier, of Fayetteville, and W. R. Hall, of Decatur.

NEW JERSEY ROADS (ELECTRIC).—Announcement is made that a company is being organized, with the backing of John H. Starin, C. S. Smith and W. Langdon, former members of the New York Rapid Transit Commission, to build a four-track elevated high-speed monorail line from Newark, N. J., to Jersey City.

NORTH & SOUTH TEXAS.—An officer writes that contracts are let to Cox & Chessher, of Groveton, Tex., for clearing the right of way, and to C. M. McConnico, of Lufkin, for other work on the line it is building from Groveton north to Cedar, about 21 miles. At Cedar connection is to be made with the Texas Southeastern, from which point trackage rights have been obtained to Lufkin, 14 miles. The

line will be laid with 60-lb. rails. P. A. McCarthy, Chief Engineer, Lufkin, Tex. (March 15, p. 388.)

National of Mexico.—This company is planning to change all its branch lines, aggregating over 400 miles, from narrow gage to standard gage. Work is well under way changing the gage between Gonzalez Junction and Acambaro, 54 miles, and when finished work will be started between Acambaro and Urapan, 143 miles. The company is also building on the northern end of its road a new branch from Jarita to coal fields near the Texas border at Columbia.

Oklahoma & Golden City.—Surveys, it is said, have been made by this company, and contracts may be let this month for building from Jefferson City, Mo., southwest to Pawhusa, Okla., about 270 miles, with a branch from the main line at Climax Springs in Camden County, Mo., south to Springfield, 67 miles. W. K. Palmer, Chief Engineer, Dwight building, Kansas City, Mo. (March 29, p. 468.)

Open River Railway & Navigation.—Surveys reported made and rights of way secured for a proposed 17-mile line, one end of which is at Holdman, Ore. Contracts for the work are to be let about October 1. C. E. Curry, Portland, Ore., is President.

Pennsylvania.—Under the name of the Pennsylvania Tunnel & Terminal Company, the Pennsylvania, New Jersey & New York and the Pennsylvania, New York & Long Island have been consolidated.

Pennsylvania Tunnel & Terminal.—See Pennsylvania.

St. Louis, Mountain Grove & Southern.—Incorporated in Missouri with $300,000 capital and office at Mountain Grove. The company proposes to build a line from Mountain Grove in Wright County, on the St. Louis & San Francisco, south to Bryant creek, in Ozark County, 30 miles. J. J. Hedges, J. H. Jarrett and E. L. Richardson, of Springfield; J. Allhands, of St. Louis, Mo., and P. M. Johnston, of St. Elmo, Ill., are directors.

Savannah, Augusta & Northern.—This company has given notice of an amendment to its charter so as to increase its capital stock from $8,000,000 to $11,000,000. The company was organized to build from Savannah, Ga., northwest to Rossville, about 330 miles, with a branch to Augusta, 30 miles. Contracts for some of the work are reported to have been let to J. W. Oliver, of Nashville, Tenn. (June 21, p. 917.)

Southern Pacific.—Local reports state that this company has plans made to establish a new route to avoid the marshes and sinks between Benicia, Cal., and Suisun. This is to be accomplished by abandoning the piers at Port Costa and the ferry from that point to Benicia. New piers are to be built at Rodeo, on Pinole Point, and a ferry run from that place to South Vallejo. From South Vallejo the route is over the existing line to Flosden, thence by a new line northeast through American canyon to Cordelia on the Napa Junction and Suisun line, connecting with the main line at Sacramento.

Velasco, Brazos & Northern.—See Houston & Brazos Valley.

Wyoming Western.—See Missouri River & Northwestern.

RAILROAD CORPORATION NEWS.

American Railways Co.—A syndicate consisting of Bioren & Co., Newburger, Henderson & Loeb and E. C. Miller & Co., all of Philadelphia, is offering at 96 and interest a block of $600,000, 10-year, collateral trust, 5 per cent. bonds, being part of an authorized issue of $2,500,000. The bonds are dated April 1, 1907.

Atchison, Topeka & Santa Fe.—See Eastern Oklahoma.

Broxton, Hazlehurst & Savannah.—See Fitzgerald, Ocilla & Broxton.

Chesapeake & Ohio.—This company has sold to Blair & Co., New York, $5,000,000 6 per cent., three-year notes; they are to be secured by the $10,000,000 general improvement and equipment 5 per cent. bonds, an issue of which will be authorized later. The proceeds of the sale of the notes are to go towards paying off floating debt and other current needs.

Chicago & Alton.—The Union Pacific and the Chicago, Rock Island & Pacific Railway Company have jointly agreed to guarantee that the Chicago & Alton will have at least $1,666,000 to spend on improvement work now under way, consisting particularly of track elevation at Chicago. The Chicago & Alton is to use its surplus for this purpose, and if this surplus is not enough, the other two companies will lend it money, up to the amount named, taking Chicago & Alton notes in return.

Chicago, Burlington & Quincy.—The lease of the Chicago, Burlington & Quincy Railroad to the Chicago, Burlington & Quincy Railway Company has been rescinded, and the railroad company has resumed the operation of the road. The railway company was organized in 1901 for legal reasons.

Chicago, Rock Island & Pacific.—See Chicago & Alton.

Colorado Southern, New Orleans & Pacific.—An agreement has been concluded by which this company will temporarily use the terminal facilities of the Kansas City Southern at Beaumont, Tex. The C. S., N. O. & P. has already trackage rights over the Kansas City Southern from De Quincy, La., to Beaumont. It will later build its own terminal.

Denver, Enid & Gulf.—See Eastern Oklahoma.

Eastern Oklahoma.—The Denver, Enid & Gulf, which was taken over by the Atchisou last year, has been transferred to the Eastern Oklahoma, which operates most of the Atchison branch lines in Oklahoma.

Fitzgerald, Ocilla & Broxton.—This is the successor company to the Broxton, Hazlehurst & Savannah, which company owns the Ocilla & Valdosta. The entire line runs from Broxton, Ga., to Irwinville, 33 miles, with a five-mile branch to Fitzgerald.

Kansas City, Mexico & Orient.—This company is offering for subscription at par $400,000, first mortgage, 4 per cent. bonds of 1951. A bonus of $400 preferred stock and $400 common stock is given with each $1,000 bond. The proceeds of the sales are to be used to finish grading from Emporia, Kan., to Kansas City. It is expected to have the road in operation from Emporia to San Angelo, Tex., at the end of the year, and at that time also 65 per cent. of the line in Mexico will be ready for operation.

Kansas City Southern.—See Colorado Southern, New Orleans & Pacific.

Medford & Crater Lake.—See Pacific & Eastern.

Pacific & Eastern.—This company has been organized to own and operate the Medford & Crater Lake, which runs from Medford, Ore. to Eagle Point, 11 miles, and was sold at receiver's sale on May 11 for $82,500. The new company is to extend it to Butte Falls and Klamath Falls, 89 miles. The Rogue River Valley Railroad, which runs from Medford to Jacksonville, 6 miles, has been bought by the same interests. The new company has $1,000,000 authorized capital stock, of which $500,000 is outstanding and $1,000,000, 6 per cent. bonds of 1937 authorized, of which $200,000 is outstanding.

Pennsylvania, New Jersey & New York.—See Pennsylvania Tunnel & Terminal.

Pennsylvania, New York & Long Island.—See Pennsylvania Tunnel & Terminal.

Pennsylvania Tunnel & Terminal.—This company has been incorporated in New York State with $40,000,000 capital to take over the Pennsylvania, New York & Long Island, and the Pennsylvania, New Jersey & New York. (June 21, p. 918.)

Pittsburg, Fort Wayne & Chicago.—The New York Stock Exchange has listed $1,431,900 additional guaranteed, special improvement stock, making $38,806,400 outstanding. The stock was sold to the Pennsylvania Railroad to partially reimburse that company for motive power, rolling stock, additional tracks, track elevation and other improvements. The stock is guaranteed by the Pennsylvania Railroad; and the Pennsylvania Company, according to its last annual report, holds in its treasury $33,443,400 of it.

Public Service Corporation.—An initial quarterly dividend of 1 per cent. on the $12,500,000 outstanding capital stock of this company was paid on July 1. The company controls nearly all the street railways of northern New Jersey, and gas and lighting interests in the greater part of the state. It owns and operates 258 miles of road and controls about 200 miles more.

Rogue River Valley.—See Pacific & Eastern.

United Railways of St. Louis.—The Mississippi Valley Trust Company and Francis, Brother & Co., of St. Louis, are offering 95.54 and interest for $200,000, two-year, 5½ per cent. collateral trust notes due July 1, 1909, but subject to call after July 1, 1908. They are secured on $1,500,000 general first mortgage, 4 per cent. bonds and $500,000 preferred stock. The proceeds of the sale will be used for paying up the majority of the $1,500,000, 6 per cent. bonds of the Citizens' Railway, a subsidiary.

Union Pacific.—See Chicago & Alton.

Yosemite Valley.—N. W. Halsey & Co., New York, have sold the majority of the $3,000,000 first mortgage, 5 per cent. bonds of 1936 of this company, which was recently put in operation from Merced, Cal., on the Southern Pacific and the Atchison, to the Yosemite National park, 80 miles. The terminal is connected with the government roads in the park by a new stage road. The railroad is to be operated all the year round.

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EDITORIAL ANNOUNCEMENTS.

THE BRITISH AND EASTERN CONTINENTS edition of the Railroad Gazette is published each Friday at Queen Anne's Chambers, Westminster, London. It contains selected reading pages from the Railroad Gazette, together with additional British and foreign matter, and is issued under the name Railway Gazette.

CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.

ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

OFFICERS.—In accordance with the law of the State of New York the [illegible] and name of the paper is made of the office of publication, at 83 Fulton St., New York, N. Y., and the names of the officers and editors of The Railroad Gazette are:

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CONTENTS

VOL. XLIII., No. 2. FRIDAY, JULY 12, 1907.

A. C. Shand, Chief Engineer of the Pennsylvania Railroad, makes the following comparative statement of rail failures on the lines east of Pittsburg and Erie:

"During the year 1901 there were removed from main running tracks on the Pennsylvania Railroad east of Pittsburg and Erie, 675 defective rails, a very large portion of these, however, were not broken, but were rails that were not properly holding up under the traffic and were what is commonly known as 'mashing' on account of the loads passing over them. This represents 46.6 rails removed from tracks on account of defects for every 1,000,000,000 tons of freight moved one mile. In the year 1905 there were removed 1,747 defective rails, or 90 rails per 1,000,000,000 tons moved one mile. Not one-tenth of these rails were broken."

The rest of the statement is a deserved advertisement of the safety of passenger travel on the Pennsylvania, a safety obtained by vigilance and a high grade of inspection. But Mr. Shand makes the unusual deduction from his figures that, "The Pennsylvania Railroad has little cause for complaint on account of defective rails," although the failures in proportion to tonnage were nearly twice as great in 1905 as they were in 1901. Moreover, the overwhelming evidence of bad rail making developed during the year 1906, and that year is not referred to in the comparison. Another general officer of the Pennsylvania made, in April of this year, the following statement of present conditions which would seem to indicate that if Mr. Shand would bring his statistics up to date they might be still more enlightening, although less valuable as an advertisement of safety on the Pennsylvania:

"We have been in danger in the past, but we are in more danger at the present time. We received one lot of rails this year from a mill; they travelled but a short distance on the cars, and there were eight of those rails broken when they arrived at their destination. We unloaded those rails as carefully as we could on skids, sliding them down so they would not strike, and there were seven broken in unloading. Now, that shows that you are not making as good a rail as you were some time ago, and yet you see the danger we are in, and until you make an open hearth or some other better kind of rail we are still in greater danger."

The Perry theory of boiler efficiency as developed under the auspices of the United States Geological Survey (see paper on Boiler Efficiencies in another column) promises to be of a value that it is difficult to estimate. As stated in the resumé of the scope of the work, its verification will result in "placing the steam boiler on a fairly secure mathematical basis." The first statement of the theory would be more than apt to excite the skepticism of any one familiar with the data available regarding boiler practice, it is so startling in its novelty. But when it is presented from a source of such undoubted honesty, and when this presentation is accompanied by a statement to the effect that the experiments that have been made have verified the theory to a wonderful degree, it must attract respectful attention. With such promises of a final establishment of the theory, it goes without saying that the future bulletins that shall be issued by the department will be awaited with a high degree of interest. The theory is by no means new, since it was set forth several years ago; but, while it attracted attention at the time, it was regarded more as the theory of an individual than a statement of a general law that must command respect as such. Further, it lacked, at the time, the corroborative experimental data needed to establish its correctness, and it is this experimental data that the United States Geological Survey has taken it upon itself to provide.

BAD RAILS BY BAD MAKERS.

The present attitude of the United States Steel Corporation is not unlike that of its principal predecessor in the days when money getting was his sole object and possible enforcement of law and penalties for violated contracts constituted his restraint. His not infrequent smiling answer to indignant remonstrance was: "Why didn't you get it from me in writing?" Or, in other cases: "Look at the penalty clause; there's your liquidated damages." The attitude of the rail makers, while not precisely comparable, has a like result of tonnage, reckless tonnage ignoring the increasing losses of life and property due to bad tonnage, relying on the restraint due to the power to divert traffic from any one railroad to prevent any one railroad company from insisting on good tonnage; relying also on its arrangement with foreign makers for restraint of competition, sustained by the United States protective tariff of about $7 a ton.

During the early period of rising indignation and protest from a few outspoken railroad officers, the steel company was silent. Later, as if in reply, we had statements of the number of months ahead for which the capacity of the mills was booked. This year

the possibility of some recognition of the charge that the rail product was bad was foreshadowed in its report as follows: "Since January 1, 1907, the orders received have been somewhat less than they were during the months immediately preceding that date." Soon after this came a childish statement by one of the heads of the steel corporation that rails break because of increasing wheel loads. Following this first indication of attention there has been an indirect and non-authoritative spreading abroad of the statement that rails are now being made according to the wishes of the consumers, who want and get cheap rails; that if better rails are demanded the price will be increased to a degree not yet intimated.

For about five years the steel company has maintained a somewhat uniform price, during slack times and flush times, and has earned by this one action the approval of thinking people because of its conservative and tempering effect. It is only in recent years that greed for tonnage and its profits has led to increasing adulteration of the product, and this is made possible by an undue protective tariff on imported rails, as well as by control of an enormous traffic which can be diverted from one railroad to another. We all recognize that "trusts" are dangerous, and here is the most conspicuous modern example of a trust imperious, with its power for injury to the whole people derived from a kindly paternal law and the lack of united action by the railroads.

It may be well to repeat one at a time in order that the non-technical man may more fully appreciate them, some of the bad practices in rail making. Only about three-quarters of a Bessemer steel ingot, even after it is elongated and compressed to a bloom, consists of tough homogeneous steel. In the upper part of the ingot, which cools last, pipe holes occur and the phosphorus, silicon and other constituents are "segregated" from the iron—the steel is not homogeneous and strong. It is decidedly unfit material for rails. That due to this cause alone many rails are treacherous and liable to cause loss of life was plainly shown in eight of the twelve photographs of broken rails shown in this paper for May 17 on pages 676, 677 and 678. The rail makers now cut off and discard from 10 to 12 per cent. of the ingot. It has been conclusively shown by experience that unless an average of something like 25 per cent. is rejected many of the resulting rails are not simply dangerous, they are sure to break, and the only element of uncertainty is the loss involved in that foreordained failure.

It would seem that with full knowledge by the railroad officer and the rail maker of this one defect, too small a discard from the top of the ingot, there would be nothing left to discuss. The railroad company wants rails that are safe for 15 to 20 years, not those that are unsafe for 15 to 20 weeks. The rail maker wants a sale for the greatest possible tonnage, but it is not conceivable that he hopes for a permanently increased demand due to a heavy percentage of failure of bad product. No, his answer may be expected to be that he cannot remelt and use this increased discard from the ingot in Bessemer steel rails; that, although this discard might be used in open hearth steel, it would take some years to get such open hearth plant in operation, and there are other objections. Meantime, before taking any step toward improvement, and while defiantly continuing to produce more than 150,000 tons a month of rails with a heavy percentage of a kind doomed to break, he is ready to consider an agreement for an increased price. This is a hold-up similar to that of a powerful and reckless trade union, and needs to be treated with similar methods to secure the same end. Tariff protection for dishonest product is not justifiable and combined action can baffle threats of traffic diversion.

THE NEW HAVEN-BOSTON & MAINE ANTI-MERGER LAW

The passage with outward unanimity of the New Haven-Boston & Maine anti-merger bill by the Massachusetts legislature again reminds one how the wave of corporation restriction, starting at the West, has surged over conservative New England. Vermont two or three months ago enacted drastic railroad legislation that makes many of the wild western statutes seem tame. New Hampshire, at about the same time, had her wrestle with the railroads, but along more ethical and common sense lines. And, later, in the last tepid days of a long legislative session, Massachusetts, too, has taken her throw out of the railroads. In the Massachusetts episode there was an antecedent element of comedy. Boston went into convulsions of dread when it was announced that President Mellen might sell out his Sound fleet to Mr. Morse. Boston next reverted to effusive gratitude when the Morse offer of $20,000,000 was declined. And then, in yet a new revulsion of feeling, Boston joined with outer Massachusetts in angry condemnation of the New Haven-Boston & Maine merger and Beacon Street made pact with Berkshire in resisting it. In it all, doubtless, as reported, was a deep vein of politics. Each party feared the other party would "get the drop" on it in an anti-merger appeal to the people at the next state election. But this is a mere sidelight on one of the most remarkable pieces of legislation that ever emerged from under the gills of the symbolic and sacred codfish.

Reversing the order of nature the ostensible sting of the law is in its head. The first section prohibits any railroad corporation of the state or "any person or corporation acting in its interests," from acquiring or attempting to acquire in any way any shares of a domestic railroad company. No such corporation, or any person acting in its behalf, before next July shall vote or attempt to vote on any stock already acquired or "attempt to exercise, directly or indirectly, any control, direction, supervision or influence whatsoever over the acts or doings of such domestic corporation by virtue of such holdings of stock therein." On the domestic corporation, by the next section, a similar prohibition is laid against like acts of the persons or corporation that has acquired stock, and at the annual meeting the election is nullified if less than a majority of stock is represented. Other sections of a somewhat prolix measure give large powers to the railroad commissioners to restrict consolidation, and require that, in consolidation, there shall be no increase of freight rates or fares, or of the united capital stock of the merged companies or decrease of transportation facilities. The penal clause is not only pungent but applies to partnership, trustee and persons as well as corporations, which for violation of the act must be punished—in the case of the corporation—by a fine of $10,000 for each offence and persons by a fine of $1,000 for each offense or not less than six months or more than a year imprisonment, or such fine and imprisonment both.

Passing by the act as a curio in railroad statute-making and viewing it seriously, it has one or two interesting constitutional aspects. Its root idea is, obviously, the theory that a corporation is absolutely the creation and creature of the state in which all individual interests are submerged. But how about the same corporation's rights in other states? The Boston & Maine has charter and statutory powers in New Hampshire, and, if we are not mistaken, in Maine also. Can a law of Massachusetts bind the investments of a Boston & Maine stockholder in New Hampshire, Maine, Connecticut or New York? Where would he the legal line in conflicting legislation on the subject in Massachusetts and New Hampshire? What, in international law, is called the principle of exterritoriality thus becomes in the case of such a sweeping and radical statute important as well as complicated. Again, corporation statutes of the kind usually attack acts and almost exclusively corporation acts done by officers. But here is a unique statute not only leveled at individuals chiefly but at *motive*. It goes beyond the materialisms and invades the airy domain of psychology. Perhaps it is a laical view but one is tempted to inquire also whether in such cases, as a fundamental proposition, there is not a personal and basic right belonging to the citizen such as the right of purchase, sale and bargain. Certainly the vague and indeterminate theory of the "police power" of a state must be strained far to include some of the provisions of this singular "psychological" law of Massachusetts. Tried out in the courts and carried to the highest tribunal of the land the decision would be interesting both in tenor and text.

But the act is not to traverse the tedious and mazy path of litigation. The New Haven corporation has elected to submit, "stand pat" and await the action of the next Massachusetts legislature. This creates a situation almost as unique as the anti-merger law itself. Neither party to the merger can act. Meanwhile, as the sequel of transfers previous to the passage of the law, the New Haven owns—through its agents—about 120,000 shares of Boston & Maine stock, or about two-fifths of all the capital outstanding, and under ordinary conditions sufficient for control. The official announcement that this stock will not—as indeed is forbidden by the law—be voted, only complicates a condition in which the merger is hung up between wind and water. Can the state of Massachusetts ever by the severest of "psychological" statutes prevent Boston & Maine management from being amenable to the actual control even if not immediately, directly and formally exercised? Meantime large plans of improvement must pause, the positive benefits of a merger be postponed and all the delays and risks of an anomalous railroad interregnum be incurred. In the case of the swift and progressive policy of President Mellen this means a good deal. In the interval the state of Massachusetts can exercise its de-

tentative facility in bringing to light the telepathic relation between the two great corporations and solving some of the problems of railroad mysticism. One of them, by the way, may possibly be a subtle harmony of their attitude on the demurrage rule.

A little more common sense, less politics and an appeal to experience would have steered the Massachusetts lawmakers to a different port. They would have descried manifest destiny in the merger of two connecting corporations owning properties only in the slightest degree competitive. They would have seen the public benefits to accrue from the dominant policy of a corporation which has been aggressive and expansive as compared with a corporation which has not cultivated its transportation field. They would have let go unheeded the "monopoly" cry in times when it is peculiarly a restraint on unjust railroad aggression, and, searching deeper into the facts, they would have found that, during the last fifteen years, the complete monopoly of southern New England has made a far better record in reduction of freight rates and fares than the incomplete monopoly of southern New England or the fiercely assailed Boston & Albany, which is no monopoly at all. Along with such reasonings would have come thoughts of what consolidation would have wrought in the way of improved inland subsidiary service on the one hand and the more important coastwise service on the other. The merger proposition might have justified some mild restrictive conditions coupled with the permit to go ahead. Instead there has been a statute so radical as to be fantastic and a perilous delay that awaits the dawn of legislative intelligence.

HEAVY FREIGHT TRAINS.

In Mr. Priestley's report on American railroads to the Indian Government, he emphasizes and reiterates again and again the use and value of statistics as they are compiled in the United States. Their chief value is attributed to the fact that they enable a railroad manager to compare the performances of to-day with those of yesterday or last month or last year and thus put himself in a position to curb losses and estimate the value of improvements. To those who are not in immediate charge, the interest in comparative statistics lies in the fact that they make it possible to keep posted as to the progress of events and the changes that have taken place in the methods of obtaining the same results or in doing the same thing. Thus attention has been called in these columns, from time to time, to the growth and development of the modern car and locomotive from those in use 25 or 30 years ago, and the changes have been startling. Most of this present condition has, however, come upon us so gradually that it is difficult to realize what it means until we resort to our comparative statistics and note what has actually been accomplished.

For example the gulf between the freight train weights of 10 years ago and now is greater than appears to the casual observer. To the man on the street there is but little difference in the appearance of the freight train of 1896 and of 1906. If he had counted the cars on some of our principal lines then and now he would have found what to him would seem an insignificant increase. For instance, he would have found trains averaging about 47 cars long on a number of roads in 1896, and that these had grown to about 52 in 1901, and to 56 in 1906. To be sure, this represents a growth of something more than 19 per cent. in train length in 10 years; but, at the same time, he would have found that on some roads there had been an actual falling off in the number of cars hauled per train. In the case of the Middle division of the Pennsylvania, for example, which probably stands for the heaviest traffic on the line, there has been a steady decrease in the number of cars hauled per train during these 10 years. In 1896, the average number of cars loaded and empty hauled per train over this division was 54.52. In 1901 it had fallen to 50.04, and in 1906 to 42.83. So that it is evidently necessary to go behind mere external appearances in order to obtain a correct idea of what is being done.

That the growth of the car capacity has been very great we all know. It has risen from an average maximum of about 60,000 lbs. to 110,000 lbs., and if a comparison of engine sizes were to be made on the same basis as that of train lengths first outlined we would find that, taking cylinder capacity as the standard, the 19-in. by 24-in. cylinder of 1896 had grown to 22 in. by 26 in. in 1901 and to 22 in. by 28 in. in 1906. And when this increase is coupled to a rise in steam pressure from about 165 lbs. to 200 lbs., the tractive power of the locomotive rises accordingly and we find that its increase has been about two-fold, or from 20,000 to 40,000 lbs. This, of course, means that the actual tonnage hauled has increased in some relative proportion, for these heavy locomotives are not built, except in rare instances, to do the work of the lighter power that preceded them.

Taking the Middle division of the Pennsylvania as a concrete example of this we find that the average weight of the train was 1,326.11 tons in 1896, 1,444.63 tons in 1901, and 1,754.95 tons in 1906. As for the tractive power of the typical consolidation locomotive in these three years, it was 23,040 lbs. for the first year and 39,688 lbs. for the last two, thus showing an increase of about 72.26 per cent in tractive power and but 18.2 per cent in the average weight of the train hauled. This must not be taken to mean that the extra increase in engine power is wasted because in the figures given it is the average train load that is considered, and this includes not only all loading up to the capacity rating of the engine but light and empty trains, by which the requirements of railroad service will invariably cut the average down to a point far below the maximum. Where the figures are available and it is possible to separate the train weights in the direction of traffic from the empty haulage, the relation between the tractive effort of the engine and train weights is naturally much closer. For example, on the Chicago & Alton, on the double-track line between Bloomington and Brighton Park, the engines used in 1896 had cylinders 18 in. by 24 in. and a tractive power of 18,176 lbs.; in 1901, the cylinders were 21 in. diameter by 32 in. stroke, and the tractive power was 42,090 lbs.; in 1906 these figures were 22 in. by 30 in. and 43,305 lbs. Meanwhile the train tonnage northbound was 1,350, 2,700 and 3,206 tons for the three years, respectively. A comparison of the increases for the three years may be stated as follows:

	Tractive power.	Train weights.
1896	1.00	1.00
1901	2.32	2.00
1906	2.33	2.37

This illustration shows that, in this case, at least, the engine rating has increased in almost exactly the same ratio as the tractive power. The greater increase of the former is undoubtedly due to the lower resistance per ton of the heavy train as compared with the light one; though in this instance there was a marked increase in the number of cars. In 1896 the train referred to contained thirty 60,000-lb. capacity cars, while in 1906 there were 56 cars of 100,000 lbs. capacity.

In collecting data regarding heavy train loads a letter from the superintendent of motive power of the Pittsburg & Lake Erie states that the "heaviest freight engines have 21 in. by 30 in. cylinders, with 50-in. drivers, and carry 200 lbs. of steam, with a tractive power of 44,100 lbs. The average revenue train load for 1906 was 1,188 tons. This is probably the heaviest hauled by any railroad in the country. Were the southbound tonnage equal to the northbound, this train load could easily be run up to 2,000 tons. The rating for the engines given above is 3,500 tons, but they have hauled 4,200 tons and have made very good time. The train load for the past few years has increased about 8 per cent. yearly."

On the Mohawk division of the New York Central the drawbar pull of the standard freight locomotives was 20,600 lbs. in 1896; 31,200 lbs. in 1901, and 47,100 lbs. in 1906, and the average number of eastbound cars hauled in the three years was 46, 56 and 67, carrying a tonnage of 1,301, 1,834 and 2,421 respectively.

The Philadelphia & Reading tells the same story of a marked increase. Here the southbound tonnage from Reading to Philadelphia was from 1,950 tons in 1896 to 2,910 tons in 1901 and 3,300 tons in 1906. With the increased length of train and the greater weight of cars and engines, there has also come a slower average speed over the division in some cases, though this is not always true. The Middle division of the Pennsylvania is a notable exception to what appears to be the ordinary rule. For example, the time of slow trains was 11 hrs. 13 min. in 1896; 14 hrs. 29 min. in 1901, and 11 hrs. 47 min. in 1906; while that of preferred trains dropped from 9 hrs. 32 min. in 1901 to 7 hrs. 46 min. in 1906, showing that the facilities for handling the traffic have more than kept pace with the increase of tractive power and engine rating, since the time of delays has dropped from three to two hours, thus somewhat lowering the running speed, which is probably due to the higher proportional rating of the locomotive. This is, however, an exceptional state of affairs; for, in most cases the time required to cover a division has increased; increased both in the actual running time and in the delays, showing that not only is the speed slower because of the probable higher engine rating but that the traffic facilities for handling trains has not always kept pace with the increase of train load as combined with the greater number of trains, although in some cases the latter is not a factor of appreciable importance. An instance of this is found in one

road where the average delays increased from 2 minutes to 1 hour and 3 minutes between 1896 and 1906, while but one train a day was added. Yet the average length of train was increased more than 45 per cent. In this case the delays can undoubtedly be traced to inadequate terminal facilities, as the yard that has to handle this traffic has been built up by accretions and is not particularly well adapted for rapid work with long trains. Other roads that show the same running speed as formerly present the same record of increase of delay time; while others again show both the falling off in running speed and increase of delay time that has been referred to, in some cases the delays having risen from 25 to 50 per cent. on an already liberal margin.

Now by reverting to the conditions set forth in the early portion of this paper we find that on the Pennsylvania Middle division there has been an actual falling off in train lengths so that yard capacity has merely been obliged to keep pace with the increase in the number of trains which is apparently a far easier proposition than that of providing for extra and often extraordinary train lengths. In this case the traffic rose from 30 trains per day in 1896, to 45 trains in 1901 and 50 in 1906; and, as already stated, the delays dropped from three to two hours. There may be other causes contributing to this excellent showing, but it certainly does appear to be a fine demonstration of the value of keeping train lengths down to such dimensions that they are readily handled in the yards, a condition that can only be economically attained where heavy motive power is worked, by the liberal and almost exclusive use of cars of high capacity.

Of course it is quite impossible to make a comparison of train lengths between different roads that would be of the slightest value because of the natural differences in the character of the traffic, grades, power, cars and terminal facilities; but, by comparing the past and present performances of individual roads, a general average of the increase of work done per train can be obtained, and this will probably average an increase that can be estimated at not far from 60 per cent.; though, in individual cases, it will rise much higher than this. This latter is especially true where superintendents have gone tonnage mad and put up engine ratings to a point where delays and slow time will cut out all profit; and, in this, experience seems to show that short trains are better than long ones.

The elements that make for this increase of train load and render it of the greatest value are, taking the track to be of a suitable character, first the heavy power, then high capacity cars, and then suitable yard facilities. In this the high capacity car plays an important role by facilitating yard movements, and it appears to be of prime importance that the train should be made of a length that can be readily handled instead of being increased to such dimensions as to add to the delays that must always be vexatious under the best of conditions. Superintendents and managers are coming to a better realization of this and see that long trains are not always the most profitable. While it would be hazardous to say what will be the ultimate weight and length of train on any road, it is at least interesting to note the great advance that has been made along these lines during the past 10 years, the means by which it has been accomplished and the results that have been attained.

Train Accidents in May.[1]

Our record of train accidents occurring on the railroads of the United States in May includes seven collisions and 21 derailments, 28 accidents in all. This record is not published in full, as was formerly done, except in the cases of the few accidents which are especially prominent—in the present instance two collisions and one derailment. The record of "ordinary" accidents—which term includes, for our present purpose, only those which result in fatal injury to a passenger or an employee or which are of special interest to operating officers—will henceforth be given as below, in the shape of a one-line item for each accident, showing date, location, class and number of deaths and injuries.

This record is based on accounts published in local daily newspapers, except in the cases of accidents of such magnitude that it seems proper to send a letter of inquiry to the railroad manager. The official accident record published quarterly by the Interstate Commerce Commission is regularly reprinted in the *Railroad Gazette*.

Only one accident in May was decidedly prominent as compared with the rest. That was the derailment at Honda, Cal., on the 11th. This accident was reported in the *Railroad Gazette* of May 17, page 691, though the number of casualties proves to have been much larger than was then reported. Of the 55 injuries to passengers, however, 45 are classed as slight. The cause of the accident could not be determined. An officer of the road says that a board of inquiry consisting of three general and four division officers, assisted by others, investigated the circumstances thoroughly, yet found it impossible to decide as to the cause. The members of the board felt sure it was not a defective switch. The train was running at regular but not unusually high speed.

One other accident caused the death of six persons and a third one killed four. The six men killed (at Dayton, Tenn., on the 21st) were miners riding from their work to their homes on coke cars which, it appears, are regularly used for this purpose. The car in which the victims were riding was at the rear of a short train and it was struck by some runaway cars which had escaped from a side track where they were being moved by means of a pinch bar and hand power, with the intention of changing their position slightly to facilitate unloading. The point where they escaped control was on a grade of about 35 ft. to the mile, and the cars soon attained such speed that they overtook the car carrying the miners. These men saw their danger but their own train was moving so fast that they dared not jump off.

The third prominent accident was the butting collision at Rosby's Rock, W. Va. A passenger train collided with a freight while the latter was entering a side track. There was a dense fog at the time, and it is said that although a flagman was sent out by the freight, the engineman of the passenger train did not see him.

Among the usual newspaper reports of accidents to electric cars in the month of May we find six cases which were accompanied by fatal injuries, the total number of deaths in these six cases being 12 or more, and of injuries 123. In one rear collision at Elyria, Ohio, seven persons were killed and six injured; and in collisions at Brooklyn, N. Y.; Akron, Ohio, and Bowling Green, Ohio, the aggregate number of casualties was 112.

Train Accidents in the United States—May, 1907.

Collisions.

Date.	Road.	Place.	Kind of Accident.	Kind of Train.	No. persons reported Killd.	No. persons reported Inj'd.
6.	Lake Shore & M. S.	Kalamazoo.	xc.	Ft.	1	1
7.	*Baltimore & Ohio.*	Rosby's Rock.	bc.	P. & Ft.	4	3
8.	Boston & Albany	Red Bridge.	bc.	Ft. & Ft.	0	8
9.	Cin., Ham. & Dayton.	Jones Station.	rc.	P. & Ft.	3	3
10.	Southern Pacific	Lordsburg.	xc.	Pass.	2	1
21.	P., C., C. & St. L.	Hollidays Cove.	bc.	Ft. & Ft.	1	7
21.		Dayton, Tenn.	xc.	Ft.	6	6

Derailments.

Date.	Road.	Place.	Kind of train.	Cause of derail't.	No. persons reported Killd.	No. persons reported Inj'd.
1.	Baltimore & Ohio	Pleasant View.	Pass.	dr.	0	20
*2.	Central of Georgia	Orchard Hill.	Pass.	d. switch.	1	2
4.	Santa Fe.	Timpas.	Pass.	eq.	0	10
4.	Chic., Burl. & Quincy.	Manhattan.	Pass.	acc. obst.	1	7
†*9.	Chic., Burl. & Quincy.	Lawndale.	Pass.	dr.	1	20
†10.	Cin., Flemingsbg & S.E.	Flemingsburg.	Pass.	dr.	2	15
11.	St. Louis & S. F.	Altus.	Ft.	ms.	1	2
†*11.	*Southern Pacific.*	Honda.	Pass.	unx.	32	65
12.	Mo., Kan. & Texas.	Milford.	Ft.	unx.	2	1
13.	Chic., R. I. & Pac.	Marlow.	Ft.	acc. obst.	3	0
13.	T. & O. C.	Truro.	Pass.	ms.	1	4
16.	Southern	Chattanooga.	Ft.	unf.	3	3
17.	Pennsylvania	Tidlonte.	Ft.	unx.	2	1
21.	N. Y. C. & H. R.	Finks Basin.	Pass.	acc. obst.	1	2
†22.	Chesapeake & Ohio	Marysville.	Pass.	dr.	1	3
†22.	Southern Pacific	West Glendale.	Pass.	malice.	1	22
23.	Southern.	Atlanta.	Ft.	ms.	1	0
27.	El Paso & S. W.	Mastedon.	Pass.	dr	1	1
27.	Lake Shore & M. S.	Northeast	Ft.	boiler.	1	1
29.	Southern Pacific	Bradley	Pass.	unx.	2	1
31.	Chic., Burl. & Quincy.	Hunewell.	Ft.	unx.	1	2

[1] Abbreviations used in Accident List:
rc.—Rear collision.
bc.—Butting collision.
xc.—Other collisions; as at crossings or in yards. Where only one train is mentioned, it is usually a case of a train running into a standing car or cars, or a collision due to a train breaking in two on a descending grade.
b.—Broken.
d.—Defective.
dr.—Defect of roadway.
eq.—Defect in car or engine.
n.—Negligence.
unf.—Unforeseen obstruction.
unx.—Unexplained.
derail.—Open derailing switch (negligence of engineman or signalman).
ms.—Misplaced switch.
acc. obst.—Accidental obstruction.
malice.—Malicious obstruction of track or misplacement of switch.
boiler.—Explosion of boiler of locomotive on road.
fire.—Cars burned while running.
Pass.—Passenger train.
Ft.—Freight train (includes empty, engines, work trains, etc.).
*Wreck wholly or partly destroyed by fire.
†One or more passengers killed.

Boiler Efficiencies.

Experiments now being conducted by the boiler division of the United States Geological Survey fuel-testing plant at St. Louis, Mo., on the nature of boiler efficiencies have suggested that stationary boilers ought to be made to do ten to twenty times as much work per unit of heating surface as they do now.

This great increase in capacity is to be attained by subdividing the heating surface and water streams more finely and by allowing less restriction of the water inside the boilers and by using high

forced and induced draft to put a large mass of gases through the boiler at a very high speed.

Up to the present time there have been only vague ideas among engineers as to what factors influenced the efficiency of the steam boiler portion of the steam generator apparatus so as to cause it to absorb more or less of the heat generated by the combustion. John Perry, a distinguished mechanical and electrical engineer of England, went into the subject mathematically a few years ago and set forth general conclusions tentatively in his book on the "Steam Engine and Gas and Oil Engines."

About a year ago the government testing plant took up the mathematical investigation of the theory of the steam boiler and of heat absorption, and extended Mr. Perry's theory somewhat. For some weeks past Walter T. Ray, assistant engineer, acting under the supervision of Prof. L. P. Breckenridge, engineer-in-charge of the boiler division, has been conducting a series of experiments on small multi-tubular boilers so dimensioned as to enable the theory to be verified, or modified, or refuted. The boilers are fed with air heated electrically. Mr. Perry's theory states that modifying conditions being omitted from consideration, every boiler will always absorb by convection from the gases passing through it, the same percentage of heat which could possibly be absorbed by any boiler containing water at a given steam temperature. This efficiency is, therefore, independent of the temperature of the entering gases and of the amount of gases flowing through the boiler. Of course, it must be understood that the above statement of the theory is slightly subject to modification even theoretically, and more so in practice.

As a practical example, assume that the water in a boiler circulates with entire freedom, which is an unwarranted assumption, and that its temperature is 300 deg. F.; let the gases enter the boiler at 1,300 deg. F., then the difference between the two is 1,000 deg. F., and consequently it would be possible for a boiler infinitely long to reduce the temperature of the gases passing through it to 300 deg. F. Let us assume, however, that the gases leave the boiler at 500 deg. F., which is 200 deg. above steam temperature. The efficiency of the boiler then is 80 per cent., because it has reduced the temperature 800 deg. out of a possible reduction of 1,000 deg.

If the same boiler be supplied with gases at 2,300 deg. F., the gases enter the boiler at 2,000 deg. F., above steam temperature. Mr. Perry's theory states that this particular boiler will reduce these gases 80 per cent. as much in temperature as would a boiler infinitely long; that is, to 400 deg. above steam temperature, which is 20 per cent. of 2,000 deg., or to 700 deg. F. It will be noticed that the mass of gases does not enter into consideration at all.

This surprising deduction is being accurately verified by the aforementioned division of the survey, from which it is found, when keeping other conditions the same and when keeping the initial temperature of the gases constant, that the final temperature of the air remains the same whatever the amount of air sent through the boiler per second. So far the upper limit has not been reached with tubes clean inside and out, although the rate of evaporation has already been pushed up to many times that obtained even in locomotive practice.

Perry's theory takes into consideration four fundamental features affecting heat absorption at any point of the heating surface:

First—Temperature difference between the gases outside any portion of the boiler tube and the water inside.

Second—The number of molecules per cubic inch in the gases outside the boiler tube.

Third—The specific heat of the gases at constant pressure.

Fourth—The velocity of the gases parallel to the heating surface.

Of the four above factors, only the first has usually been considered. It will be readily seen that if we increase the temperature of the gases we decrease the number of molecules beating against any square inch of tube heating surface, and thus the second factor largely neutralizes the first, especially at high furnace temperatures.

The third factor can be taken as constant equal to .24.

The fourth factor is the new and surprising one. Mr. Perry considers that a high velocity of gases parallel to the heating surface scrubs off more or less of the dense film of gases adhering to the metal surface, which film of gases has already become cold by proximity to the metal. The higher the velocity of gases the more the scrubbing effect, and consequently the greater the amount of heat transmitted. This theory necessarily assumes that the ability of the metal to transmit heat is practically infinite, and when we consider that we ordinarily never put through a boiler tube more than 1/1000 of heat it could possibly carry, it will be realized that this assumption is warranted.

Mr. Perry's theory and the Survey's verification of it will result in placing the steam boiler on a fairly secure mathematical basis, the same as generators and motors are now on. Thus far the experiments check out the theory excellently. The theory and results will be embodied in a special [illegible] or three months to be followed by [illegible] as the work proceeds.

The Iles-Murrayville Cut-Off of the Alton.

The cut-off which the Chicago & Alton has been building from Iles, Ill., a point just below Springfield on its Chicago-St. Louis line to Murrayville, on its Kansas City line, has been completed and it is expected to have trains running over it about the first of August. The Kansas City line leaves the main, or Chicago-St. Louis line, at Bloomington, running southwest to Roodhouse, where it is joined by a northerly branch from St. Louis, Roodhouse being the division point for the eastern and western divisions of the system. The present Bloomington-Roodhouse line is unsuited for heavy-tonnage freight or high-speed passenger operation, because of its numerous curves and 0.8 and 1 per cent. grades. Traffic requirements to and from the western territory necessitated either revising and rebuilding the old line or some other provision to permit maximum tonnage freight trains to be run from Roodhouse to Chicago.

The Alton's heaviest tonnage is in coal from the fields at and south of Springfield, and the Chicago-St. Louis line had already been rebuilt for the most part to a gradient and curvature suitable for this traffic. It is now double-tracked between Chicago and Bloomington, 126.6 miles, and between Lawndale and Iles, 37.6 miles, and the gap of 23 miles from Bloomington to Lawndale is to be completed in the near future. By building a cut-off from Iles, which is 2.2 miles south of Springfield, to Murrayville, 10 miles above Roodhouse, a low-grade line about five miles shorter than the existing line between Roodhouse and Bloomington was obtained at about what it would have cost to revise and rebuild the old line. Also the cut-off traverses considerable territory not previously served by a railroad.

The cut-off is 34.34 miles long. In one respect it is remarkable, in that it is a tangent for its entire length except for the junction curves with the two existing lines, these being 1 deg. at Iles and 20 mins. at Murrayville. The controlling gradient is 0.3 per cent. both ways. The country traversed is nearly level and the line is located for its entire length on the divide between Sangamon river on the north and Apple creek on the south. There are, therefore, no waterway crossings requiring bridges. There are three crossings with other railroads. At two of these the grades are separated. The third is temporarily a grade crossing protected by interlocking, the plans for which have been approved by the Illinois Railroad and Warehouse Commission. Ultimately these grades also will be separated. Avoidance of the two grade crossings first mentioned increased the cost of the line by more than 10 per cent. Many highway crossings also have been avoided, the grade of the line being quite high throughout its length. The line is gravel ballasted throughout and laid with 80-lb. rails. It is to be equipped with automatic block signals in conformity with the Alton main line practice. There are five stations on the cut-off, named Cockrell, Knapp, Prouty, Yeomans and Clements, after the members of the Interstate Commerce Commission as it was constituted at the time the names were assigned. Following is a brief comparative summary of the new line and present line between Roodhouse and Bloomington:

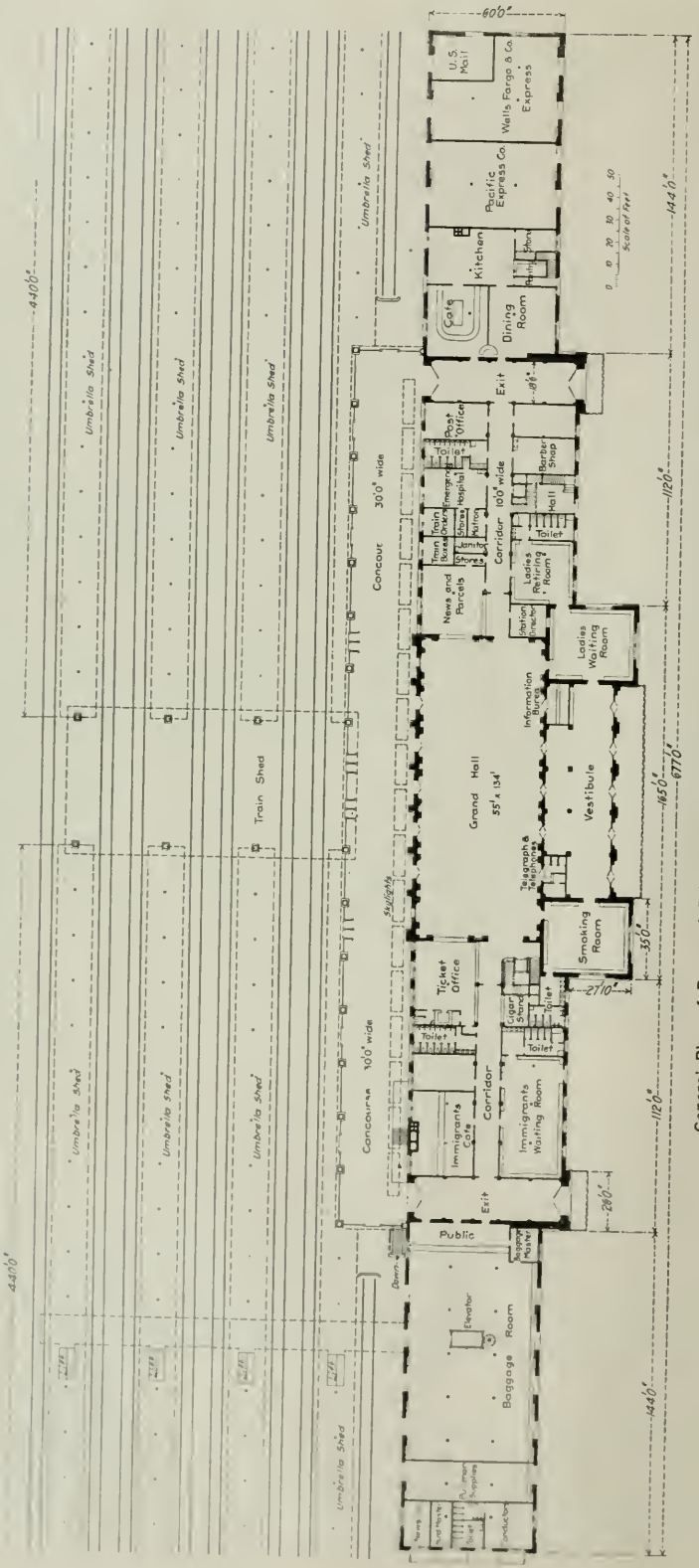
	Via Jacksonville, (old line).	Via Springfield, (new line).
Distance, miles	110.5	105.4
Total rise, ascending grades, ft.	1,059.0	512.0
Total fall, descending grades, ft.	934.0	387.0
Total degrees curvature	940.0	226.0
Maximum degrees of curvature	5.0	2.0
Controlling grade northbound, ft. per mile	38.6	15.8
Controlling grade southbound, ft. per mile	52.8	37.4

New Station, Yard and Terminal Facilities of the Harriman Lines at Salt Lake City.

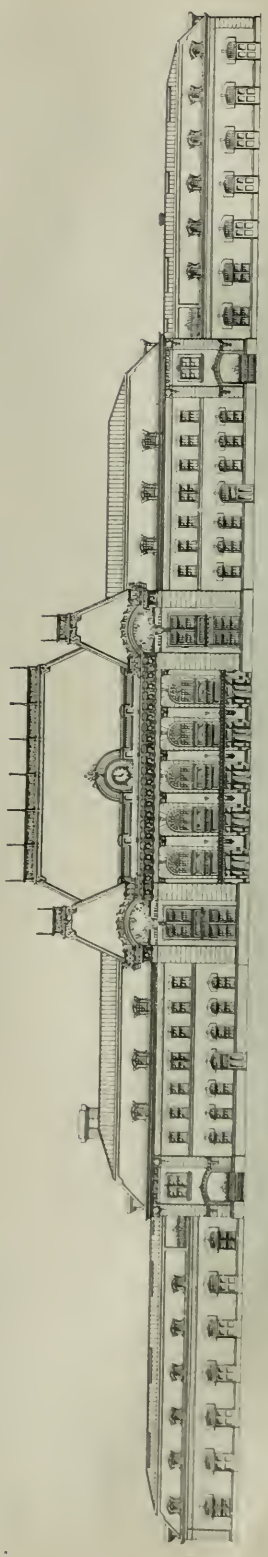
A view and brief description of the proposed new union station to be built at Salt Lake City, Utah, by the Oregon Short Line for the joint use of the Harriman lines centering there were given in our issue of January 25. Through the courtesy of J. D. Isaacs, Consulting Engineer of Bridges, Buildings and Signals for these lines, we are now enabled to present a more complete description, with plans and elevations from the architect's drawings.

In planning the station, careful study was given to securing the most desirable arrangement for the handling and comfort of its patrons. The location is ideal. It is in the center of South Temple street at the axis of West Third, affording a fine view of the building from East Temple street through rows of boxelder trees which line each side of South Temple street. The building is 677 ft. long over all by 70 ft. wide, with a height for the central portion of 100 ft. to the top of roof cresting. The entrances, five in number, leading to a spacious vestibule, are in the center of the main facade and are protected by a wide marquee supported by ornamental iron brackets and heavy chains.

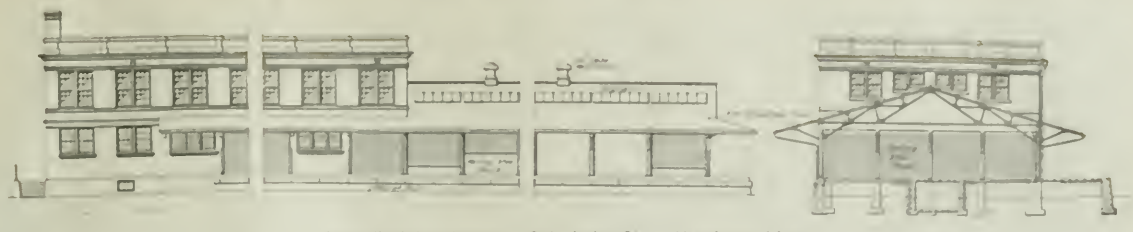
The vestibule opens into the general waiting room or grand



General Plan of Proposed Salt Lake City Union Station for the Harriman Lines.



Proposed Union Passenger Station for the Harriman Lines at Salt Lake City, Utah.

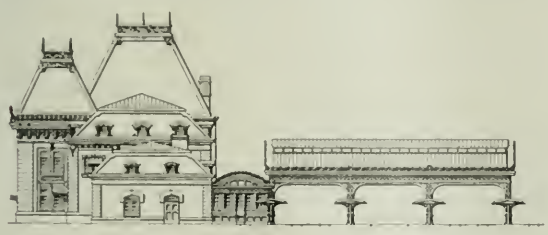


New Freight House at Salt Lake City; Harriman Lines.

hall, 55 ft. wide by 135 ft. long, with a vaulted ceiling two stories high from the spring of the arch, the ceiling being 60 ft. above the main floor. At the left or south of the general waiting room, separated from it only by a counter and screen, are the railroad and Pullman ticket offices and the telegraph and telephone offices; the news and parcel stands and the information bureau are at the north or opposite end of this room.

The two bays or towers flanking the central portion are occupied by the women's waiting room on the right and the men's smoking room on the left. In connection with the women's waiting room are a large retiring room, toilets, etc., and the remainder of this two-story wing contains the emergency hospital, station director's and matron's rooms and a branch postoffice. In the westerly two-story wing are the cigar stand, emigrants' waiting room, cafe, toilets, etc. Passengers coming from the trains do not enter the main waiting room, but pass through wide exits at each end of the two-story wings, going directly to the street or cab stands.

The baggage room occupies the extreme western wing. It has a basement floor below and a low mezzanine story above the ground floor for the storage of baggage not immediately called for. It is reached by a central corridor leading directly from the general waiting room. A telpherage system of transferring baggage will be installed throughout these three floors, with a large elevator



End Elevation; Salt Lake City Station.

running from the mezzanine to the basement floor. A passage or subway on the level of the basement floor runs transversely under all the tracks, having hydraulic lifts between each series of tracks, so that baggage can be loaded on a truck and taken directly to the car by way of the subway and lift without cutting any of the trains. In the extreme eastern wing will be a large cafe and dining room, express rooms, quarters for the Pullman Company, and rooms for trainmen, conductors, etc., with all necessary toilets and lavatories.

The second floor is reached by two stairways and elevators, one at the western end of the general waiting room, the other from a street entrance at the opposite end. On this floor are the offices of the several roads which will use the station. These offices are arranged on each side of a wide corridor. On the three sides of the general waiting room is an observation corridor for the use of the public and patrons, giving a view of the entire floor of the general waiting room.

At the rear or track side of the building is a one-story concourse, 50 ft. wide by 390 ft. long, with steel roof. This concourse is open on the track side above a height of 6 ft., but is arranged to be closed with sash during the winter season. Spanning the tracks transversely is an open train shed 40 ft. wide, with open lattice columns, architecturally designed, and of a height to allow the free passage of trains. This shed will protect passengers in bad weather. Between each series of tracks, and extending each way from the central train shed 400 ft., will be umbrella sheds 16 ft. wide and 10 ft. 6 in. high. The heating plant and other machinery will be located in a room in the basement.

In selecting a method of treatment the renaissance of the French school was adopted, and great care has been exercised to carry out the detail in true proportions as to ornamentation and application of same, so as not to make the building too ornate or overburdened with enrichment. Color effect of the materials for both the exterior and interior has entered largely into the design to produce a harmonious composition. The base or plinth above the ground line will be faced with finely tooled granite, while the walls above will be of brick with the outer face of pressed brick of a warm tone of buff, and the panels between windows of the central portion on the street elevation of Sienna marble. All belt courses, the water table and the entire cornice entablature will be of terra cotta of a color to match the brick work.

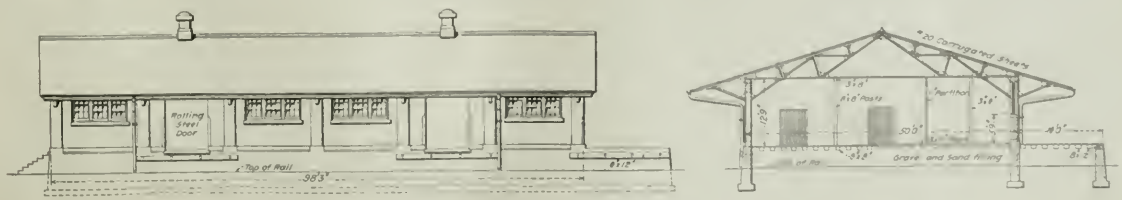
The entrance doors will be bronze, finished a dark copper color, and the marquees over the main entrance and side exits, as well as the ornamental roof cresting, will be of cast iron, plated to match the color of the doors. The entire roof will be covered with a dark green slate, laid in design, while all hips and decks of the roof will be of copper.

At the north end of the two-story wing will be an overhead iron bridge. This starts at the curb line of West Third street, gaining by easy steps a height sufficient to pass over all trains, and terminates at West Fourth street. This is to be a public thoroughfare. In the center of the main facade, above the cornice, will be a clock with the face large enough to be seen for several blocks.

The interior walls of the general waiting room are divided into panels, with pilasters placed so as to receive the ribs for the vaulted ceiling above. At the line of the second floor a cornice of ornate design will run around the entire room. The ceilings and walls at all openings will be deeply paneled with enriched plaster moulding. A large ceiling light will fill the center panel of the ceiling for about two-thirds of the length of the room, terminating with rounded ends made of art glass. Above the cornice line, at each end of the room, will be artistically designed clocks set in positions to be seen easily from any part of the room. The base and wainscot of the general waiting room and connecting corridors will be of marble and scagliola, selected for color and tone, and in harmony with the color scheme throughout the general waiting room and corridor. This color scheme will also be used in all of the second story corridors and the observation corridor. On the second floor, the observation corridor in front of the building will have arched openings, and on the opposite side there will be windows filled with art glass, appropriately designed. All of the interior wood finish throughout the building will be in quarter-sawed oak, finished in keeping with the color scheme.

The building is to be fire-proof throughout—the exterior walls of brick and the interior columns, floor girders and the floors of reinforced concrete. All of the trusses supporting the roof will be of steel, and the entire concourse and train shed will be of steel, having the roof covered with asbestos roofing. The building is to cost about $450,000, and will be built from plans made in the office of J. H. Wallace, Assistant Chief Engineer of the Southern Pacific, under the direction of D. J. Patterson, Architect for that company.

Besides the new union station, the yards and terminal facilities

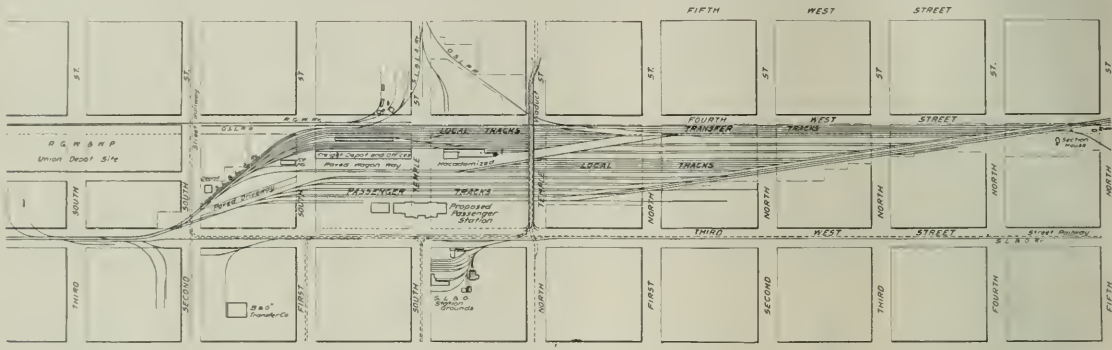


New Hide House at Salt Lake City; Harriman Lines.

of the Harriman lines at Salt Lake City, are being rearranged and extended. This work is now nearly finished. More trackage and larger terminals were needed because of the great increase in freight and passenger traffic, due to the rapid growth of Salt Lake City and the development of the resources of the surrounding country, and also in part because of the building of the San Pedro, Los Angeles & Salt Lake, which uses the yards and terminal facilities of the Oregon Short Line at Salt Lake City.

As shown on the accompanying plan, the new terminal yards are composed of two parts, called the north yard and the south yard. In the north yard are the switching, repair, roundhouse, coaling and coach cleaning tracks, while the south yard contains the passenger station tracks, transfer and local freight tracks. All incoming freight trains are sent directly to the north yard, where distribution is made as required by car lading. All outbound trains are made up in this yard. Incoming passenger trains approach the passenger station from both north and south directly over main line tracks.

The combined yards when complete will contain in all 46.8 miles of track with room for 4,100 freight cars and 455 passenger coaches. The extreme length of the two yards is 2.98 miles and the area covered 134.27 acres, most of which was acquired for this purpose. The average gradient through the yards is about 0.3 per cent. The passenger tracks are laid with 80-lb. and the freight tracks with 70-lb. rails, with No. 7 and No. 9 frogs. All tracks connecting the north and south yards at Fifth North street are protected by an interlocking plant. The crossing of the Oregon Short Line and the main line of the Rio Grande Western on Ninth South and Fifth West streets is also protected by an interlocking plant. All switches except the ones controlled by these interlocking plants are operated by hand. The entire yards are ballasted with gravel and drain to the city's drainage system.



South End of New Salt Lake City Yard.

North End of New Yard at Salt Lake City; Harriman Lines.

Note change of angle in drawing.

The new terminal facilities in the north yard include an 85-ft., 20-stall brick engine house; a 600-ton coal chute with six pockets and cable hoist; a new foundry; car repair shops; store house; coach cleaning plant; Pullman linen house, and a new ice house of 3,000 tons capacity equipped with an electric elevator of the most improved type. In the south yards a freight house, hide house, ice house, transfer platform and heavy freight platform have been built.

As indicated by the accompanying plans, the freight house is of brick, concrete and steel construction. It is 660 ft. long by 50 ft. wide, with a platform 16 ft. wide running the full length of the building on the west, or track, side. The south 157 feet of the building is two stories high, the upper story occupied by the local freight offices. The remaining 503 feet, the freight shed proper, is one story. A basement 26 ft. x 50 ft. under the south end holds a hot water boiler and coal bins. The whole building is of fireproof construction, the floors are of reinforced concrete and the roof also of reinforced concrete with surface of tar and gravel roofing. The first floor, which is on the platform level, contains the cashier's office, hallway, warm room, refrigerator room and general freight room. The cashier's office is in the south end of the freight house, directly on First South street. A vault 5 ft. 11 in. by 6 ft. 4 in. is connected with the cashier's office. The warm room, 37 ft. by 40 ft., is arranged for heating and is used for storing such freight as would be damaged by frost or cold. The refrigerator room, 10 ft. by 24 ft., is used for general freight and is connected directly with the freight shed. Rolling steel doors are installed on both sides of the building. The second floor is occupied by the local freight offices, consisting of the agent's private office, 14 ft. by 25 ft.; general clerks' office, 98 ft. by 50 ft., and record room, 32 ft. by 50 ft., complete with steel shelving and steel tables for handling the records.

The freight shed proper is built entirely of steel. Rolling steel doors, 12 ft. by 10 ft., extend the full length of the shed on both sides, enabling any part or the whole shed to be thrown open. The building is lighted throughout by electricity, the wires being enclosed in iron conduits. In the freight shed are lights about 40 ft. apart are used. The entire freight house, except the freight sher, is heated by hot water. The building was completed February 1, its total cost being $110,000.

The hide house is 50 ft. wide by 98 ft. long, and is of the same construction as the freight shed. It is used for handling green hides, beer kegs, junk, etc. It is divided in 12 compartments, each of which can be closed independently of the others. The total cost, including a 16-ft. platform on the west side, was $8,000.

North of the hide house and connected with it is the heavy transfer platform, 160 ft. long by 54 ft. wide at the south end and 30 ft. at the north end. A concrete retaining wall surrounds the entire platform. Three platform scales are provided, and at the north end there is a pillar crane of 10 tons capacity. The other transfer platform is west of the freight house and is 18 ft. wide by 400 ft. long. A corrugated iron roof covers the entire shed. The total cost of the two platforms was $7,600.

On North Temple street a solid reinforced concrete conduit was built by the railroad company across the whole width of its yards to carry the overflow from City Creek canyon. This conduit is 600 ft. long, with a sectional area of 3 ft. 9 in. by 10 ft. and a controlling gradient of about 1 per cent., while at its approach to the tracks the gradient is 6 per cent.

The North Temple street viaduct, as shown on the plan, spans

all of the Oregon Short Line tracks on North Temple street between Third West and Fourth West streets. It is a substantial steel structure of through plate girder construction supported by steel bents on concrete foundations. The length of the steel work is 916 ft. The east approach is 117 ft. long and the west approach 168 ft. long, making a total length of 1,201 ft. The minimum clearance over the tracks is 22 ft. The gradient on the east approach is 6 per cent., on the west approach 7 per cent., and on the viaduct 0.9 per cent. The floor is of wood and affords a clear roadway 24 ft. wide. On the south side a 6 ft. sidewalk is provided, which is reached by stairways at suitable points. The approaches to the viaduct are paved with stone blocks and are supported between concrete retaining walls ending in concrete abutments.

The total cost of these improvements, not including the new passenger station, will be about $1,000,000. We are indebted to W. H. Bancroft, General Manager of the Oregon Short Line, for the information. The plans for the freight and passenger yard were made in the office of William Ashton, Chief Engineer, under his personal supervision; likewise the plans for the freight house, which were prepared directly under J. P. Hill, Engineer of Buildings. The construction work was in charge of L. L. Dagron, Assistant Engineer.

June Railroad Law.

The following abstracts cover principal cases decided in June by the Federal courts:

Indictment under Elkins act.—An indictment under the anti-rebate act is not open to the objection that it sets out more than one offense, because it alleges that the defendant offered, granted and gave a rebate. United States vs. Delaware, Lackawanna & Western Railroad Co., 152 Fed. Rep. 269.

The Federal Employer's Liability Act.—Judge Hanford in the Circuit Court of Washington holds that the portion of the employer's liability act making interstate railroad companies liable for injuries, notwithstanding the contributory negligence of the employee, if the negligence of the railroad company was gross in comparison with that of the employee, is not unconstitutional as violating the commerce clause of the constitution. This statute revives the doctrine of comparative negligence—a doctrine discarded by practically every court in the United States. Plummer vs. Northern Pacific Railway Co., 152 Fed. Rep. 206.

Wilful injuries.—A railroad company cannot avail itself of the defense of contributory negligence on the part of a traveler run over and killed at a crossing if the fatal injuries were wilfully and wantonly inflicted. Lacey vs. Louisville & Nashville Railroad Co., 152 Fed. Rep. 134.

Care as to passengers boarding trains.—The rule that a train having stopped to discharge and take on passengers at a station must not be started while passengers are engaged in boarding the train, is available to one not having a ticket but intending to pay his fare on the train. St. Louis Southwestern Railway Co. vs. Wainwright, 152 Fed. Rep. 624.

Ejection of passengers.—A passenger refusing to produce a ticket or pay his fare may be removed from the train and the removal is not made wrongful because of a tender of the fare by a third person with the consent of the passenger after the process of the removal has begun. Missouri, Kansas & Texas Railway Co. vs. Smith, 152 Fed. Rep. 608.

Preferences.—An unlawful preference and discrimination is held to have been created by fixing the freight rates for common soap in less than carload lots in a new classification adopted to govern in official classification territory, at 20 per cent. less than third class, but not less than fourth class, at which that commodity has previously been rated, where the result of applying this classification to the varying rates, is to leave soap in less than carload lots in the fourth class to a considerable extent in one of the subdivisions of such classification territory and in a higher class in the other subdivisions. The Interstate Commerce Commission has the authority to order offending carriers to desist from the enforcement of such discriminations. Cincinnati, Hamilton & Dayton Railway Co. vs. Interstate Commerce Commision, 27 Sup. Ct. 648.

Transportation of liquors.—The agreement of a local express agent to hold for a few days a C. O. D. interstate shipment of intoxicating liquors at the request of the consignee to enable him to pay the charges does not destroy the interstate commerce character of the transaction and render the express company liable to prosecution for violating a state local option law. Adams Express Co. vs. Kentucky, 27 Sup. Ct. 606.

What is meant by "right of way."—Called upon to construe the meaning of the term "right of way" in a decree that one company should have the use of the "right of way" of another company, the Circuit Court of Appeals holds that the term when used to describe the real estate of a railroad company ordinarily signifies the entire strip of land which a railroad company has found it necessary or convenient to acquire for railroad purposes and is not limited to the specified part used for the main tracks of such railroad company. St. Louis, Kansas City & Colorado Railroad Co. vs. Missouri Railroad Co., 152 Fed. Rep. 849.

Liability for fire.—The Circuit Court of Appeals of the Fourth District holds that where a fire was negligently set by a railroad company's sub-boss of a bridge and trestle crew while he was engaging in one of the company's boarding cars when not on duty, the act was not performed within the line of his employment for the company, and hence it was not liable for property of others destroyed by the fire. Southern Railway Co. vs. Powers Fuel Co., 152 Fed. Rep. 917.

Condemnation of right of way for use of telegraph company.—A contract between a telegraph company and a railroad company giving the telegraph company an exclusive right of occupancy of the right of way is opposed to public policy and void, and does not prevent a condemnation of the right of way by another telegraph company. Georgia Railroad & Banking Co. vs. Atlantic Postal Telegraph Cable Co., 152 Fed. Rep. 991.

Automatic air-brakes.—A railroad company cannot be held liable for injuries, on the ground that it had not equipped its cars with air-brakes as commanded by statute, unless this violation of the statute was the proximate cause of the accident. Thus, where a pedestrian was killed on the right of way on stepping in front of a rapidly moving train without being seen by the engineer it is clear that the absence of the air-brakes was not responsible for the accident. Bookman vs. Seaboard Air Line Railway, 152 Fed. Rep. 686.

Labor unions.—Judge Cochrane, in the Federal District Court of Kentucky sustains the validity of the Federal statute punishing interstate railroads for discriminating against employees and persons seeking employment who belong to labor unions. He holds that such legislation is clearly within the interstate commerce clause of the constitution. United States vs. Adair, 152 Fed. Rep. 737.

Train Despatchers' Convention.

The twentieth annual meeting of the Train Despatchers' Association was held at Boston, June 18, 19 and 20. The attendance was large. The present membership of the association is 1,018, a net gain of 64 during the past year. The Treasurer's report showed the Association in good financial condition. The Train Despatchers' Bulletin, sent free to members, is to be increased by the addition of four pages, making 48 in all.

Discussing the report of the Train Rules Committee the association expressed belief that the "19" order is safe to be used for the superior as well as the inferior train in making meeting points provided the "middle order" be used in connection therewith. The delivery of this form of orders to the superior train contains an element of safety exceeding that of the "31" form inasmuch as the operator is on the platform for the purpose of delivering the order, and is in a position to prevent oversight of the signal.

It was recommended that a clearance card be delivered with all train orders, the card to show the number of each order, the intention being to give opportunity to conductor and engineman to check the orders with the card, thus making sure of the fact that none is overlooked. The card should be made in manifold, a copy for the conductor and each engineman (also the pilot, if there be one), the operator to retain the lowest copy.

The convention pronounced in favor of a signal to be placed on the engine of a train to denote "Schedule Fulfilled." Such a signal would be displayed on a single train if it were the only one using a schedule, or on the last of a number of sections if there were such. The present practice of displaying signals on all sections except the last is directly opposed to the foundation principle of signaling and contains an element of positive danger. No recommendatian was made as to the precise method, some members favoring a reversal of the present rule by requiring the only train on the schedule or the last section to display green signals, none being shown on the preceding sections, while others thought a distinctive signal shown on every train would more readily command the attention of those concerned.

Close to this subject is that of better means of identification of trains, the present practice being very imperfect, having caused a great amount of trouble in the past. Indicators showing the identity of each train, passenger and freight, were recommended.

The rules and usages of some roads make it important that conductor and engineman know positively when a telegraph office has been closed for meals or for the night, and it was recommended that there be some variation from the regular train order or block signal to indicate this condition.

It was recommended that a train register be used on single track at junction and terminal stations for the purpose of obtaining at first hand and in writing from the conductor of each train the information that the train has arrived, rather than from the observation of the operator. Whether this information be given to other trains by the operator or the despatcher, it should originate with and be recorded by the conductor of the train. It was

deemed that a matter of so great importance should be recognized and provided for by the Standard Code.

The "A. B. C." Rules devised by Mr. A. Beamer, Superintendent of the Northern Pacific, and used on a section of that road handling a heavy traffic, were discussed at length and with approval of the convention. Briefly stated the plan is this: All superiority between trains is eliminated, no trains orders are issued and a train leaving any station is given authority to run to the next station, and to the next only, regardless of all trains. The operators work the regular telegraph block system between themselves, and in addition the despatcher directs whether or not the train may proceed from the station. The only authority in the hands of conductor and engineman is a block card furnished by the operator under direction of the despatcher. The plan has been in satisfactory operation for several months. Train despatchers are convinced that the present system of train orders, although developed to a high standard of efficiency, is inadequate to the needs of the large traffic of to-day. The convention voted to continue consideration of the subject through its Train Rules Committee during the coming year.

The next place of meeting will be Fort Worth, Tex., and the incoming officers are as follows: President, C. H. Mullinix (Illinois Central), Fulton, Ky.; Vice-President, C. A. Mitchell (N. Y., N. H. & H.), Boston, Mass.; Secretary, J. F. Mackie (C., R. I. & P.), Chicago, Ill.

The Coal Reserves of the United States.*

Coal may be divided into three main classes—anthracite, bituminous and lignite, but in the trade these main classes are broken up into several groups, which are represented in the following diagram:

DIAGRAM SHOWING CLASS OF COAL.

Coal	Anthracite	(*a*) Anthracite.
		(*b*) Semi-anthracite.
	Bituminous	(*c*) Semi-bituminous.
		(*d*) Bituminous.
		(*e*) Sub-bituminous.
	Lignite	(*f*) Lignite.

(*a*) Anthracite coal is too well known to need description. (*b*) Semi-anthracite is a low grade of anthracite. (*c*) Semi-bituminous is a high grade of bituminous, such as the George's Creek coal of Maryland, Pocahontas coal of Virginia and West Virginia, and the Carboniferous coal of Arkansas. (*d*) Bituminous is the common grade of coal found throughout the eastern coal fields and in limited areas in the West. (*e*) Sub-bituminous is applied to coals below the grade of bituminous, but above that of lignite. They are black and shining, but are light in weight and slack badly on exposure to the atmosphere. These coals are common in the western fields of Washington, eastern part of Montana, northern Wyoming, about Denver in Colorado, and in northwestern New Mexico. (*f*) Lignite is brown and woody, and occurs in North Dakota, South Dakota, Texas, southeastern Arkansas, Mississippi and Alabama.

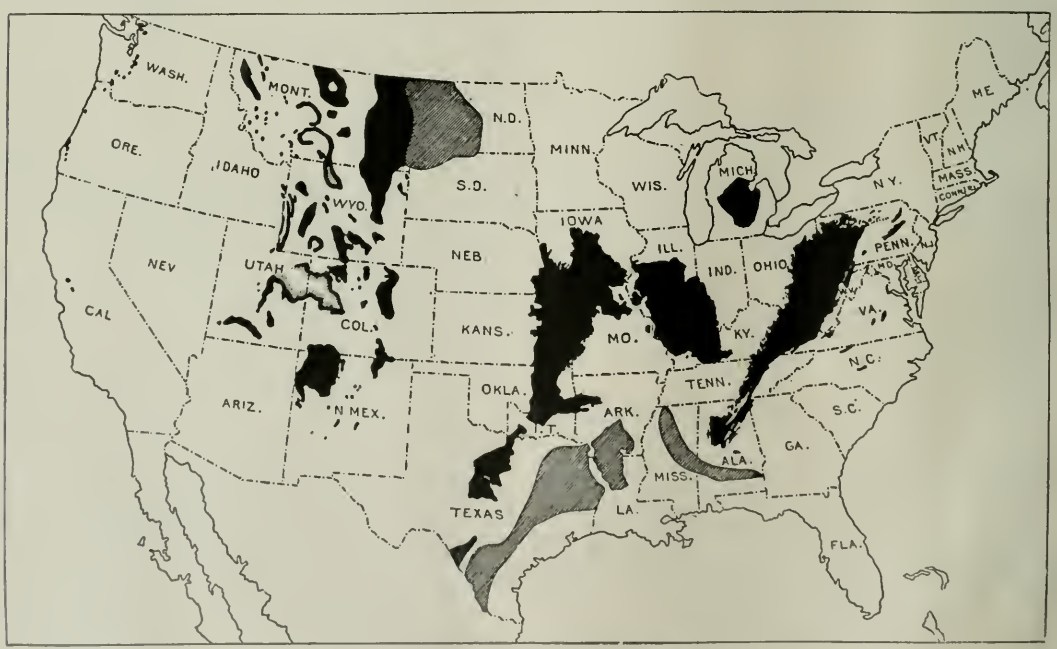
The classes noted above include all of the different kinds of coal that are known, but certain peculiarities of coals within the bituminous class have led to distinctions which are of great importance; thus the property of coking, which is limited entirely to the bituminous class, has given to coals possessing this peculiarity a value far above those coals having similar composition, but which do not possess this characteristic. The reason why one coal will coke and another will not is not understood; a practical test is the only way by which the coking properties of a coal are determined. Most of the coke is produced in the Appalachian coal field in Pennsylvania, West Virginia, Virginia, Tennessee and Alabama.

The coal output of the principal coal producing states for 1906 as reported by the United States Geological Survey was published in the *Railroad Gazette* of June 28, 1907.

The areas of the coal fields that lie within the various states differ greatly, even more than the production. The relative size of these areas is given in the accompanying diagram.

It will be a surprise to many to learn that the coal fields of Montana are more extensive than those of any other state, and that Texas is a close second. In this connection it must be understood that each of these states includes an enormous territory, equal to two or three of the smaller eastern states. It is true, however, that most of the coal territory of these states is underlain by low-grade lignite, and hence the fields are not so important as their areas would indicate. The same is true of North Dakota, which includes an extremely large area of coal territory, but the fuel is wholly lignite and of comparatively little value.

The extent of some of the coal fields is largely hypothetical. This is particularly the case with Washington, where the present estimate is probably far below the real extent of the fields. It might be supposed that Washington had been explored thoroughly enough to determine approximately the extent of its coal fields, but the peculiar conditions which prevail on the west slope of the Cascade range make it impossible to settle the question at the present time. The surface is deeply covered by glacial drift and vegetation, and it is only where the great streams, rushing down off the mountain slopes, have cut through this drift that the coal beds are exposed. In this way they are known at many localities, and it is probable that they are present in the intermediate covered areas, but no one is willing to say so until more prospecting has been done. When that occurs it is probable that the recognized area of the coal fields of Washington will be greatly increased. The known coal fields of Alaska seem to be comparatively small, having approxi-



Coal Areas of the United States.

Black shows anthracite and bituminous coal; shaded, lignite.

*Abstract of an address by Marius R. Campbell, of the United States Geological Survey, to the National Geographic Society.

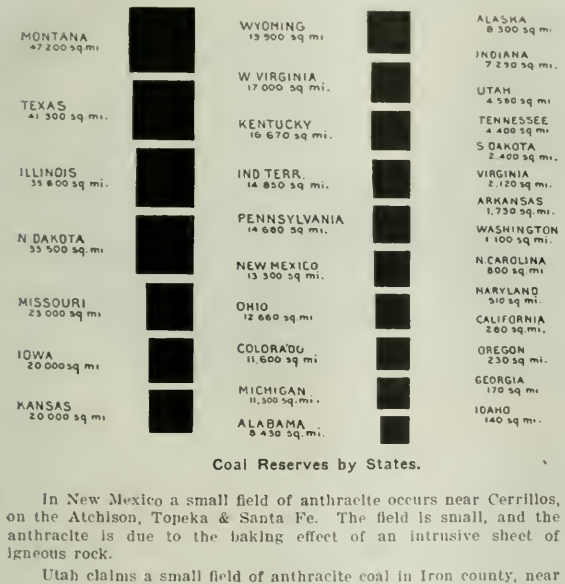
mately the same area as the bituminous field of Alabama. Here again exploration may, and probably will, increase the area materially, especially that of the low-grade lignites of the Arctic slope.

The area given for the coal fields of Alabama includes only the bituminous coal of carboniferous age in the northeast part of the state. In addition to this, as shown by the accompanying map, there is a wide band of lignite-bearing tertiary rocks crossing the southern part of the state. These rocks are known to contain beds of lignite, but in the presence of high-grade bituminous coal the lignite has never been explored, and consequently the number of beds, their thickness and extent, are not known. It is possible that when the supply of better fuel is exhausted, or has fallen below the demand, the lignite field may be found to contain an important supply of fuel.

So far as our present knowledge goes, the distribution of the various classes of coal in the western states is as follows:

Anthracite.—Only small areas of anthracite coal have been found in the western states and Alaska. Generally these are the direct result of volcanic activity and hence are of limited geographical extent.

The largest field of anthracite coal in the western states is in Gunnison county, Colorado, in the Crested Butte region. Apparently the anthracite in this field is the result of immense intrusions of igneous rock, which have baked the coal and thus driven off its volatile matter. The same coalbeds only a short distance away are either bituminous or sub-bituminous in character. One other occurrence of anthracite is known in Colorado, in the Yampa coal field, in the northern part of Routt county. In this locality the coal has been changed to anthracite by dikes and sheets of igneous rock. This field is very limited in extent.



Coal Reserves by States.

In New Mexico a small field of anthracite occurs near Cerrillos, on the Atchison, Topeka & Santa Fe. The field is small, and the anthracite is due to the baking effect of an intrusive sheet of igneous rock.

Utah claims a small field of anthracite coal in Iron county, near the southwestern corner of the state. It has not been developed and little is known of its extent or value.

In Washington a very small field of anthracite occurs in the vicinity of a large mass of igneous rock on Carbon river, southeast of Tacoma.

The largest anthracite field outside of Pennsylvania occurs near Controller bay, Alaska. In this field the change in the character of the coal is said to be not directly related to volcanic activity, but to be due to the intense folding to which the rocks have been subjected.

At present, anthracite is mined in the West only in Gunnison county, Colorado, and near Cerrillos, New Mexico.

Coking Coal.—Good coking coal is scarce in the Western fields. The principal source of supply is the Raton, or Trinidad, field, in southern Colorado and northern New Mexico. Of the coke produced in the western fields, 70 per cent. comes from this region. Some coke is also produced in Colorado, on the west side of the Front range, at Durango and in the vicinity of Glenwood Springs. Other important centers of coke production are Castle Gate and Sunnyside, in Utah, and along Carbon river southeast of Tacoma, Washington. Coke is also made to a limited extent in Wyoming near the Black Hills and in southern central Montana. There are several other coals that will coke with difficulty, which may be developed in the future, but the present [illegible] not particularly promising.

Bituminous and Sub-bituminous Coal.—This class of fuel is much more abundant than either of the two preceding classes. In New Mexico the largest deposit of such coal is in the Raton field, in the north central part of the territory. Similar coal also occurs in the northern part of the great Durango-Gallup field, in the northwest corner of the territory, and in several small fields south of Santa Fe.

In Colorado good bituminous coal occurs in the field just mentioned, at Trinidad and about Durango. It is also present in the small field south of Canyon City and in Gunnison county. As shown on the map the latter field occupies the southeastern point of a large synclinal basin which extends as far west as Castle Gate, Utah. The coal outcrops on the south limb of this basin in the Book Cliffs west of Grand Junction and along the "Great Hogback" from Gunnison county northwestward through Glenwood Springs and Meeker. Throughout the whole line of outcrop around this basin the coals are of the bituminous class, although in places they belong to the lowest group of the class. Good bituminous coal also abounds in the Yampa field, in Routt county. Thus it will be seen that Colorado has a large supply of this class of coal.

Utah is also well supplied by the same basin and by its extension southward from Castle Gate along the Wasatch Plateau. There is also a small field at Coalville, east of Salt Lake City, and a field of unknown extent in Iron county, occupying the Colob plateau.

Wyoming has bituminous coals along the line of the Union Pacific at or near Hanna, Rawlins, Rock Springs, and Kemmerer, and also in small areas about the Black Hills. It is possible that other areas of bituminous coal exist in this state.

Montana has considerable bituminous coal in the fields along the Northern Pacific west of Billings, about Great Falls and in the Crazy mountains, but by far the largest areas in the state carry coal of an inferior grade.

Washington has several bituminous coal fields along the western foothills of the Cascade mountains and at least one local basin at Roslyn, on the eastern side.

Most of the coals of California are of low grade, but one bed has been developed in Stone canyon, in the southeast corner of Monterey county, that is good bituminous coal. So far as known, this is the only coal of this class in the state.

Sub-bituminous Coal.—This class of coal is abundant in the western fields. Most of the coal in the south part of the Durango-Gallup basin is of this class. It is the only coal found in the Denver basin and in North and South Parks of Colorado. The great fields in the northeastern part of Wyoming, the Bighorn basin, and most of the fields in Uinta county contain sub-bituminous coal. All of eastern Montana is supposed to be underlain by it, as is also the big field in the north-central part of the state around the Bearpaw mountains. A number of small fields lying west of Butte, Helena, and the main front range contain coal of this character, but generally they are of small extent and probably have little commercial value. In Washington this class of coal is abundant, but as a rule it occurs some distance west of the Cascade mountains.

Lignite.—This class of fuel is found only in the fields of southern Alabama, Mississippi, Arkansas and Texas on the Gulf slope and North and South Dakota at the north. It is mined commercially only in North Dakota and Texas.

Up to the present time we have used our fuel without question as to possibility of its exhaustion. Of late, however, more far-seeing people have been thinking deeply on this subject, especially since the recent order of the President withdrawing temporarily from coal entry 64,000,000 acres of coal land, and his recommendation to Congress that the time has arrived to begin the conservation of our mineral fuels, and urging upon that body the passage of laws upon the subject.

In the older fields of the east, with the exception of Indian Territory, practically all of the coal land has passed to private ownership. Therefore the President's order and the interest of the people generally, centers about the coal fields of the Rocky Mountain region and the Pacific slope. The former contains an area estimated at 134,800 square miles, and the latter, including Alaska, 10,000 square miles, or a total of 144,800 square miles out of a total for the whole country of 400,500 square miles.

Of this area of 144,800 square miles of coal fields of the western states, it is estimated that 50 per cent. has passed to private ownership, leaving about 72,000 square miles of coal fields yet belonging to the government. It must be remembered, however, that more than half of this area is included in the lignite fields of eastern Montana, North Dakota and South Dakota, and when this is deducted from the figures given above, it leaves an area of only about 33,000 square miles of fairly good coal, the title to which is still vested in the United States.

The estimated amount of coal in the coal fields of the United States, not including Alaska, is 2,200,000,000,000 short tons, enough,

if it were moulded into a block, to form a cube with a side $7\frac{1}{2}$ miles long, or spread out flat to make a layer $6\frac{1}{2}$ ft. thick over the 400,000 square miles of coal fields of the United States. Is not this amount, to all intents and purposes, inexhaustible? In order to judge about this, it is necessary to know the rate of consumption.

The total production of the United States in 1906 was over 414,000,000 short tons. The United States leads the world in coal production by over 100,000,000 tons, Great Britain, and next Germany, being the only countries which produce more than about 50,000,000 tons a year. If the present rate of coal consumption should be maintained from now on, the coal of the United States would last nearly 4,000 years. On the other hand, the increasing rate of coal consumption in the United States is an alarming factor in considering the future supply. The rate of increase is enormous, the amount produced in each decade since 1816 being equal to the entire previous consumption. The amount of coal consumed in the 10 years from 1816 to 1825 was about 315,356 short tons. In the 10 years from 1896 to 1905 the consumption was over 2,832,599,452 short tons. If the consumption of coal continues to increase in the future as fast as it has during the last 90 years, the coal supplies of the United States will be exhausted in about 100 years. Since there is every prospect of a constantly increasing demand for coal, it seems probable that the rate of consumption will increase at nearly the same ratio as in the past, and hence that the life of the coal fields of the United States will probably be about 200 years.

New Southern Pacific Passenger Station at Tucson, Ariz.

The accompanying illustration shows the general style of a new passenger station which is just about to be opened for use by the Southern Pacific at Tucson, Ariz., a division point on its main line from San Francisco to El Paso and New Orleans. This is one of the first adaptations of the old Spanish mission architecture to a Southern Pacific passenger station. The building is arranged not only to accommodate the traveling public, but also the division officers and staff.

New Passenger Station at Tucson, Ariz.; Southern Pacific.

Southern Arizona is very hot during most of the year, therefore the building was so planned that the waiting rooms on the ground floor are protected from the sun's rays by wide arcades on each side of the main part of the building. The main building is flanked at each end by a low one-story wing. Each end of the main building itself on the street front shown in the photograph has a shallow pavilion. Similarly the track side of the station has a gable. At each end of the main building, which is two stories high, is a low one-story wing. The building is 218 ft. by 60 ft., with solid brick walls, finished outside in cement stucco. The ornamentation is of cast cement stone placed in the walls during construction. Level with the second floor is a low, deep loggia covered with a wide sweeping roof of red terra cotta Spanish tile.

The foundation and basement floor containing a heating plant is built of concrete. The second floor and roof timbers are wood. In the center of the main building on the first floor is the ticket office, with the general waiting room and women's room on one side and the smoking room and waiting room for Mexicans on the other side. The baggage room is in the smaller one-story wing at the end of the main building. In the wing at the other end is an emergency hospital and the offices of the commercial agent and roadmaster. The whole second floor is to be used by the division force.

The interior of the building is in keeping with the style of the exterior. The walls of the smoking room are paneled up to the height of the doors with wood; above this a low, ornamental cornice runs around the whole room. The frieze between this cornice and the ceiling is filled in with a dark leather, in the center of each panel of which is a shield, representing in colors the great seal of one of the states through which the Sunset Route of the Southern Pacific runs. In the entrance vestibule are four Tympanum arches, which are to be filled with oil paintings by Maynard Dixon of subjects typical of Arizona or taken from its history. The general waiting room and smoking room will have tile floors. There are especially designed electroliers for lighting the building which is equipped throughout with electric fans and steam heating. The cost of the new station is about $65,000. The plans were made in the office of J. H. Wallace, Assistant Chief Engineer of the Southern Pacific, by D. J. Patterson, Architect for the company.

Association of Transportation and Car Accounting Officers.

The semi-annual meeting of this association was held at St. Paul June 25 and 26. The principal reports were printed in the *Railroad Gazette* of June 28, page 923.

The membership of the association now represents 215,000 miles of road. The committees on per diem and on car service were consolidated and a new committee on "Conducting Passenger Transportation" was created. This committee proposes to consider the advisability of restricting baggage to certain trains (in suburban service), the effect of electrification on passenger business, standard speeds of trains for different degrees of curvatures, and using half-minutes in reporting trains.

The committee recommendation concerning Per Diem Rule No. 5 was recommitted. The report on office methods was adopted substantially as presented. The report of the committee on conducting transportation brought out a long discussion, the views of the committee being very generally approved.

The rules for handling cars, recommended by the committee on car service, were adopted, with the exception of Rules 9, 10 and 17, which were recommitted.

The next meeting will be held at Chicago, December 10, and the next summer meeting will be held at Atlantic City June 23, 1908. The President of the association for the ensuing year is Fred Clark (C., B. & Q.), Chicago; Secretary, G. P. Conard, 24 Park Place, New York City.

Standard Time on the Canadian Pacific.

Mr. W. J. Camp, Electrical Engineer of the Telegraph Department of the Canadian Pacific Railway, read a paper on this subject at the annual meeting of the railroad telegraph superintendents at Atlantic City. The circuits of this road being very long, time signals are sent by hand. The speaker describes the arrangements of the repeaters at Montreal, where the time is taken from McGill University. The company sends time regularly to islands in the Pacific ocean, also to the Azores, in the Atlantic, and other distant points. The true longitude of Montreal was fixed several years ago by a long series of observations by astronomers at Montreal and in Nova Scotia, Ireland and England. Mr. Camp says that on several occasions the time given on railroad lines in the United States has been as much as three seconds in error. The standard clocks on the Canadian Pacific are made the subject of daily records, and the reports are examined and compared every month. The time inspector visits every standard clock once, twice or thrice a year. The watch inspectors of the company examine every watch twice a year, and all watches are twice a month brought to them to be compared. An employee who has neglected to visit the inspector in the first and third weeks of each month is not eligible for duty without an order from the superintendent. Each employee must keep with him the card showing the rating of his watch. All watches must be cleaned at least once in 15 months. All inspectors have seconds pendulum clocks and are required to ascertain the error thereof at least once a day. At Montreal the Canadian Pacific has 81 clocks on five circuits worked by one master clock.

Five More New York Public Service Commissioners.

Last week we published the photographs of four of the members of the New York Public Service Commissions. The accompanying photographs are of five more Commissioners, of these Mr Keep is a member of the Commission for the Second district, consisting of all New York state except New York, Kings, Queens and Richmond counties. The other four are on the Commission for the First district.

Charles H. Keep, of Buffalo, was born in Lockport, N. Y., in 1861. He graduated from Harvard University in 1882, and from Harvard Law School in 1885. He practiced law in Buffalo until 1903. From 1890 to 1901 he was Secretary of the Lake Carriers' Association, and from 1898 to 1901 was Secretary of the Buffalo Chamber of Commerce. In 1903 he was appointed Assistant Secretary of the United States Treasury, where he remained until January, 1907, when he was appointed Superintendent of Banks of New York state.

C. H. Keep.

William McCarroll, of Brooklyn, was born in Belfast, Ireland, in 1851. He was educated at Russell's Academy, Brookville Academy and at the Royal Academical Institution and then came to this country, where, in 1869, he began to work in the leather manufacturing business. In 1878 he formed a company of his own and in 1902, when the American Leather Company was organized, he was made Vice-President and General Manager. He is now President of this company and also President of the Hide and Leather Association, the New York Board of Trade and Transportation and the Morocco Manufacturers' National Association. Mr. McCarroll is also Chairman of the National Committee for the Promotion of Foreign Commerce and a Director of the National Manufacturers' Association, as well as being a member of several other organizations.

William McCarroll.

M. R. Maltbie.

E. M. Bassett.

Edward M. Bassett, of Brooklyn, was born in that city in 1863. He was educated at Hamilton College, Amherst College and Columbia Law School. After graduating from the latter he was admitted to the bar in 1886. He spent the next six years in legal work connected with a contracting firm in Buffalo, and then returned to New York and began the general practice of law. He is now the senior member of the firm of Bassett, Thompson & Gilpatrick. He was on the Brooklyn Board of Education from 1889 to 1901, and on the Flatbush Local School Board from 1901 to 1902, when he was elected to the United States Congress, where he served for two years. Mr. Bassett has worked on the improvement of the United States bankruptcy law and the New York state law regarding eminent domain.

Milo R. Maltbie, of New York, was born at Hinckley, Ill., in 1871. He graduated from the Upper Iowa University in 1892, from the Northwestern University the next year, and from Columbia University in 1897, after having acted as Professor of Economics and Mathematics at Mount Morris College from 1893 to 1895, and as a fellow in administrative law at Columbia from 1895 to 1897. He was Secretary of the Reform Club Committee on municipal affairs from 1897 to 1902 during which time he was also editor of *Municipal Affairs*. He was prize lecturer on municipal government at Columbia in 1900, and has been Secretary of the Municipal Art Commission since 1902. Mr. Maltbie has been on several other commissions; he has investigated civic art and municipal conditions in Europe and has also investigated the municipal ownership of public utilities in Great Britain, the street railway franchises of Chicago and the Ramapo water contract in New York City.

J. E. Eustis.

John E. Eustis, of the Bronx, was born in Limerick, N. Y. When he was 17 years old he enlisted in the 20th New York Cavalry in which he served for two years, and then went to Wesleyan University, where he graduated in 1871, having taken a scientific course. He then came to New York and was appointed City Surveyor. The next year he began to study law and graduated from Dwight Law School in 1877. In 1880 he began practice and is now a member of the firm of Eustis & Foster. He served as School Trustee of the Twenty-fourth Ward until 1885 and was then made a School Inspector, which position he held for five years. In 1896, he was appointed Commissioner of the Board of Education. He was Park Commissioner for the Bronx in 1902, and he has been Vice-President of the Citizens' Union, and a member of its City Committee, of the Bronx West Side Association, of the Civic League, of the West Side Board of Trade, of the Bronx Bar Association, and of the Bar Association of New York county.

Electric Railways.*

SUBJECT FOR DISCUSSION:

(*a*) What are the factors which determine the maximum economical grade for electric railways?

(*b*) In establishing direct lines with heavy grades, under what conditions will it be found practicable to use electric locomotives and gas-engine generating stations, rather than traction by steam locomotives?

It is difficult to furnish material for discussion of a question having such scope as the first part of this topic, except in the shape of generalities, which are either obvious or of little use in the special case which the engineer may have in mind. The length of line, the character and density of traffic, the location and length of grades, all have important bearings upon the economies, constructing and operating, in any railway proposition. It is probable, therefore, that the proposer of the question had in mind a discussion of the factors peculiar to the method of traction, rather than those effecting the location of rail-

*An informal discussion at the annual convention of the American Society of Civil Engineers, by George Gibbs. From advance pages of the *Proceedings* for August, 1907.

way lines in general. These factors result from the method of application of the power to the trains and from the interconnected character of the apparatus which makes up the motive power system.

On a steam railroad the power plants are the locomotives; an electric road has its power system jointly in the locomotives (or the motor cars), in the continuous power conductor along the line, and in the central power-house. In the steam railroad, therefore, the first cost of power equipment is fixed by the number of locomotives, independently of the location, or the length of line, or other outside considerations; with the electric proposition the first cost of the power system is affected, not only by the number of locomotives or motor cars, but also by the magnitude of the other items of power equipment, and these items depend largely upon the grades, their length and possibly their position. For instance, we can readily imagine a line with grades located in such a way that, with a given train interval, all trains may be ascending simultaneously; in such a case the line equipment and power-houses must be designed to supply all trains taking power simultaneously, even if this maximum power is only needed for a small percentage of the total time. A location with the grades differently selected, even if the maximum gradient is not altered, might readily result in a much lower maximum demand at the power-house, and a consequent reduction in cost of the power system. Length and position, as well as rate of grades, therefore, are of much importance in an electric railway proposition.

The quantitative importance of these factors, of course, depends upon the character of the business; thus, where the traffic is very dense, requiring the operation of trains at short intervals, the relative location of grades is not as important as with infrequent train units, because, as the number of trains is increased, those ascending and descending the grades at any one time tend to balance, resulting in a relatively steady load on the power-house. The length of grade in an electric proposition has a peculiar importance because of the fact that electric motors have a rating in which the time limit comes in. Thus, for short maximum grades, the limit of motor capacity is in the commutation of the current; with long grades the limit is in the heating of the motors, due to the cumulative effect of passing current through the motors, the resulting heat being not entirely dissipated by radiation.

As to maximum practicable gradients. This factor is generally a less limiting one in electric traction than in steam. For trains composed in whole or in part of motor cars, the question of adhesion may generally be dismissed, because the limiting grade, from the standpoint of safety, is generally less than that dictated by the adhesive limit. Even with locomotive trains the problem is less serious in electric than in steam traction, because of the large proportion of the electric locomotive weight available for adhesion, and because of the facility with which trains may be double-headed with electric locomotives. This arises from the fact that by multiple control two or more locomotives become in effect a single unit, and are not open to the objections of dual control, as in operating two or more steam locomotives on one train.

From the two factors, namely, the higher adhesion ratio and the selection of grade locations, it may result that, with an electric railway line, the economic grade may be greater than that possible with steam traction. For certain kinds of electric railways in a flat country, for instance the interurban trolley road, this facility for surmounting short but very heavy grades without reaching the adhesive limit is of great importance in separating steam and electric grades at crossings, without excessive cost, either for grading or for power plant.

The effect of gradient upon operating cost cannot well be discussed for the general case; in some cases the grades may have little or no effect, if they are short and the traffic is heavy; in other cases their length and location may have an important effect upon the quantity of fuel required and the economy of power-house operation. Of course, the cheaper the fuel the less the importance of this factor in determining the line location.

Summing up, therefore, some important points to be considered in laying out an electric traction proposition are:

1. The effect of density of traffic in averaging the load requirements at the power-house.

2. The effect of location of grades, especially in infrequent service, in averaging load requirements at the power-house.

3. The wider latitude in fixing the maximum grades because of the greater adhesion ratio.

4. Limiting commutating effects on short grades.

5. The motor heating effects on long grades.

6. The less effect of grades on speeds because of the greater accelerating rate possible.

In order to use gas-engine stations successfully for any electric traction project it is necessary, of course, first, that gas engines and generators be obtainable of the proper characteristics for such work, and, second, that they will prove advantageous and economical. The form of the question appears to limit the subject to gas-engine prime movers for electric lines, rather than consideration of electric traction versus steam traction. In laying out the project in question, however, it is presumed that it would first be essential to determine whether electric traction of any kind would be advantageous, and then whether gas engine would be better than steam or water-power prime movers.

A general discussion of electric versus steam traction, of course, opens up a vast subject, and to indicate even the treatment would be beyond the limits of a brief opening discussion. Generally stated, for heavy grade work it may often be advantageous to adopt electric traction, not only because of economy of operation, but because of an increase in the capacity of the line consequent upon the use of exceptionally powerful electric locomotives which will enable the ruling loads to be taken over the grade without doubling; also because of the convenient application and control of electric locomotives, and because of the factors mentioned in connection with the discussion of the previous question.

Having determined that it will be economical or advantageous to use electric traction, it does not necessarily follow that gas engines would be the best means for producing power. Where water-power is available, and may be developed at moderate cost, on the line or within reasonable transmission distance of it, it will be found that such power will be more economical than either gas or steam. Where water-power is ruled out, and where the railroad is located within a short distance of coal mines, it may be that a steam generating station would be more economical than a gas-engine station, because of the lower first cost of the steam generating plant.

In order that the gas-engine plant may be used economically, it is necessary that, as before stated, the machinery be available in units of proper size, that the details be worked out practically, and that they compare favorably with steam or water in first and operating costs. Doubtless these questions will be discussed in connection with the subject of gas engines, and, therefore, it may be stated here, that, from the point of view of economy of power, the gas-engine plant promises well, but from the view of availability there appear to be at the present time two important limitations: The first is in the small over-load capacity of the gas engine, which is disadvantageous for fluctuating railroad loads, and the second is in the fact that gas engines and producer plants, up to this time, have been developed in relatively small units. Of course, it is true that some large gas engines have been built, but they can hardly be called a commercial article yet for general application to railway purposes.

The Railroads of Mexico.*

BY ERDIS G. ROBINSON, C. E.
Formerly of the Engineering Department of the Mexican Central.

The national history of the Republic of Mexico is of such surpassing interest that one writing only of the railroads of that country can with difficulty confine his thoughts, and therefore his pen, strictly to his subject. The temptation to wander is strong and ever present. If at times the following remarks may seem to depart somewhat from the stated subject, the writer would suggest, in addition to the above, that in making a study of railroads it is necessary to a proper understanding of the subject to know somewhat about the physical character of the country served, as well as its commercial activity and political stability, since the prosperity of the one is dependent upon that of the other.

Soon after the conquest in 1520 by that intrepid explorer and courageous adventurer Cortes, Mexico became the source of much traffic in precious metal exportation. The Spanish conqueror and explorer was most keen after the riches of the earth and but little concerned with the welfare of the people or the future of the country he was despoiling; wherein, we are led to believe by certain radical sheets of to-day, he resembled greatly the commercial *conquistadores* of the present age. Those early prospectors covered the entire land; mineral deposits were discovered and worked by slave labor, and the precious metals mined were sent to Spain in vast quantities. For the transportation of these precious cargoes from the interior to the seaport at Vera Cruz, roads and trails were built with a thoroughness attested by the present use of many of them still in good condition.

But a nation conceived in greed and selfishness, and nurtured in tyranny and injustice cannot become the home of a peaceful people and prosperous enterprise. For 300 years the seeds of discord sown by the early Spanish colonizer, though lying dormant during certain long periods, finally harvested crops of internal rebellion and foreign invasion which prevented the country during all that time from enjoying the real prosperity which comes only with national peace. It was not until the present ruler of Mexico, by means of a successful revolution, established himself as president of the republic, that an era of peace was inaugurated which promised to endure. This happy condition made possible the development of

*When it is necessary to refer to values or costs the writer has used the words *dollar* and *cent* to refer only to the money of the United States. When values are given in Mexican units, the words *peso* and *centavo* are used. This course is not only the proper one, but seems to lead to less confusion than to be referring frequently to "*dollar, Mexican currency*," or "*dollar, gold*," or "*dollar, United States currency*," etc., as is often done. It is easy to remember that the Mexican peso has a fixed gold value, and is worth 50 cents.

the railroad interests, which forms the greatest guaranty of the continuation of peace and prosperity since it furnishes employment for the people, facilitates the operation of other industries and strengthens the hold of the government upon all the districts of the state.

Accordingly, with peace thus established, the natural riches of the country and the special inducements offered by a wise government attracted the alert mind and opened the pocket of the far-seeing investor, and the final foreign invasion of Mexico was begun by the commercial conquest and the inauguration of the railroad era.

RESOURCES.

It is to be expected that a country with a great variety of climatic conditions will have a very diversified production. From the tropical and humid coast lands of Mexico to its high, cool and dry plateau may be found nearly all of the possible weather conditions, and the products vary accordingly. The plains of the temperate plateau are naturally dry and therefore unproductive. These areas are largely covered by extensive mesquite growth, very valuable as sources of fuel, as well as many varieties of the not invaluable cactus. In some favored localities where nature has provided springs or running streams beautiful garden spots are found, where fruits, grains and vegetables are grown in abundance. The Mexicans, urged by necessity, have developed a high order of skill as hydraulic engineers, and have in successful operation many irrigating plants led from the reservoirs located in the hills. At the advantageous physical positions on the plains and in the mountains are located towns and haciendas which become the centers of much business. Near Torreon are large areas planted in cotton, the yield of which is all fabricated in the country. Further to the north are found some of the largest cattle ranges in the world. To the northeast, on the line of the Mexican International, are located the only considerable coal fields of Mexico. Further to the south, in and around Mexico City, as well in other centers of population, are large tracts planted with maguey, from which is produced the prodigious amount of intoxicating liquor consumed in the country, this traffic amounting to nearly one-half of the total agricultural tonnage of the Mexican Railway. From the different districts over the country come many important crops, nearly all of which are consumed at home. In Monterey there has recently been finished a high-grade steel plant; in several cities there are smelters for reducing the vast amounts of ore mined in the country, and in other cities miscellaneous industries are located. All these industries are carefully fostered and guarded by a high protective tariff law, the good effect of which on the internal development of the nation is plainly evident.

In the mountainous regions there are many large tracts of fine timber land of almost untold value to the country at large, and to the railroads in particular, as sources of construction timber and fuel. Many miles of roads have been built to exploit these rich timber lands.

On the lower coast lands are grown the usual tropical and semi-tropical crops—rubber, tobacco, henequin, cane, coffee, chicle, etc., as well as crops found further north.

In naming the resources of Mexico as the basis of its railroad industry, the mining business must be given the greatest prominence. The history of Mexico is a story of its mineral development. With the discovery and opening of the mines came cities located near those centers of wealth. As time passed mining methods improved; the cities grew, railroads were necessary, and engineers were given the task of reaching by rail these cities which had been located with no thought of future rail connections. Later, as the mining business prospered, all other lines of industry increased in proportion. It became necessary to communicate with the outside world and railroads to the seaports were needed.

The important relation of the mineral resources to the railroad business can be no better shown than by studying the table giving classification of the railroad traffic (shown elsewhere), from which it will be noted that the products of mines make up 54 per cent. of the tonnage of the Mexican Central, 75 per cent. of that of the Mexican International, 46 per cent. of that of the Mexican National and 26 per cent. of that of the Mexican Railway. Expressed in round numbers and in the Mexican peso, the gold mines yield annually 22 million, the silver mines 80 million and the copper mines 25 million. The entire exports of the country amount to something over 200 million pesos, the imports to 160 million pesos and the corn crop to 75 million pesos.

TOPOGRAPHY.

A large part of the area of Mexico is a high tableland, with considerable width at the northern part and narrowing to a point south of the City of Mexico, where the mountain ranges converge. Across the northern part, along the United States boundary, the elevation is between 2,000 and 4,000 ft., and at the city, 7,500 ft. This rise in elevation is not made gradually, however, but over a series of plateaus separated from one another by intervening ranges of hills. At Torreon, about midway from the northern line to the City of Mexico, the elevation is almost the same as at El Paso, although the separating ridges passed over have reached an elevation of 5,000 ft. on the north and over 8,000 ft. on the south of that centrally located city.

Along each coast line is a strip of low land less than 100 miles wide, which has the good and bad qualities common to the truly tropical climates. At the least unfavorable points along these coasts are seaports, some located at natural harbors formed at the rivers' mouths, and some built up on the open coast line. Tampico is of the former and Vera Cruz of the latter class, for nature has not blessed Mexico with numerous and well-sheltered natural harbors, and in securing those in service the government and the railroads have had to help. At Tampico an excellent harbor is secured by means of jetties at the mouth of one of Mexico's large rivers, these jetties forming as fine an example of such construction as will be found in any country. They were built for the Mexican Government by the Mexican Central, E. L. Corthell being the consulting engineer. The deep water assured by these jetties and the excellent wharves recently completed by the government at a cost of nearly 4,000,000 pesos, as well as other wharves, and the connection by rail to Mexico City and to Monterey by two lines of the Mexican Central, may well account for the large tonnage handled at this port. At Vera Cruz, until recently, there was no good harbor protection nor wharf facilities for handling of the cargoes, which were transferred to land by lighters from the vessels anchored in the open. This city, however, had been the principal seaport since the time of the Spanish conquest. The vast quantities of precious metals in transit to Spain were brought here for shipment, and the importance of the port was thus early established, and it still ranks first in importance in value of imports and exports. Two lines of railroad now connect it with the Mexico City, and it also has connection with the Isthmus of Tehuantepec, on the south. The importance of this port gradually made better harbor protection imperative, and this was secured by great breakwater construction, which has resulted in a sufficient depth of water and a well-protected anchorage.

There are a number of harbors along the Pacific coast, notably at Acapulco, Manzanillo, Mazatlan and Guaymas. These harbors are as yet without rail connection with the interior of the country, although, prompted by prospects of good business and by liberal government subsidies, many lines have been projected and surveys made. At the present time the Mexican Central is completing its line from Guadalajara to Manzanillo (to be described later), at which point the government has recently made very important and costly harbor improvements.

The harbors named above, as well as others of less importance, have long accommodated a valuable coastwise trade, serving as natural outlets for the products of the low coast lands, but largely barred from handling the business of the interior until railroads were built crossing the two mountain barriers which, rising abruptly from the low elevations, divide these strips of coast lands from the great plateau areas. Almost from the level of the sea the mountains rise to heights which easily rank them with the loftiest ranges on this continent and furnish scenery of surpassing grandeur. In the eastern range, and in direct line from Vera Cruz to the City of Mexico, is Mt. Orizaba, rising from almost the sea level in one grand cone to an elevation of over 17,000 ft. Slightly southeast of the City of Mexico and plainly visible from it as beautiful snow-capped peaks are the two mountains, Popocatepetl and Ixtaccihuatl, the former rising to a height about the same as Orizaba. Further to the west, in the beautiful state of Michoacan and surrounded by vast areas of dense forests, is Mt. Patamban (elevation 13,000 ft.), while still farther west is the mountain of Colima. All these mountains are volcanic peaks; Orizaba and Popocatepetl were reported in eruption at the time of the Spanish conquest, while Colima is still doing business as a volcano, its frequent eruptions of ashes and lava being an unique and grand spectacle which furnishes a good bid for tourist travel in the hands of the passenger agents of the Mexican Central, whose Pacific extension skirts the base of this interesting mountain. The mention of these few mountains will serve to indicate the general character of the ranges separating the low from the high lands; lofty volcanic peaks with all the rugged topography that can accompany such mountains.

In order to exploit the mineral and timber riches of these lands, and to convey to and from the seaports the products and supplies of the engineer, as well as the faith and confidence of the capitalist, necessary to cross by railroads these forbidding mountain areas and to penetrate into their very hearts.. The slopes and passes among these mountains are deeply cut by barrancas of most forbidding topography, which while they offer the only means of crossing, still seem to have been designed by nature to test the patience and skill of the engineer, as well as the faith and confidence of the capitalist. These barrancas are too wide and deep to be bridged and too sharply cut by tributary barrancas to be easily turned, and therefore must be overcome by heroic means.

To an engineer the nature of this country can be appreciated best by a study of the character of the lines already built. In a later paragraph will be given such information as the writer has been able to gather concerning the grades, curves, etc., of the lines that have been completed over these precipitous divides.

(To be continued).

Progress of the Pennsylvania Tunnels Under Manhattan Island.

In our issue of November 2, 1906, through the courtesy of the Pennsylvania, New York & Long Island Railroad and The United Engineering & Contracting Company, contractors for the work, we gave a general description of the plant and organization used in driving the Manhattan crosstown tunnels of the Pennsylvania extension into Manhattan and Long Island, being that portion of the line under 32d and 33d streets, between the east end of the terminal station at Seventh avenue and the East river, where the contractors are using the west half of the shafts sunk by S. Pearson & Son, who have the contract for driving the sub-aqueous tunnels eastward under the East river.

The plans for the tunnels under 32d and 33d streets, as originally made, showed three tracks from the terminal station to the west building line of Fifth avenue under each street, the third, or center track, to be used for storage purposes. The grade of the tunnel through this length was therefore made such that trains would remain at rest without setting the brakes.

From the west building line of Fifth avenue eastward the tunnels were designed for two tracks; those under 32d street for eastbound express and local use; those under 33d street for westbound service, and the grade was made 1½ per cent., descending to the level of the tubes below the bed of the East river. Under Fifth avenue and somewhat to the eastward these two grades were joined by a long, easy vertical curve.

The profile of the tunnels showed the base of rail an average probability of causing considerable settlement of the front walls of the old residence structures on either side of the street. Such structures as the larger hotels and business buildings would have caused no trouble, as the foundations of these buildings rest on the solid rock.

After careful review of the situation, it was determined to make application for permit to do the work by open cut under a temporary street surface, after the front walls of the buildings not resting on rock, had been carried down thereto, as shown in Fig. 1. This permission was ultimately granted by the Rapid Transit Commission, as it seemed to be to the best interests of the city and the property-holders.

At the time the application was before the Rapid Transit Commission, the railroad company having modified its trackage arrangements within and west of the station, found that it was reasonable to do away with the storage track east of Sixth avenue, and made plans by which the section from Fifth avenue to Sixth avenue could be changed to two-track tunnels, and the vertical curve shifted to Sixth avenue.

In the previous article standard sections of three-track and two-track tunnels were shown, and by reference to these it will be seen that the height of the three-track section was some 8 ft. greater than that of the two-track section. The change to the two-track section lowered the top of the roof 8 ft., and the change in grade gave 5 ft., thus lowering the grade of the roof below the bed of the old stream a total of 13 ft.

At this new grade of roof exploration drifts were sent for-

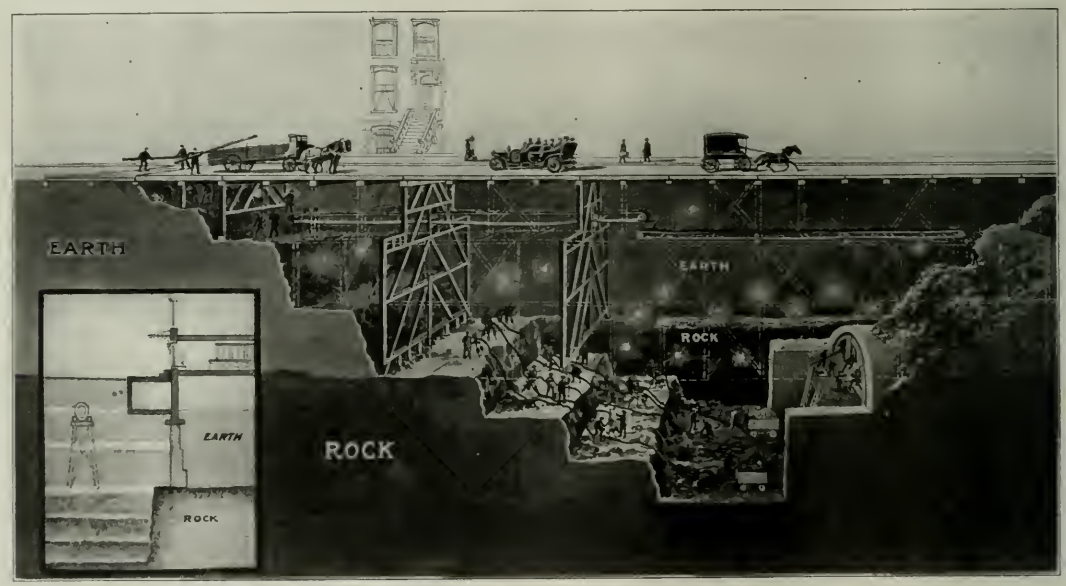


Fig. 1—Proposed Method of Excavating Pennsylvania Crosstown Tunnels West of Fifth Avenue.

of 85 ft. below the surface of the streets, and the accurate preliminary survey of the top of rock indicated that the roof of the tunnel, practically throughout its entire length, would lie 40 ft. below the surface of the rock.

On the west side of Fifth avenue, however, the bores passed under the bed of an old stream, flowing, in general, in a southeasterly direction through a trough of rock that was either the reason for its presence, or cut out by the action of the stream; and at this point the roof of the three-track section cut through the rock into soft material.

When this point was reached with the excavation going westward, the section was advanced by driving three separate small headings, one at the elevation of the roof in the middle of the cross-section and the other two the full height of the perpendicular sides of the tunnels.

Had the ground been dry, as had been expected, because of the elimination of surface water by buildings and pavements, it would not have been difficult to have driven these small headings forward through the soft ground, and to have constructed the sidewalks and thrown the masonry of the roof across from wall to wall by alternate sections. But the conditions of the sewers, built back forty years ago, and possibly also of the Croton water pipes, kept the ground saturated, and it was found to be of such a nature that it was being carried into the tunnel in suspension by the seepage.

Therefore, while it was quite practicable to build the tunnel by this method, it could not have been carried out without the ward, with the result that ample depth of solid rock was found over the tunnels, making it unnecessary to resort to open cut. It is, therefore, probable that the lower grade will be adopted, and that there will be no open cut, except for a short distance at the west end of 32d street, where it is impossible to change the grade, and where the structures are of such a nature that they can be readily protected and the work done, without great inconvenience, from the surface.

The only other change in the plans for the excavation of the tunnel consists in sinking shafts at the west end for the purpose of hastening the completion of the work by driving eastward to meet the drifts on their way west from Fifth avenue. It is expected that the excavation will be entirely completed by November 1.

These tunnels have now been driven for 80 per cent. of their length, through solid rock, under the most thickly inhabited district of Manhattan, without damage to the buildings on either side of the street, and with an inconvenience so slight that the property-holders and tenants have expressed their high appreciation of the way in which the work has been handled, no serious complaints have been made.

At present the work of lining with concrete is well under way, and precisely as in the case of the excavation, the plant is driven entirely by electricity. The materials (cement, sand and broken stone) are received at the dock at the foot of East 35th street, furnished the contractor by the railroad company for his sole use.

The sand and gravel are unloaded by means of clam-shell

Fig. 2—Heading of Double Track Tunnel in Solid Rock.

Fig. 3—Completed Excavation for Two-Track Tunnel in Solid Rock.

buckets, two men, one operating the electric hoist and one the traps of the hopper under which the wagons drive to be loaded, being the only labor necessary to clear the boats. Both materials are unloaded at the rate of 50 cu. yds. an hour. The material is carted to the shafts, where it is dumped into bins constructed in the shafts, the top being at the ground level, and the bottom about 20 ft. above the grade of the tunnels.

The cement is also fed down to this level through a gravity device similar to the Louisville type of spiral fire-escape. Just beneath the hoppers of the bins are the charging platforms of the mixers. The batches are measured in boxes fed from the hoppers and dumped into the loading chutes of the "Smith" mixers, which in turn dump the material into the concrete cars, in which the mixed concrete is carried to the point of placement in the walls.

The operation of placing the concrete is as follows: The floors are first brought to the final level of the under side of the ballasted tracks, the idea being to obtain a smooth graded floor to give perfect drainage. On this floor of concrete are placed the rails of a 16-ft. gage track, on which the frames for the side walls and roof arch are run. When these rails are once lined and graded there is no further bother with engineering instruments in completing the tunnel masonry, since the forms are substantial and the tunnel section uniform throughout. The floor concrete is shown in place for half the tunnel, in Fig. 3.

The first operation for the side forms is to smooth up the walls for the waterproofing. These forms are shown in place in Fig. 4. When the waterproofing is finished the forms for the side walls complete are set up to a point somewhat above the spring of the arch. These forms are shown in place in Fig. 5.

It should be noted here that the cross-section of the twin tunnels shows a concrete central wall. However, as the two-track sections advance toward the East river, where the two tunnels of two tracks each are broken up into four sub-aqueous tubes passing under the river, the two tracks under each of the streets gradually separate, so that ultimately they are sufficiently far apart to leave a core of rock between. The point where the core of rock is left in place is shown in Fig. 5.

Fig. 7 shows the completed arches of the tunnel, which is the standard section across town.

The forms are made in 32-ft. sections, and follow each other in close sequence as the work progresses. The arch concrete and the upper portion of the central wall is placed by an ingenious belt conveyor designed by the contractor and constructed for them by the Robins Conveying Belt Company. By the system adopted the labor of placing concrete is reduced to a minimum, although the investment in plant is large.

Fig. 4—Placing Forms for Concrete Side Walls.

Much work has been accomplished in the 13 months of actual tunnel digging. Several records in tunnel work have been made. For several successive months after the plant got working a greater yardage was taken out of the six headings that were being driven simultaneously than has ever been taken out of six headings in any other tunnel. This is partly due, of course, to the unusual size of the drifts, but a record for linear feet of progress has been made on this job.

The great width of the headings was a peculiar advantage, owing to the necessity to pull the cuts in such a way that no damage would be done to the structures lining the streets when blasting. Three, and even four, relieving cuts have been used in order to maintain the desired daily progress and still keep within the limitations imposed by city ordinance and good judgment.

No material damage has been done by blasting. The absence of damage has been due primarily to an expenditure by the contractor that would startle a cross-country railroad tunnel builder; not only in the actual excavation below the surface, but in the headhouse plant and top charges made necessary in order to avoid noise and interference with the full enjoyment of their property by the neighboring house-holders.

So great a work could not, of course, be carried out without some annoyance. There has been arranged a regular hour for the receipt and consideration of complaints, and some of these have been more or less amusing.

For example, a young man in a large retail house, who had a contract to maintain the incandescent gas-burners, came in and promised dire punishment unless the blasting was altogether stopped, on the allegation that it was breaking his mantles.

It is curious to note how universal is the habit of not noticing cracks in the ceilings and walls until some attention is called to them. To avoid just this complication, examination was made of every house in the zone of influence of the work, and complete diagrams were made, with affidavits of the examining engineer at-

Fig. 5 View in Tunnel near East River Shaft Showing Central Rock Wall.

Following the completion of the sidewalks, shown in Fig. 6, comes the placing of the arch forms. These may be freed from the concrete by being lowered, since the sidewalks are carried above the spring line of the arch. The steel forms for the arch are shown in place in Fig. 6.

tached, showing all the cracks and faults existing before the work was undertaken. In practically every complaint that is filed a reference to the diagrams shows that the cracks complained of

Fig. 6—Steel Forms for Tunnel Arch.

existed, and in many cases the plaster was down before a blast was fired.

That no damage has been done to structures in good condition is clearly shown by the fact that the tunnels have been driven under the subway station at 33d street, built in the same rock and only 35 ft. above, without shaking loose any of the [illegible]

George S. Rice, Chief Engineer of the [illegible] Railroad Commissioners, had installed in the station a specially constructed seismograph to determine the effect of the blasting. This was kept in position for five months, and while the tunnel was being driven from 400 ft. west of the station to 400 ft. east. The effect of the blasting was shown on the records as a momentary movement of the needle perpendicular to its travel when at rest. The record was merely a straight line about $\frac{1}{16}$ in. long, perpendicular to the line of rest. The seismograph happened to be in position at the time of the San Francisco earthquake, and the record made by that phenomenon extended over a period of 13 minutes. The record consisted of a wavy line, passing both sides of the line of rest, with a maximum versed sign of $\frac{3}{16}$ in. This shock was recorded simultaneously with the record made at the state house in Albany.

Another interesting situation developed with regard to a public school along the line. Here the woman principal, as well as her staff of teachers, were alarmed lest the children should become excited through the effect of blasting. The contractor asked that a committee of teachers be organized to make a visit to the tunnel for the purpose of seeing what was going on, and be reassured that no damage could result. This committee visited the tunnel, and were so impressed with the way the work was being conducted that all timidity disappeared, and no further complaint has been registered.

The excavation is now about 80 per cent. complete, and about 20 per cent. of the concrete has been placed. It is expected that the excavations will be entirely completed by the first of the coming year, and that the concrete will be practically finished by the end of the present season. What there is left to be done will take but a short time the early part of next season, and the work will be completed on contract time, early in 1908.

We are indebted to D. L. Hough, President, and Paul G. Brown, Managing Engineer, of The United Engineering & Contracting Company, for the information; to J. P. Gillette for the photographs, and to Capt. G. A. Coffin for the drawing, from which Fig. 1 was made.

Fig. 7—Completed Section of Standard Twin Tunnels.

Strength of Red and Yellow Douglas Fir Bridge Stringers.*

The terms red and yellow fir are not thoroughly defined. By some only close-grained, bright yellow sticks are designated yellow fir and all other sticks called red fir, while others call only close-grained sticks of a pronounced red color red fir and all other material yellow fir. Both red and yellow fir are secured from the same species—Douglas fir—and often from the same tree.

An analysis of the strength tests made by the Forest Service on Douglas fir stringers is shown in the attached table. These stringers were graded according to the export grading rules of the Pacific Coast Lumber Manufacturers' Association, and in the table are grouped by grades. In classifying the stringers according to color all timbers of a reddish tinge were called red fir and all of a yellowish tinge were called yellow fir. The rings per inch shown in the table indicate that yellow fir is of slower growth than red fir. It also ranges higher in grade. Of the 94 yellow fir stringers tested 47.8 per cent. were selects, 40.4 per cent. were merchantables and 11.8 per cent. seconds. Of the 162 red fir stringers tested 29.8 per cent. were selects, 43.8 per cent. were merchantables and 26.6 per cent. seconds, but, grade for grade, these tests show that there is practically no difference in the strength and stiffness of red and yellow fir in bridge stringer sizes:

Strength of Red and Yellow Douglas Fir Bridge Stringers.
(Yellow fir expressed in per cent. of red fir.)

Kind of fir.	Grade.	No. of tests.	Rings per in.	Per cent. of moisture.	Weight, per cu. ft. in lbs.: As tested.	Weight, per cu. ft. in lbs.: Oven dry.	Fiber stress at elastic limit. lbs. pr sq.in.	Modulus of rupture. lbs. per sq. in.	Mod. of elasticity. 1,000 lbs. pr sq. in.
Red...	Select..	48	10.3	29.6	38.2	29.5	4,427	6,974	1,645
Yellow	Select..	45*	17.5*	87.0	94.0	97.0	101	96	100
Red...	Merch..	71	9.0	29.7	35.9	27.7	4,056	6,019	1,534
Yellow	Merch..	38*	16.4*	90.0	97.0	99.0	101	102	97
Red...	Seconds	43	7.5	27.4	35.7	28.0	3,674	4,923	1,319
Yellow	Seconds	11*	14.5*	98.0	104.0	105.0	99	106	98

*Not expressed in per cent.

New York Central Freight-Yard Policemen.

A recent issue of the *New York Herald* contained an interesting account of the desperate contest which the New York Central & Hudson River has waged for the past few years with freight-car thieves in New York City, from which we quote as follows:

When A. H. Smith came from the West to become general manager he sent for Chief Inspector Humphreys and began to study the question. R. F. Humphreys, brother of the inspector, and like him, a veteran policeman, was called to the city and placed in charge. He went at it confidently and slowly. He used special care in picking his men. They had to be men who would be useful in emergencies, able to take care of themselves on and off moving trains. They had to be able and willing to stand off the attack of a half-dozen men in a lonely aisle of cars, with assistance far away. They had to be able to "hop" a freight, grab their man, throw him off and jump after him; they had to be alert and capable of long hours of duty. Above all they had to be honest. What use would the "force" be if a policeman could be bought to be at the other end of his post when there were valuable cars to be "ripped," or what further use would it be if a policeman could be induced to fail in his identification of the prisoner when on the day of trial?

It took something like three months to get the men, and when they were selected every one of them came from "up the state." All were young, all were lusty and all had proved their courage. Some had been policemen, others had been soldiers and several were active young college athletes who went into it because of the possible dangers of it. The twenty-seven of them were brought to the city a year ago last month and installed at the pier at the foot of West 49th street.

They were provided with everything any man would want. Their sleeping quarters were given to them, a gymnasium, shower baths, lounging and reading rooms and good salaries. A man that joins the force gets first $60 a month, but he works into a $125 salary if he shows the right spirit. If he does not deserve a raise he gets out; they don't want him. The long district is divided into three posts, or precincts—one at the milk station at 33d street, another at 59th street and the third at Spuyten Duyvil. Down around 33d street the milk thieves were working. This was a large band, usually working with company employees. Many a can of milk would be reported missing in the morning and no one could tell where it went.

Fifty-ninth street was the car thief district. That extended up above 99th street, and in this district there were a half-dozen well-organized bands, with some hundreds of independent operators. There were regular landing places along the Hudson river for the marine fleet, "fences" for disposing of property of all kinds, secret cuts, private ways and escapes. The district was divided by the bands impartially, and there was a "gentleman's agreement" among the thieves that made the rights sacred.

There was one band for the "new yards," as they were called, which begin at 60th street; there was the 69th street band, the band in 74th street, the "Bath House band," and so on up every few blocks. Spuyten Duyvil was the "yegg" clearing house. Through that point had to pass all the criminal tramps beating their way to the city.

This police force had been in existence just one year on May 17, 1907. During that period they made 1,351 arrests, and of this number there were a few more than 1,200 convictions. One-half of those arrested were charged with theft, larceny, robbery, burglary and highway robbery; a third more were for trespass and attempts at the same; others were for stealing rides and the like. The members of the force shot at least three men during the year, and two of their men were shot in return. One man was killed, Peter Michaels, a member of the 69th street band. There were at least three pitched battles, in which shots were exchanged, and the personal encounters were without number. Every man on the force was shot at, and often heard volleys of stones come whizzing by.

Of all the bands in existence a year ago, May 17, but one survives, the 69th street band, and out of that eight members are now serving terms of imprisonment. Michaels was shot and the leader dare not show his face across the tracks. The powerful political backing the band had a year ago is weakening, and visits to see "if something can be done to settle it" are not so frequent, nor is bail forthcoming so quickly as it was.

The men work twelve hours at a stretch and seventeen are on duty at night. F. D. Hunter is a graduate of Colgate University. Hunter, who is very quiet, tells about the work: "The Chief (and by the Chief he means Wilson A. Humphreys, at Albany) won't have a man who drinks, who has a spot on his record or who loses his head. He wants men, also, who are very good pistol shots. It is around 10 o'clock and the sergeant tells you it is time he made his rounds. He is compelled to do this just as in real police stations. If he finds a roundsman derelict there must be charges preferred and a policeman goes through the same ordeal. He starts out and is soon plunging ahead between a row of freight cars on one side and a moving train on the other. It is not pleasant walking for the visitor. Every one of our men along the track has his post, but he does not patrol it as a regular policeman would. You will usually find him hidden between cars or lying flat on a roof in a bad locality. He does not need to walk around, for the reason that there never has yet been made a car door that did not rattle or squeak when it was opened. He waits for that rattle, and when he hears it he runs.

"We've caught them trying to get away with sewing machines and machinery parts. They'd ruin $1,000 worth of machinery for $10 worth of brass."

To the left or river side of the track now spring up low sheds, bathhouses and heavy houseboats. "This is where Michaels was killed," says Hunter. "We got into the place this spring and got a carload of stuff. The keeper is now doing time. You've got to keep watch on all these places. Over there," pointing to a small dump pier, "is where the boats come in. They come from over in Jersey, and they are a bad crowd. We got eight of them and one of their boats this spring. They are pretty well scared now."

"This is where the park begins. That was their best hold. They could rush a trainload of stuff over in there and get away with it. We have had some good fights up along here. They usually work in bands of four or more, so they are ready for a fight. Usually a boy acts as their scout, and he comes on the track, as if he were going over to the river. If the coast is clear he whistles or coughs, and the men are over the wall into the car in half a minute. * * *"

Foreign Railroad Notes.

The Prussian State Railroads call for bids for 700 locomotives, to be delivered between April 1 and Oct. 31, 1908. The call is addressed only to those works which have heretofore received orders from these railroads.

At the beginning of the summer traveling season this year the Prussian Minister of Public Works issued a circular to his railroad subordinates in which he enjoined the strictest attention to maintaining passenger cars in good condition; to see that at terminal points they are kept cool and provided with cold water. Conductors and guards must see that the doors close tight and do not stick, that the door fastenings are in order, that the window blinds do not rattle, that windows open and close easily, that the window curtains are in order, that the lamps burn properly, that the lavatories are clean and provided with plenty of water. Well founded complaints of passengers should be attended to, when possible, during the trip, without waiting till the terminal station is reached.

*Bulletin of the U. S. Department of Agriculture, Forest Service

GENERAL NEWS SECTION

NOTES.

In the Federal Court at Rochester N. Y., July 5, the New York Central & Hudson River was fined $15,000 for carrying oil, shipped by the Standard Oil Company, at a secret rate.

The Mexican Central is to put cupolas in the roofs of the baggage cars of all through trains, in order to make it easier for the conductor to keep watch of the movement of his train.

Suits have been filed in the Federal Court at Des Moines, Iowa, to enjoin the Minneapolis & St. Louis and the Iowa Central from adopting the 2-cent fares prescribed by the Iowa law.

The Atchison, Topeka & Santa Fe has notified the Attorney General of Missouri of its compliance with his request to cease issuing passes in that state; and it is said that the Burlington, the St. Paul and some other roads will comply.

The Delaware & Hudson Company is receiving 450,000 ties from the South. The company bought but few ties last year because of the high prices. The ties arrive in New York by the Mallory line and are transferred to canal boat and barges of the Myers line for Albany.

Cattlemen of western and northwestern Texas say that since last March the railroads have been unable to supply more than half the cattle cars that shippers need, and that consequently thousands of animals are dying for want of water. Claims are being presented for damages due to delay in furnishing cars.

Since the fire of April, 1906, the ferries of the Southern Pacific between San Francisco and Oakland have carried 2,000,000 passengers a month, as against an average of 1,300,000 before the fire. These boats have carried in 40 years about 300,000,000 passengers. Of this number only three lost their lives while using the ferry.

Following a loss of travel in consequence of increased competition from street railroads, the Philadelphia & Reading has taken off a number of passenger trains between Philadelphia and Chestnut Hill; also some from the Glenside division. At Tioga (about three miles from the terminal), where trains of several divisions pass, the number of trains stopping each day is now 40 less than under the last time-table.

The United States Civil Service Commission, Washington, is to receive applications August 1 for positions in the Department of Accounts in the Interstate Commerce Commission. The positions to be filled are those to be established in connection with the inspection of railroad companies' accounts under the revised Interstate Commerce law. Applicants must have railroad experience and must know at least as much as a traveling auditor.

At Catalla, Alaska, July 4, a fight with clubs and pistols between rival railroad construction forces was accompanied by a novel feature, a "go-devil." The go-devil is something like a battering ram. It is erected at the point of intersection of the two lines and is kept in motion in such a way as to prevent the enemy from doing any work within its range. This machine was put up by the Brunner forces but it was captured by the Guggenheim forces.

The Mayor of Philadelphia has signed the ordinance under which the Philadelphia Rapid Transit Company receives limited street railroad franchises throughout the city for 50 years with a provision that the city is to have half of the income from operation in excess of 6 per cent. on the capital paid in. The city is to be represented in the board of directors by three persons—the Mayor and two selected by the councils. This arrangement was proposed by the Retail Merchants' Association, but it was opposed by the Reform Party.

Governor Comer, of Alabama, in his message to the Legislature last Tuesday complained that the state railroad laws are "held up" by injunction in the Federal Court the same as in Iowa. He said: "Discrimination has been proved, and it is a great hardship for Alabama to be forced to go through court processes on a case already pioneered and worked out and demonstrated." The Governor advocated biennial sessions of the Legislature and the passage of an anti-lobby bill.

The record for May shows the greatest aggregate movement of freight cars in the history of the Pennsylvania road. The total freight car mileage for the month was 122,770,303. The number of freight cars moved on the Pennsylvania's eastern lines during May averaged 146,476 a day; average daily movement of each car 27.07 miles. These figures do not include cabooses. On May 24 the interchange between the eastern and western lines at Pittsburg totaled 8,784 cars, which was 670 more cars than had ever passed between the lines before in one day.

The New York Central has issued on the Pennsylvania division an order doing away with a third brakeman on all road freight crews except way freights, pick-up and through trains. Hereafter one brakeman, one flagman and a conductor with the engineer and fireman will constitute a full crew. Owing to the great amount of construction work going on and the extra work trains on the road the third man has been thus far retained though with every car in a train equipped with automatic couplings and air brakes, only two brakemen are ordinarily deemed necessary.

In the United States Circuit Court at Chicago the Federal District Attorney has asked for injunctions to restrain five prominent express companies from granting franks to their employees and others. One of the defendants, the United States Express Co., in its answer contends that it is not a common carrier. The revised Interstate Commerce law, under which the provisions of the act now apply to express companies, has a long section containing a list of exceptions to that clause of the law which forbids free transportation, but the exception as regards employees applies only to the transportation of persons, not property.

The Cincinnati Chamber of Commerce has issued a circular to its members, requesting them to load cars to their marked capacity. It is pointed out that in view of the increased capacity of cars, averaging now nearly 60,000 lbs., the loading of cars to the minimum limit of 24,000 lbs., 30,000 or 40,000 lbs. is a waste of space which is an injustice to the commercial public, both railroads and shippers. This should be laid before certain legislatures and railroad commissions, which, though supposed to be fountain heads of justice, issue laws and rules perpetuating the injustice here mentioned.

Electrification in Australia.

It is proposed to electrify the suburban lines about Melbourne, Australia, for which purpose the government is prepared to spend $15,000,000. The system to be adopted is now under discussion.

St. Louis Railroad Terminals.

The Municipal Bridge and Terminals Commission of the city of St. Louis, which is a board of nine public spirited citizens, appointed by the municipal assembly, with Mr. Rolla Wells as chairman, says in its fourth report, recently submitted, that plans are being made for the improvement of the extensive tracts of land recently acquired by the Terminal Railroad Association for the enlargement of its freight yards, and will soon be laid before the Municipal Assembly. The commission reports that the executive officers of the railroads centering in the city have worked with the commission in a friendly spirit. Indeed, the marked success of this commission during its two years' life appears to have been due largely to the reasonable attitude of mind evinced by its members. Unlike some bodies of municipal representatives, these gentlemen evidently do not invariably approach the railroads with a demand for every possible improvement that can be thought of. In securing the abolition of the differential rates between St. Louis and East St. Louis on all freight from the east, except from points within 100 miles, the commissioners have secured reductions aggregating many hundred thousand dollars yearly for the business men of the city, but in modestly stating this in the report they admit some of the points made by the railroads and frankly declare that from points within the 100-mile radius the existing rates are entirely fair to all interests. In the matter of passenger fares, also, the commission for the present keeps its hands off, believing that there is nothing in the situation which will not probably adjust itself in the near future to the satisfaction of the city.

The commission still has much work before it and asks for an appropriation to continue its investigations. The elaborate plans for a new bridge across the river and the arrangements for a large number of new freight houses are yet to be worked out. The commission believes that the different railroads doing business in the city should each deal with the public through its own agents. The public is jealous of any appearance of monopoly and the prejudice against the Terminal Railroad Association cannot be extirpated. To give, on the joint terminals, really satisfactory service the agent of each road must be able to act as though he were working on a part of his own road; and, while there can be no objection to an

agent serving two or more roads, he should do business in the name of the individual railroad company.

Washington Railroad Commission's Rules.

The Railroad Commission of the state of Washington has issued a code of eleven rules governing passenger and freight traffic which the railroads of the state are directed to print on large cards and post in their passenger stations. Rule 1 makes all regular tickets good for 30 days. Rule 2 requires railroads to redeem unused tickets within six months at any general passenger office or at the station where sold. Rule 3 requires the three principal roads of the state to sell at all coupon stations 2,000-mile tickets at $50. Unused parts of mileage books must be redeemed after one year at 2½ cents a mile. Before the end of the year, unused parts may be redeemed allowing 3 cents a mile for the part used. A firm having bought a ticket for an employee may return it and have the unused portion credited on the purchase of a new book for another employee.

Rule 5 requires clean and comfortable waiting rooms and toilets. Rule 6 requires bulletin boards for delayed passenger trains, and rule 7 requires notice to be given at stations and on cars when a train is likely to meet an obstruction delaying it more than 30 minutes.

Rule 8 requires every station agent to keep a record, open to inspection, of applications for cars and how they are filled, etc. Rule 9 requires a similar record in the superintendent's office, and a monthly abstract of this must be sent to the railroad commission. Rule 10 requires every passenger train to be fitted with a hose and valve at the rear end so that in moving the train backward the rear brakeman can control its speed.

The New Commissions in New York State.

The Public Service Commission of New York State, Second District (headquarters at Albany), has announced the retention of the following employees of the old Railroad Commission, at the same salaries for the present: Steam railroad inspector, J. D. Schultz; inspector of electric railroads, C. R. Barnes; expert on accidents, E. F. Vanhoesen; locomotive inspector, G. P. Robinson; superintendent of grade crossings, A. H. Sutermeister; inspector of grade crossings, J. E. Brazee.

The Commission has been too busy organizing to attend to specific complaints. All matters relating to railroads have been referred to a committee of which Commissioner Sague is chairman, and Commissioner Decker is to attend to all matters relating to tariffs. All roads must file tariffs by November, 1907.

The commission has set hearings for each of the first three days of next week on applications for new security issues and proposed extensions and improvements to various railroads.

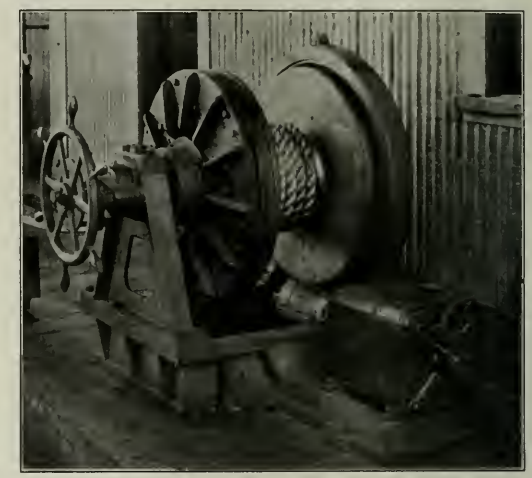
The commission has created a division of light, heat and power and appointed Henry C. Hazzard, former secretary of the gas commission, as the chief clerk at a salary of $4,000 a year. Mr. Hazzard's salary as secretary of the gas commission was $3,000 a year.

On the suggestion of the commission of the first district a conference between the two public service commissions will be held to formulate uniform rules of procedure.

The commission for the first district (New York City) has ordered all railroad companies within that district—steam and electric, subway, surface and elevated—to send to the Commission memoranda of their accounts, showing their systems of bookkeeping; also to furnish a complete record showing the movement of traffic, a schedule of all cars and trains in commission on the first day of July, giving the exact scheduled starting time of each car or train on every trip; the exact time of its scheduled arrival at destination, with the incidental statistics concerning distances, number of runs for each car and the headway. The same order calls for each company's estimate of the number of cars it expects to have in use on September 1 of this year, with the total seating capacity, and, for purposes of comparison, the number of cars, with total seating capacity, in commission on September 1, 1906, and September 1, 1905.

Lidgerwood Slip-Drum Electric Winch for Car Ferries.

At the three car ferry transfer bridges of the Pennsylvania at the Greenville, N. J., terminal yards there have been in use for nearly three years a number of motor-driven slip-drum hauling-in winches of novel construction made by the Lidgerwood Manufacturing Co., New York. These bridges are operated entirely by electricity and the winches are controlled from a cab or tower by the same operator who manipulates the raising and lowering mechanism. The winches were designed to overcome the difficulty and danger of hauling in by hand power and to prevent the parting of the mooring lines in rough weather or under the shock of running cars on the floats.



Lidgerwood Slip-Drum Electric Winch.

Transfer Bridge at Greenville Yard, Showing Lidgerwood Slip-Drum Hauling-In Winch.

Each winch is moved by a 10 h.p. General Electric d.c. motor geared to develop 5 h.p. at 900 r.p.m. The motor turns the drum through a steel worm running in oil. Each end of the worm shaft is provided with a roller thrust bearing. The drum is 14 in. in diameter and has a 14-in. face. It carries a manila hawser 2 in. in diameter which it hauls in at a speed of 10 ft. a minute. The winch complete with motor occupies a space 56½ in. long, 44 in. wide and 52½ in. high.

The slipping drum friction is of the type developed by Spencer

Miller for maintaining a constant tension on the cables used in the Lidgerwood cableway for coaling ships at sea. It is designed to slip continuously under full pressure for an hour at a time without destructive wear or heating and to maintain a constant tension on the hawser of any desired amount. The friction can be adjusted by the operator to give any strain. The winches at Greenville are adjusted to exert a pull of 11,000 lbs. before slipping and a continuous pull of 9,000 lbs. while slipping. The drum is normally loose on its shaft and is lined with bronze bushings to take up wear while slipping. At its ends the drum is provided with steel friction rings rubbing against soft steel and soft cast-iron friction blocks mounted in the surrounding casing. The surfaces of the rings and blocks are brought together with the required degree of pressure by means of a threaded screw and a combination of springs. The friction produced is of peculiar quality. The coefficient is high and varies only slightly between a state of rest and movement.

In operating the winches the mooring lines are made fast and the motors started. While bringing the float in, if it rebounds or is bumped by a tug or high wave the drums slip before a breaking strain comes on the hawsers, but continue to exert a pull sufficient to check the movement of the float. If for any reason the float should break away while loading or unloading cars the winches check the movement and are ready immediately to haul in again before any damage is done. During the three years they have been in use at Greenville they have been subjected to many severe tests and have been satisfactory in every way.

Two-Cent Passenger Fares in Many States.

Reports from Chicago to the effect that passenger fares are to be reduced to 2 cents a mile on many roads even where not required by law continue, and the air of authenticity is maintained; but no official announcements are yet given out. An Assistant General Passenger Agent of the Burlington at Omaha is reported as saying that his road will within 10 days announce rates of 2 cents a mile between all points on the entire Burlington system, extending into 11 states. Notices sent to the Interstate Commerce Commission—which of course deal only with interstate rates—are said to indicate that all of the prominent roads expect within the present month to adopt the 2-cent rate throughout Illinois, Wisconsin, Minnesota, Iowa and Missouri.

At Richmond, Va., July 10, Judge Pritchard, in the United States Circuit Court of Appeals, continued the restraining order against the enforcement of the uniform 2-cent passenger rate ordered by the State Corporation Commission.

INTERSTATE COMMERCE COMMISSION RULINGS.

Equal Facilities for Negroes.

The Interstate Commerce Commission on July 8 decided the case of Georgia Edwards v. the Nashville, Chattanooga & St. Louis, which involves the right of interstate carriers to discriminate between negroes and whites in facilities furnished.

Immediately after the Rate Law took effect the complainant, a colored woman, purchased a first class ticket from Chattanooga, Tenn., to Dalton, Ga. She entered the car assigned to the use of white passengers but was removed to the car assigned to colored people. She filed a complaint, alleging discrimination in the facilities furnished to her as against those provided for white passengers. The opinion is rendered by Commissioner Lane, who holds that where a railroad provides certain accommodations for first class white passengers it is commanded by the law that like accommodations shall be provided for colored passengers of the same class. The following statement of facts precedes the conclusion of the opinion:

The train in question was defendant's No. 93, which leaves Chattanooga at 6:36 a. m., and arrives at Dalton at 7:38 a. m. The distance from Chattanooga to Dalton is 38 miles. This train started from Nashville, 151 miles northwesterly of Chattanooga, and before it left Nashville, all the cars were thoroughly cleaned inside. They were again cleaned to some extent at Chattanooga. Both at Nashville and at Chattanooga the cleaning process applied equally to both the passenger coaches in the train. These two cars are of the same quality, having seats of the same size, upholstered in a like manner and with exactly the same quality of goods. One of them is used by white passengers and is provided with towels and washbowls, while the other is without such conveniences. The latter is constructed as follows: A partition placed in the middle of the car divides it into two compartments, and entrance from one to the other is had through a swinging door which, after being opened, closes automatically. Negro passengers are required to occupy one of these compartments, while the other is occupied by other passengers who wish to smoke.

In one end of the other passenger coach there is a compartment for smokers which will seat seven persons, but defendant does not provide any separate smoking compartment for negroes. It is also true that while only one toilet is provided in the negro compartment, the car which is entirely used by other passengers [illegible] one is to be used by [illegible] and the [illegible] only partially enforced. The principal [illegible] case and only one [illegible] the other is that the [illegible] the negro compartment is very much less than [illegible] transported in the other car. Defendant [illegible] sengers about one-sixth of the space in its [illegible] passengers, while the number of negroes transported [illegible] about one-fifteenth of the total. When there are [illegible] compartment, smoking there is allowed, but not otherwise. [illegible] happens that a car provided by defendant for the use of white [illegible] no washbowls and only one toilet and no smoking compartment [illegible] smoking is allowed in such cars if there are no women present.

On the whole defendant's Nashville-Atlanta passenger trains are among the best in the country, so far as equipment is concerned. The [illegible] are manufactured by the Pullman Co., and vestibuled. The cost of the car allotted to negroes was about $8,100, while that of the other passenger car in train No. 93 was about $8,800. The expense of the small smoking compartment in the latter accounts for nearly all the difference in cost.

Commissioner Lane holds that the broad question of the right under the thirteenth and fourteenth amendments of the Constitution to segregate white and colored passengers has been upheld by the Supreme Court of the United States and the Interstate Commerce Commission in previous decisions. The opinion concludes:

While, therefore, the reasonableness of such regulations as to interstate passenger traffic is established, it by no means follows that carriers may discriminate between white and colored passengers in the accommodations which they furnish to each. If a railroad provides certain facilities and accommodations for first-class passengers of the white race, it is commanded by the law that like accommodations shall be provided for colored passengers of the same class. The principal that must govern is that carriers must serve equally well all passengers, whether white or colored, paying the same fare. Failure to do this is discrimination and subjects the passenger to "undue and unreasonable prejudice and disadvantage." In this case it is manifest that defendant has unduly and unjustly discriminated in some particulars against colored passengers, and it will be ordered therefore that where the defendant carrier provides a washbowl and towels in coaches devoted to the use of white passengers and also a separating smoking compartment for such passengers, that similar accommodations shall be provided for colored passengers paying first-class fare.

Application for Rehearing Denied.

The Interstate Commerce Commission has announced its decision, rendered by Commissioner Clark, on the motion of the Missouri Pacific and the Chicago, Burlington & Quincy for rehearing in the case of the City Council of Atchison, Kansas, against those companies and others. In the original decision the Commission held that defendants should abstain from withholding the same or equivalent elevator allowances or free services in connection with elevation and transfer of grain at Atchison which are at the same time granted or furnished at Kansas City, Mo., and Kansas City, Leavenworth and Argentine, Kan.

The motion for rehearing contained various reasons for its being granted, which are discussed, but held not sufficient for granting a rehearing. In denying the motion the Commission says: "While the power to grant a rehearing is discretionary, it is not believed that the petition presents a situation which makes it necessary or advantageous so to do. The petitioners had an opportunity to fully present their case, but the counsel of the Missouri Pacific did not submit any testimony and did not show enough interest in the proceeding to remain throughout the hearing. Full hearing was had and briefs were filed. No allegation has been made that the case was not completely submitted. It is not alleged that the decision of the Commission is erroneous or that since the hearing evidence has been discovered which was not at that time known. It is not asked that some matter not previously presented or considered should be now brought to the attention of the Commission."

Relation Between Wheat and Flour Rates.

The Interstate Commerce Commission, in an opinion by Commissioner Prouty, has announced decision in the case of Howard Mills Co. vs. the Missouri Pacific and other carriers. The complainant alleged that the defendant carriers unduly discriminated against Kansas millers in favor of California millers by exacting rates for transportation of flour which were 10 cents greater per 100 lbs. than the rates for transportation of wheat from Wichita and other shipping points in Kansas to points in California known as "Pacific coast terminals," and also by exacting rates for transportation of flour which were 35 cents per 100 lbs. greater than the rates for transportation of wheat from these shipping points to Phoenix, Ariz. The Commission decides that the flour rates between the said shipping and destination points should not exceed the wheat rates by more than 7 cents per 100 lbs.

The Commission says that there is no inflexible requirement that rates on grain and the products of grain should be under all circumstances the same, but rather that carriers may, in just regard for their own interests or to meet special conditions, vary those rates within narrow limits. When, however, the relation has

been established, business developed and money expended on the strength of it, then the carrier cannot, in the absence of some sufficient reason, change that relation, nor would the Commission direct such a change.

Commodity Rates to Amarillo, Tex., Reduced.

In an opinion by Commissioner Prouty, the Commission has decided the case of Nobles Brothers Grocery Company and others against the Fort Worth & Denver City and others. It appears in this case that a certain defined territory in the northern part of Texas, commonly known as the Burnt district, takes from Kansas City and other Missouri river points lower rates than are made to the balance of the state, in recognition of greater proximity to these Texas points; the class rates from Kansas City to Fort Worth, representative of the Burnt district, are higher than from Kansas City to Amarillo (where complainant does business) though Amarillo is less than the average distance to the Burnt district; and that the Santa Fe is rebuilding its road to Amarillo, which will soon be situated on its main line. The Commission decides that the present class rates from Kansas City to Amarillo are unreasonable and unjust, and that the commodity rates between said points should not exceed those from Kansas City to Fort Worth; but that the class rates from St. Louis to Amarillo may properly be higher than from St. Louis to Fort Worth.

MANUFACTURING AND BUSINESS.

The Pittsburg Steel Company, Pittsburg, Pa., is to issue $4,000,000 first mortgage 6 per cent. bonds to pay for building at Monessen eight 60-ton open hearth furnaces, a blooming mill and three billet mills.

J. W. Williams has been appointed sales agent in southern states for the Carbon Steel Co., Pittsburg, Pa., with office at 426 Lincoln Trust building, St. Louis. Mr. Williams continues to represent Brown & Co., Inc., Pittsburg.

Solomon Ginsburg has been elected President of the New York Car Wheel Company, Buffalo, N. Y., succeeding Joseph H. Berry, deceased. W. G. Smith has been elected Vice-President and J. A. Venable, Secretary and Treasurer.

The Westinghouse Electric & Manufacturing Co., Pittsburg, Pa., has sold to Kuhn, Loeb & Co., New York, $6,000,000 three-year, 6 per cent. notes, dated August 1, 1907. They were issued to retire an issue of the same amount of 5 per cent. notes maturing August 1.

A special meeting of the stockholders of the Safety Car Heating & Lighting Company, New York, has been called for July 15 to act on a proposal to increase the capital stock from $5,000,000 to $10,000,000. The new stock is to be issued to present holders as a 100 per cent. stock dividend. The annual dividend rate has been 18 per cent. for the last two years.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad conventions and engineering societies, see advertising page 24.)

National Association of Railroad Commissioners.

The annual meeting of this organization is to be held at Washington, D. C., October 8, and not in the state of Washington, as had been announced.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Delaware, Lackawanna & Western.—The general offices in New York City have been moved to 90 West street.

Grand Trunk.—William Wainwright, General Assistant and Comptroller, has been elected Fourth Vice-President, with office at Montreal, succeeding F. H. McGuigan, who went to the Great Northern last March. Mr. Wainwright's former office has been abolished.

Randolph & Cumberland.—Ira A. McCormack, Assistant to the General Manager of the New York Central & Hudson River, has been elected President and General Manager of the Randolph & Cumberland, with office at New York.

Operating Officers.

Chicago, Rock Island & Pacific.—See Houston & Texas Central.

Delaware & Hudson.—C. E. McKim has been appointed Superintendent of Car Service, with office at Albany, N. Y.

Houston & Texas Central.—J. F. Sugrue, formerly Superintendent of the Chicago, Rock Island & Pacific at Dalhart, Tex., has been appointed Assistant Superintendent of the Houston & Texas Central at Ennis, Tex., succeeding D. Black, resigned.

Illinois Central.—Patrick Laden, Assistant to the Assistant Chief Engineer, has been appointed Superintendent at Mattoon, Ill., succeeding Otto Schilling, resigned.

Mexican Central.—A. F. Chreitzberg has been appointed Trainmaster at Gomez Palacio, Durango.

New York Central & Hudson River.—See Randolph & Cumberland under Executive, Financial and Legal Officers.

Norfolk & Western.—G. W. Merrell, Assistant to the General Superintendent, has been appointed Assistant to the General Manager, with special duties in connection with maintenance of way and accounts.

Southern Pacific.—A. B. Stickney has been appointed Superintendent of the San Joaquin division, with office at Bakersfield, Cal., succeeding W. H. Averell, promoted.

Texas & New Orleans.—D. T. Wacther, yardmaster at Beaumont, Tex., has been appointed Trainmaster, with office at Jacksonville, Tex., succeeding A. K. Frye, resigned.

Traffic Officers.

Buffalo, Rochester & Pittsburg.—R. W. Davis, General Freight Agent, has been appointed Freight Traffic Manager, with office at Rochester, N. Y. F. W. Bale succeeds Mr. Davis, with office at Rochester.

Colorado Southern, New Orleans & Pacific.—George A. Hill, Industrial Agent, has been assigned to other duties and his previous position has been abolished.

Philadelphia & Reading.—R. L. Russell, freight claim agent, has been appointed Assistant General Freight Agent in charge of through and export freight traffic, with office at Philadelphia, Pa., succeeding E. B. Crosley, who has been appointed Coal Freight Agent.

St. Joseph & Grand Island.—C. T. Hummer, city passenger agent and chief clerk to the General Freight and Passenger Agent, has been appointed to the new office of Assistant General Passenger Agent.

St. Louis & San Francisco.—W. R. Powe, Assistant General Freight Agent at Memphis, Tenn., has been appointed Chairman of the Southern Freight Classification Committee, with office at Atlanta, Ga., succeeding P. J. McGovern, deceased. E. T. Willcox, division freight agent at Birmingham, Ala., succeeds Mr. Powe.

Union Pacific.—W. S. Basinger has been appointed Assistant General Passenger Agent at Omaha, succeeding Gerritt Fort, resigned.

Wabash, Chester & Western.—W. S. Easton has been appointed General Freight and Passenger Agent, with office at Chester, Ill., succeeding C. E. Kingsbury, who remains Auditor.

Wheeling & Lake Erie.—H. S. Bradley, commercial agent at Pittsburg, has been appointed General Agent at Canton, Ohio, succeeding C. C. Wilson, transferred.

Engineering and Rolling Stock Officers.

Chicago, Burlington & Quincy.—William Baird has been appointed General Car Inspector of the lines west of the Missouri river, with office at Lincoln, Neb., succeeding E. S. Barstow.

Grand Trunk.—Joseph Hobson, Chief Engineer, has been appointed Consulting Engineer. Howard G. Kelley, Chief Engineer of the Iowa Central and of the Minneapolis & St. Louis, succeeds Mr. Hobson. William McNab, Assistant Engineer at Montreal, has been appointed Principal Assistant Engineer. The offices of all are at Montreal.

Illinois Central.—L. A. Downs, roadmaster at Chicago, has been appointed Assistant Chief Engineer of Maintenance of Way. See this company under Operating Officers.

Peoria & Eastern.—W. P. Feeley, Assistant Engineer, has resigned to go into other business.

LOCOMOTIVE BUILDING.

The Canadian Pacific, it is said, has decided to build 50 heavy freight locomotives.

The Pennsylvania Lines West, it is said, have decided to order five passenger locomotives and 45 freight locomotives.

The Iroquois Iron Company, Chicago, has ordered one saddle tank locomotive from the Baldwin Locomotive Works.

The Portland & Seattle denies being in the market for five switching locomotives, as reported in the *Railroad Gazette* of July 5.

CAR BUILDING.

The Illinois Traction Company, it is said, has recently ordered 10 cars from the American Car & Foundry Company.

The Missouri, Oklahoma & Gulf, as reported in the *Railroad Gazette* of July 5, has ordered 200 coal cars of 80,000 lbs. capacity from Barney & Smith.

The Rochester, Syracuse & Eastern has ordered, through J. G. White & Co., from the Niles Car & Manufacturing Company, 15 combination passenger and baggage cars and two express cars; each car has four 75 h.p. motors.

The Buffalo & Susquehanna has ordered, it is said, 500 steel gondolas of 100,000 lbs. capacity from the Pressed Steel Car Company, and is in the market for 1,000 additional steel gondolas, 200 box cars and 100 coke cars.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

ALASKA ROADS.—About 20 miles of railroad has been built by the Guggenheimer interests (American Smelting & Refining Company) from Catalla, Alaska, towards the Copper river district. Between 800 and 1,000 men, it is said, are at present building the line. At Catalla the company is building a breakwater, and it is also doing a large amount of bridge work near that place. A branch is to be built from a point about 18 miles from Catalla into the coal fields. M. K. Rodgers, of Seattle, Wash., is in charge of the work.

ATCHISON, TOPEKA & SANTA FE.—There are to be extensive improvements to the line through Wellington, Kan. Contracts for the work are to be let in a few days. About 150 miles of the line beginning at Cicero, a few miles north of Wellington, is to be rebuilt. It is thought that the contract for the work will be let to Bancroft & Doty, of Topeka, who offered to do it for $440,000.

BUCKHANNON & NORTHERN.—This company, which started grading about four years ago on a line from Bellington, W. Va., north to New Brownsville, in Monongahela county, about 60 miles, and suspended work some time ago, has recently started surveys and will resume work on the line. About 45 miles is graded. S. T. Brady, Parkersburg, W. Va., Chief Engineer. (March 15, p. 380.)

CAIRO TERMINAL TRACTION.—The Illinois Traction System, otherwise known as the McKinley Syndicate, has organized a company under this name with a capital of $500,000, and office at Cairo, Ill., to build an electric line from Cairo north about 20 miles to the northern boundary of Pulaski county. It is said the company intends to eventually extend the line north to a connection with the McKinley lines at St. Louis and East St. Louis, and to build other extensions to connect with electric lines in the southern part of Illinois. The incorporators include: L. E. Fisher, D. H. Sawyer, W. S. Dewey, B. F. Vogel and D. Hogan.

CANANEA, YAQUI RIVER & PACIFIC.—See Southern Pacific.

CANYON CITY & NORTHWESTERN.—Incorporated in Texas with a capital of $100,000 to build a line from Canyon City, Tex., northeast to Yarnell, in Carson County, about 36 miles. The general offices are at Canyon City. The incorporators include C. T. Ward, L. G. Conner, J. M. Black, W. F. Weller, R. W. O'Keefe, D. M. Stewart, all of Canyon City.

CAPE FEAR, SOUTHPORT & ATLANTIC.—Incorporated in North Carolina, with $1,000,000 capital and office at Southport, to build a line from Southport, N. C., west to the North Carolina state line, 40 miles; also from Southport north to Wilmington, 25 miles. The incorporators are A. J. Fahnestock, F. S. Pusey and C. F. Anck, of Philadelphia, Pa.

CARTHAGE RAILROAD.—See Randolph & Cumberland.

CHICAGO & ALTON.—The cut-off from Iles, Ill., to Murrayville, on the Kansas City division, 35 miles, is to be opened for traffic about August 1. See article on page 33.

CHICAGO, ROCK ISLAND & PACIFIC.—A contract is reported let by this company to John J. Fox, of Fort Worth, Tex., for ballasting work on lines in Texas.

CHICAGO SOUTHERN.—This road is to run from Chicago Heights, Ill., where it connects with the Chicago Terminal Transfer, south 114 miles to the Indiana state line, where it connects with the Southern Indiana, which runs to Terre Haute. Track has been laid for 11 miles from the state line north and for 65 miles from Chicago Heights south. It is said that work has been started toward completing the gap. Arrangements for the reorganization of the company's finances are well under way.

CHICAGO SUBWAY [illegible] & T[illegible] COMPANY.—[illegible] which was organized in 1904 and of which William [illegible] is President, [illegible] that it is going to take over the Arnold subway project for which plans were made by Bion J. Arnold. The company has applied to the city government for [illegible] to build a double-deck subway system, to consist of three north and south lines from the northern boundary of the city of Chicago to its southern boundary, and three west side lines from the central district to the western city limits. S. D. Gos[illegible], S. M. H[illegible] and John M. Ewen are interested.

DEFIANCE, HICKSVILLE & FORT WAYNE (ELECTRIC).—Incorporated in Ohio with $10,000 to build electric lines. The incorporators include W. E. Golding, H. C. Eplert, M. O. Topliff, E. E. Murphy and M. I. Brown.

FAIRMONT & MANNINGTON (ELECTRIC).—Contract is reported let to the Blodget Construction Company, of Wheeling, W. Va., by this company, which is being promoted by New York capitalists, to build an electric line from Fairmont, W. Va., west to Mannington, 15 miles.

LONG ISLAND.—Final consent having been obtained from the New York City Board of Estimate and Apportionment, work on the change of line of the Manhattan Beach line will begin at once. This work, being done under the direction of the Brooklyn Grade Crossing Commission, is part of the Bay Ridge improvement. It will remove, altogether, about 80 grade crossings on the Long Island Railroad between Bay Ridge and East New York, and between Manhattan Beach Junction and Manhattan Beach. The contract has been let to Walter H. Gahagan. Construction forces are ready and filling will begin at once. The Brighton Beach improvement, under direction of the Grade Crossing Commission, has been finished, so far as highway crossings are concerned. Two tracks are already in operation and the other two will probably be ready by autumn. It is estimated that it will take about a year for the Long Island Railroad's tracks to be laid on the new elevated grade. Work on the Bay Ridge line from the shore of the bay to East New York is being pushed to completion. At several points trains are already running on the new grade. (See Brooklyn Rapid Transit, March 15, p. 380.)

MEXICAN ROADS.—R. S. Towne, of New York, and associates are projecting a line from the city of Zacatecas, Mex., northwest to Durango, 250 miles. Mr. Towne is interested in the Mexican Northern and in the large smelter at San Luis Potosi.

MISSOURI, KANSAS & TEXAS.—This company, it is reported, is moving three miles of track between Ada and Konawa, Ind. T., from the Canadian river embankment to a new grade along the rock cliff. The work includes some new bridges at Tyrola. It will both shorten the line and eliminate danger from floods.

MORGANTOWN & KINGWOOD.—Local reports state that this road has finished the 20-mile extension to Rowlesburg. The line now extends from Morgantown, W. Va., southeast to Rowlesburg, 50 miles. (May 17, p. 695.)

NEW ORLEANS GREAT NORTHERN.—Track on the branch from Rio, La., northwest via Franklinton to Tylertown, Miss., 41 miles, has been laid, and it is expected that the branch will be put in operation this month.

NEW YORK CITY RAILWAY.—This company has begun the work of changing the First avenue horse car line from Fifty-ninth street north so that it can be operated by the underground trolley system. Later a similar change is to be made below Fifty-ninth street.

OMAHA, LINCOLN & BEATRICE (ELECTRIC).—Work, it is said, is to be resumed on this line, building from Omaha, Neb., southwest to Lincoln, 56 miles. About 14 miles is finished. E. C. Hurd, General Manager, Lincoln.

ONTARIO ROADS (ELECTRIC).—Plans, it is said, are under way to build an electric line from Fort Francis, Ont., southwest, about 150 miles to Duluth, Minn. W. H. Elliott, of Fort Francis, and other local capitalists are interested.

PENSACOLA, ALABAMA & GEORGIA.—Application has been made in Florida by a company under this name to build a line from Pensacola, Fla., northeast to Andalusia, La., 75 miles. The project is being promoted by residents of Pensacola, and is supposed locally to be backed by the Central of Georgia.

RANDOLPH & CUMBERLAND.—This company, operating the old Carthage Railroad from Cameron, N. C., northwest to Hallison, 18 miles, is planning to extend the road southeast to Southport, 216 miles. (March 15, p. 390.)

SACRAMENTO VALLEY & EASTERN.—This company, it is said, has finished 10 miles of road between a point on the Southern Pacific near Kennet, Cal., and the works of the Bully Hill Copper Company at De Lamar. When finished the road will be 18 miles long. (March 15, p. 391.)

Shawnee Central.—This company, recently incorporated in Oklahoma with $10,000,000 capital and office at Shawnee, has surveys made and rights of way secured for about 50 miles on its proposed line from Shawnee, Okla., east to Muskogee, Ind. T., about 90 miles. Contracts for the work, it is said, will shortly be let. J. M. Aydelotte, President, and F. H. Peckham, Chief Engineer, Shawnee, Okla. (May 31, p. 760.)

Sikeston & Southeastern.—An officer writes that contracts will be let this fall for building this proposed line from Sikeston, Mo., north via East Prairie to Hickman, about 30 miles. A. J. Matthews, President, Sikeston, and J. E. Warner, Chief Engineer, Benton.

Southern Indiana.—See Chicago Southern.

Southern Pacific.—The Mexican Engineering & Construction Company of Mexico City has a contract for building the first 32 miles of road of the Cananea, Yaqui River & Pacific west from Orendain, Mex. Connection is to be made with the Mexican Central at Orendain.

Spokane & Inland Empire (Electric).—This company, which recently opened its line from Spokane, Wash., south as far as Oakesdale, announces that the road, originally intended to be built only as far as Moscow, Idaho, is to be extended further south to Lewiston.

Utica & Mohawk Valley (Electric).—Announcement is reported made by General Manager C. Loomis Allen that an electric road is to be built from Rome, N. Y., to Oneida. The necessary franchises have been obtained, and the work will be started as soon as financial arrangements can be made.

Valley River.—Incorporated in West Virginia with $50,000 capital to build a line from Mill Creek, W. Va., southwest to Clovercreek, Va., about 40 miles. The office of the company is at Mill Creek. The incorporators include: J. G. Huffman, Jr., and F. C. Huffman, of Wheeling, W. Va.; N. Heuch and W. A. Donnell, of York, Pa., and L. E. Schull, of Mill Creek.

Western & Atlantic.—Application has been made to the state legislature for permission to extend the terminals of this company at Chattanooga, Tenn., to the Tennessee river.

RAILROAD CORPORATION NEWS.

Atlanta, Birmingham & Atlantic.—N. W. Harris & Co., New York and Boston, are offering at a price to yield 6⅜ per cent. $1,720,000 5 per cent. equipment trust notes dated July, 1907, and falling due in 20 equal semi-annual instalments beginning January 1, 1908. The bonds are secured on 1,200 coal cars, 500 box cars, 300 flat cars, 30 cabooses and 25 locomotives costing approximately $2,145,000.

Baltimore, Chesapeake & Atlantic.—A semi-annual dividend of 2 per cent. on the $1,500,000 cumulative 5 per cent. preferred stock has been declared. The annual rate was 2 per cent. in 1905 and 3 per cent. in 1906.

Baltimore & Ohio.—See Washington Terminal Company.

Boston & Lowell.—The Massachusetts Railroad Commission has approved an issue of $250,000 stock of this company to reimburse the Boston & Maine for improvements and additions. The new stock, which will make $6,849,400 outstanding, being the total authorized issue, will be sold at public auction for not less than par value.

Boston & Maine.—See Boston & Lowell.

Buffalo & Susquehanna.—N. W. Harris & Co., New York and Boston, are offering, at a price to yield 6 per cent., $540,000 5 per cent. equipment bonds, series "B" dated April 1, 1907, and falling due in 20 semi-annual instalments beginning October 1, 1907. The bonds are secured on 500 steel gondolas, four passenger cars, two combination passenger and baggage cars and five consolidation locomotives costing about $640,000.

Chicago & Eastern Illinois.—Speyer & Co., New York, have agreed to underwrite $3,085,000 general consolidated and first mortgage, 5 per cent. bonds of 1937, which are to be issued to retire $2,376,800 first mortgage, 6 per cent. bonds maturing next December and $150,000 first mortgage, 7 per cent. bonds of the Indiana Block Coal Railroad, maturing next July. The general consolidated and first mortgage bonds are part of an authorized issue of $30,000,000, of which $16,583,000 is already outstanding. The present issue is part of $6,403,000 reserved to retire prior lien bonds.

Chicago, Peoria & St. Louis.—The January 1 interest on the 2,000,000 consolidated mortgage 5 per cent. 30-year bonds was paid on June 25. The payment of the preceding semi-annual interest was similarly delayed.

Chicago, Rock Island & El Paso.—See El Paso & Southwestern.

Chicago Southern.—The July 1 interest on the $4,000,000 two-year, 5 per cent. notes has been paid. About 75 per cent. of the issue has been deposited with the Girard Trust Company of Philadelphia under the terms of the plan for exchanging them for their par value in first mortgage, 5 per cent., 30-year, together with 25 per cent. par value of common stock of the Southern Indiana, which is owned by the same interests. See construction column.

Denver City Tramway Company.—See Denver, North-Western & Pacific.

Denver, North-Western & Pacific.—The President of this company is said to have sold his holdings in the Denver City Tramway Company to Eastern interests, including D. C. Clark and W. L. Bull, of New York, and Marsden J. Perry, Benjamin A. Jackson and Samuel M. Colt, of Providence, R. I. The proceeds of the sale are to be used toward paying for the completion of the D., N-W., & P.

El Paso & Southwestern.—It is understood that this company has taken over the Chicago, Rock Island & El Paso line from Santa Rosa to Tucumcari, 59 miles.

Mexican Central.—Some of the income bondholders, including Alexander Morton, of London, and certain New York bankers, have demanded an examination of the books of the company in order to find out the amount of income properly applicable to interest payment on these securities. There are three classes of income bonds, aggregating $32,179,900 outstanding, on which no interest has been paid for 15 years. See National Railways of Mexico.

National Lines of Mexico.—See National Railways of Mexico.

National Railways of Mexico.—This is the name of the company in which the National Lines of Mexico and the Mexican Central are to be merged. It will have $30,000,000 4 per cent. non-cumulative preferred, $125,000,000 5 per cent. non-cumulative second preferred and $75,000,000 common stock. The common and second preferred are to share equally in dividends after the regular dividends on both first and second preferred have been paid. There are to be issued $231,000,000 4½ per cent. preferred mortgage bonds and $186,000,000 4 per cent. general mortgage bonds. The principal and interest of the last named securities are to be guaranteed by the government. The terms on which these securities are to be exchanged for old securities are not yet announced. A syndicate headed by Ladenburg, Thalmann & Co., New York, has been formed to bring out the bonds. The Mexican Central has outstanding $59,454,300 stock and $142,173,000 bonds and notes, and the National Lines of Mexico have $93,403,000 stock and $96,029,000 bonds and notes. The Mexican Central has about 3,350 miles of road and the National Lines about 3,500. The Tehuantepec National is not included in the merger.

Philadelphia, Baltimore & Washington.—See Washington Terminal Company.

Southern Indiana.—See Chicago Southern.

Topeka & Northwestern.—This company, which built 38 miles of the cut-off on the main line of the Union Pacific from Menoken, Kan., to Marysville, 70 miles, has made a mortgage securing $6,000,000 6 per cent. bonds of 1957. It is understood that the bonds are to be turned over to the Union Pacific in payment of the cost of the cut-off.

Union Pacific.—See Topeka & Northwestern.

United Railways Investment Company.—At a meeting to be held July 23, the stockholders are to be asked to authorize the issue of $3,000,000 three-year, 6 per cent. notes and the acquisition of the $1,000,000 ten-year, 5 per cent. notes of the United Railroads of San Francisco.

United Railroads of San Francisco.—See United Railways Investment Company.

Wabash.—The directors have declared an interest payment of 6 per cent. on the $3,500,000 debenture "A" 6 per cent. bonds and 1 per cent. on the $26,500,000 debenture "B" non-cumulative 6 per cent. bonds. No interest had been paid on the debenture "A's" since July, 1904, and no interest had ever been paid on the debenture "B's." The plan for retiring both classes of debentures was agreed on last December. (Dec. 28, 1906, p. 184.)

Washington (D. C.) Terminal Company.—Brown Bros. & Co. have bought $1,575,000 two-year 5 per cent. notes to be dated August 1, 1907. They are secured on $2,000,000 first mortgage 4 per cent. bonds of 1945, and are guaranteed principal and interest by the Baltimore & Ohio and the Philadelphia, Baltimore & Washington.

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS.

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CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.

ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns our own opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

OFFICERS.—In accordance with the law of the state of New York, the following statement is made of the office of publication, at 83 Fulton St., New York, N.Y., and the names of the officers and editors of The Railroad Gazette

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CONTENTS

Vol. XLIII., No. 3. Friday, July 19, 1907.

The report of the demise of the freight car clearing house and pooling experiment appears to be "greatly exaggerated." The Alton has decided to withdraw and the St. Paul has not been a supporter for some time, but the other roads do not seem to have yet lost courage. Nevertheless it was not reasonably to be expected that even the most limited car pool would succeed at the first attempt, or the second. Such an arrangement has all the disadvantages of a gentleman's agreement on the one hand and of an unwieldly machine on the other. A Mallett compound locomotive with 40-ft. boiler tubes and eight groups of drivers would be simpler. The mere expense of keeping the necessary records, with or without the attempt at an actual or modified pool, staggers the railroad officer who is not farsighted and bold. Freight car records have always been trouble breeders. No car accounting scheme ever supplanted another by a strong vote; it has always been carried by arguments which on slight provocation would reverse themselves. Some roads are now declaring that any equalization of cars as between different roads must be given up because under the present Federal law it becomes illegal. This argument is useful as talk, but, we believe, as talk only. The Interstate Commerce Commission has taken uniformly sensible views on economical use of freight cars and can be depended on to block any arbitrary or narrow construction of the law. The silver lining to this car pool cloud is the fact that nothing can hinder any road from hunting up its own cars, nor from taking proper measures against those who misuse them. A pool might be five years in getting successfully under way, but in five months with a sufficient force of tracing agents a single road could make a long stride toward reform, provided it were not itself too big a sinner.

Mr. Wilgus' resignation from the New York Central has something more than personal interest to those who have watched the development of railroad officers to meet the peculiar demands of exacting modern conditions. The day of the grand old man of keen, observant eye and a memory for the face and name and personal quality of every division officer and of most foremen is long past. Time was when the science of railroading was crude, when the appliances and uses of power were few, when the loads were light and the speeds were low, and when memory, rules of the thumb and stern but parental watchfulness of subordinates were the only requirements for the man who ran the road. We need those men now to maintain discipline, but with the use of electricity, compressed air and oil, as well as steam; with many safety appliances making speed, weight, shorter space intervals and luxurious comfort possible and necessary; with decreasing rates and increasing costs; with trade union, socialistic and governmental domination; with these, the satisfactory officer at the head of a department of a great railroad must be an earnest student and must become a scholar with full knowledge of the sciences involved in his administration, and, of equal importance, of character and with a judgment of men. Mr. Wilgus is simply one of this modern type and it happens that his field of usefulness has been that of designing engineer. But the requirements of this age must develop the same type of scholarly, devoted men in the operating, traffic and financial departments. The "scholarly" officer need never to have seen the walls of a university, but he must have an insatiable appetite for facts which pertain to his work, and keep busy in digesting them. A man cannot operate successfully a machine which he does not thoroughly understand, and it is becoming more and more plain that the ideal officer in charge of operating, contracting for transportation, or financing a great modern railroad must be capable of a thorough understanding of its locomotive and electric power, its signals, track and structures, their uses and limitations; and this with an ability to train and judge subordinates. A livery stable or a stage route has in its management some of the problems of a great railroad with electric terminals, but these problems vary in size and difficulty.

W. F. M. Goss has resigned as Dean of the Engineering Schools of Purdue University to become Dean of the College of Engineering of the University of Illinois. His name has long been identified with Purdue University, but his fame comes rather from his services to railroad science and his help to motive power officers. His going will be a loss to Purdue and a gain to the University of Illinois, but his wide field of influence among railroad officers will not be narrowed. He will have equal opportunities in his new position to continue the work by which he has become so well known in the past. Railroad officers, particularly those of the motive power department, all over the world are familiar with his work in investigating the problems of the locomotive. It was he who conceived

the idea of a stationary locomotive testing plant and who, after a number of years of patient waiting and planning, saw the first plant wiped out by fire almost before any experiments with it had been made. He was not discouraged and soon had another and better experimental plant with a large modern locomotive ready for testing. The results of his investigations during the last ten years have made great changes in locomotive design. Perhaps more than to any other man he may be given the credit for inspiring the monumental work of the Pennsylvania Railroad in building its own elaborate locomotive testing plant for the St. Louis exposition, work in which is now continued in a permanent and progressive way at Altoona. The experimental work at Purdue under Prof. Goss has not been confined entirely to the locomotive, however. Largely through his efforts the Master Car Builders' Association built and installed there its brake-shoe testing machine, its drop testing machine for couplers and axles and its air-brake test rack. His boys, his old students, will all feel a sense of personal loss when he leaves the post where he was so long their friend and counselor.

ELEMENTARY ESSENTIALS IN RAILS.

The railroads are not asking for the impossible when they demand rails that are tough and strong and hard enough to stand a reasonable amount of wear under heavy wheel loads. They want rails made of sound homogeneous steel free from segregation and pipes, toughened and hardened by proper physical and heat treatment during rolling and not by simply increasing the hardening elements, carbon and phosphorus and then passing the metal at too high a heat through the rolls. High carbon and phosphorus make hard rails—which break because they are brittle—and the method costs nothing. Because this gets wearing qualities under present methods of rolling, these hardening elements have been gradually increased to beyond the danger point. It takes more time to roll rails thoroughly at a low temperature and reduces the output a little.

The lower the temperature to which steel is worked the finer the structure and the greater the hardness and toughness. If the work stops at a high temperature the steel in cooling assumes a coarse crystalline structure, and becomes brittle. On the other hand, if the rolling or forging is continued until the steel cools down to the so-called "critical temperature," about 1,600 deg. Fahr., the fine, strong texture produced by the physical work is retained on further cooling, and a hard, tough steel is produced. With rapid and continuous rolling the finishing temperature is therefore a good indication of the amount and efficiency of the work done on the rails. Kept low enough it insures that the steel has been thoroughly worked under the best conditions, and that in cooling it will not deteriorate. It is not practical to work too close to the critical temperature, but it is easily possible to finish rails at much lower temperatures than at present employed.

The method of checking the finishing temperature almost universally used is to measure the shrinkage in a rail length from the time it leaves the last pass until it cools completely. It is an accurate thermometer. The committee of the American Society for Testing Materials recommends "a shrinkage allowance at the hot saws for a 30-ft. rail of 100-lbs. section, of 6 11/16 in., and 1/16 in. less for each 5-lb. decrease of section. These allowances to be decreased at the rate of .01 in. for each second of time elapsed between the rails leaving the finishing rolls and being sawn." This is a more liberal allowance than was made a few years ago, when we got good rails, and it does not unduly limit the mill's tonnage. The limit to be placed on the shrinkage allowance is a matter to be agreed on, but it should be much lower than it now is in any specifications in force.

While the chemical requirements are important they need not be defined too closely or insisted upon too strongly. Given the proper heat treatment and sufficient work in the rolls the rails will be hard enough, even though the chemical composition of the steel varies widely. The greatest danger from bad chemical composition is in making brittle rails due to too much phosphorus and carbon. To guard against brittle rails the drop test, if properly conducted, is a sufficient check. It is not enough, however, to make a drop test from every third heat or every fifth heat of steel. There are inevitable variations in the action of the Bessemer converter and these variations may be sudden and extreme. One heat may make good rails, and the next heat bad rails. Nor should there be any provision for retest of heats which fail under the drop. If the test rail fails it is reasonable to suppose that other rails in the same heat may be weak and dangerous to put in track. Dr. C. B. Dudley, in a recent address, said:

> "If a shipment made under specifications has been tested and does not fill the requirements, all of the material covered by the test should be rejected. None of the specifications of the Pennsylvania Railroad provide for a second or third sampling in corresponding tests. Our theory is that the material ought all to be of the grade called for by the specifications. One sample then is as good as 50. If a specification is so severe that only two-thirds of well-made material will stand test, the specification should be changed. On the other hand, if a manufacturer can only make a product, two-thirds of which will stand test, he should either learn how to improve his product, or go out of business."

Rail specifications then to meet present needs resolves itself into firm insistence on three points; sufficient discard from the top of the ingot to give sound homogeneous steel, limiting the shrinkage to insure low finishing temperature and adequate physical work during rolling and a drop test made frequently enough and severe enough to detect brittle rails. These features of the specification the railroads have a right to determine for themselves, always, of course, within reasonable limits; but it is a fact that rails furnished to American railroads during the past four years have not been made to specification—this with possibly a few exceptions. Orders with specifications as to quality have been refused during these flush times. Quality has deteriorated, sacrificed to increased output and increased profits. The conditions are changing. Orders are now solicited, but orders are held back in the hope that the publicity given to bad manufacturing may result in a decent regard for the rights of the railroads and the people who use the railroads.

MEXICAN GOVERNMENT RAILROAD HIGH FINANCE.

The principal railroads of Mexico are shortly to be consolidated in one great system under control of the national government. Complete plans of the merger have not yet been made public, but certain facts have lately been reported from the city of Mexico. The National Railways of Mexico, the new company, is to include, with the exception of the Tehuantepec National and the Vera Cruz & Pacific, the various railroads in which the government has a controlling interest, amounting in all to nearly 7,000 miles of line. The new company is to be capitalized at $230,000,000 in stock, of which $30,000,000 is first preferred, $125,000,000 second preferred and $75,000,000 common stock. Bonds are to be limited to a maximum of $417,000,000, of which $231,000,000 are to be preferred mortgage 4½ per cent. bonds, and the remaining $186,000,000, 4 per cent. general (second) mortgage bonds, the latter guaranteed principal and interest by the Mexican government. This makes a total capitalization (stock and bonds) of $647,000,000.

The railroad development of Mexico has been different from that of the United States, in that it has been by north and south rather than by east and west lines. To be sure the first railroad in Mexico, the old Mexican Railway—the most important, by the way, of the lines still independent of government control—was built to carry an existing traffic between Vera Cruz, the principal seaport, on the east coast, and Mexico City, the capital. But even to this day, owing to the difficulties of crossing the Sierra Madre range which runs parallel to and not far from the west coast, with the exception of the Tehuantepec National, which crosses the narrow isthmus at the southern extremity of the republic, there is no east and west line in operation across the country from coast to coast. The two most important railroads, the Mexican Central and the National of Mexico, connect points on the United States boundary with the capital city. These roads were so built because the principal mountain ranges of Mexico run north and south, and because the promoters of these roads were men from the United States who looked to the interchange of traffic between the two countries as the principal source of future profit.

Up to 1880, the Mexican government made no effort to encourage railroad building. Up to nearly that time the uncertainties of Mexican politics made railroad construction especially difficult and expensive through the exactions of the party which happened to be in power. The cost of the Mexican Railway, the only road built previous to 1880, was estimated by A. M. Wellington to have been doubled by such means. In 1887, Porfirio Diaz, then 47 years old, was first elected President of the republic. Ever since that time he has been in power, directly or indirectly. He brought order out of disorder because of his success in developing the material welfare of the country. In particular he realized the efficacy of railroads in uniting the political and upbuilding the commercial interests of the nation. In 1880, three years after his election, a law was passed which, while expressly reserving the right of gov-

ernment regulation, provided for government subsidies and other favors to new railroads. Most of the railroads of Mexico were built under this law. It was superseded in 1899 by a new law which amplified the old one and also made possible more efficient methods of railroad operation, in particular by legalizing pooling arrangements and prohibiting construction of unnecessary parallel lines. It also provided that all railroads built under succeeding concessions should revert to the government at the end of 99 years. This law therefore marked a strengthening of the railroad policy of the government.

In 1903 it was rumored that interests allied with the Standard Oil group of capitalists in this country, who already had a large interest in the Mexican Central, were about to acquire the National and consolidate the two roads. The government thereupon bought control of the National of Mexico, thus preventing the threatened merger. It also secured the Mexican International and the Interoceanic of Mexico, two small but important roads. These three roads were more or less formally combined under the title National Lines of Mexico. Although the government held virtual control, it did not undertake the actual management, which was left largely in charge of the other owners. In other words, this was not government operation or strictly even government ownership, but simply government control by stock ownership.

Last December it was announced that the government had bought securities of the Mexican Central sufficient for control, and was planning to consolidate that road with the National Lines. The three main arguments for this consolidation were summed up as follows by Minister of Finance Limantour to the Mexican Congress: First, to avoid friction between competing lines; second, to prevent absorption of the Mexican Central by one of the great railroad systems of the United States, and, third, because of the prospect of realizing economies through consolidation.

The first reason is shown by the accompanying remarks of the Minister to refer particularly to the inequalities of a situation in which it is to the interest of the national government to favor one of two competing roads at the expense of the other. A concrete instance is the concession granted to the National Lines soon after their acquisition by the government, allowing them and them only to build new railroads across a stretch of territory about 30 miles wide on the south bank of the Rio Grande, thus preventing the Mexican Central from building a projected cut-off to give it a shorter route for international traffic than its present roundabout route via El Paso. It does not seem as if this could have been an important reason from the government's point of view because the hardship falls, not on the government's own road, but on its competitor. But there is another possible reason for this desire to avoid competition. The Mexican Central is heavily over-capitalized. It has about $100,000,000 in mortgage bonds and collateral trust notes falling due within four years. It is by no means certain that the road, left independent, could have come through this trying financial period without a receivership. Hence with the Mexican Central independent there was the possibility of the government system's having to face the ruinous competition of a bankrupt road.

The second reason is probably the one which was most important in bringing about the acquisition of the Mexican Central. The strong federal government of Mexico has for some time looked with alarm at the prospect of having its principal railroads controlled in the United States. Yet to prevent the reported absorption of the Central by a United States system, the government has undertaken the very consolidation which three years earlier it entered upon its large policy of railroad ownership to prevent, and has brought to an end the useful competition in railroad rates and service which it then attempted to preserve.

The third reason, the economies of consolidated management, though actually important, probably was incidental. There is no doubt, however, that there are many economies to be gained, particularly in centralization of management and more economical routing of through traffic.

Not only has the Mexican government in making this consolidation adopted the very principle which it was unwilling to see established under private ownership in Mexico, and at which it looked askance as carried out in the United States, namely, consolidation of parallel and competing lines, but in the formation of the merger it has followed still other methods evolved by American railroad financiers. As already mentioned, the stock capitalization of the new company is $230,000,000. Considering the consolidated system to have 7,000 miles of line—in reality it has a little less than that—this is at the rate of $32,857 stock per mile. The total bond issue of $417,000,000 similarly works out at $59,571 bonds per mile. This is a total of $[illegible] per mile, comprising [illegible] of the bonds are to be issued at once or sold to refund outstanding issues. The present capitalization of the Mexican Central, National of Mexico, Mexican International and Interoceanic of Mexico together is about $21,[illegible] stock and $[illegible],000 bonds per mile.

Even though the new funded debt per mile be no heavier than at present, the new company would have a total capital (stock and bonds) of $[illegible] per mile. The average stock and bond capitalization of all United States railroads is $66,583. But, in Mexico, of the less than 7,000 miles of line included in the merger, 1,315 miles are narrow gage, and, furthermore, maintenance expenditures on standard and narrow gage alike have been much lower than the average on United States roads, with the resultant fact that the Mexican roads are reported to be in great need of repairs and improvements. The figures for the United States, on the other hand, cover, with unimportant exceptions, standard gage railroads, many of them with large amounts of second, third and in some cases fourth track, and with exceedingly valuable terminals. More than this, the typical United States railroad has of late years, instead of holding back on maintenance expenditures, been appropriating large sums out of earnings for betterments and improvements. It is obvious therefore that even the probable minimum capitalization of the National Railways of Mexico is very high, in comparison with the present value of the roads. It is to be observed further that the maximum proposed bond issue of the consolidated company is 80 per cent. larger per mile than the existing bond issues of the separate companies. A part of the bonds, however, are no doubt to be reserved for betterments and additions to existing lines and acquisition of other roads which may sooner or later come under control of the government. The explanation given by the Minister of the $230,000,000 of stock capitalization is that the issue is large in order to give the government control of a majority of the shares, their value being a matter of secondary consideration; in other words, that part of the stock is issued for purposes of control only.

The National Railways of Mexico in short is a splendid example of the modern highly capitalized holding company. It has all the elements of that institution as developed during the last few years in the United States. A number of properties, most of them already capitalized at an amount far exceeding their actual value, are merged in a central company which issues its securities in exchange, in amounts not only large enough to repeat the overcapitalization of the constituent units and to cover the economies of consolidation, but to provide for all the growth which can at best be expected for many years in the future. The operation appears to be on a par with the Chicago & Alton reorganization and the formation of the Rock Island Company. The striking and original thing about it is that it is being carried out by the government of the country in which the consolidated properties are situated; this at the very time that the United States government is considering the advisability of trying to break up similar mergers. It is only natural to wonder whether the evil effects of such "high finance" methods, as recognized in the United States, will appear when such a consolidation is carried out by a government. What effect, for instance, will the existence of $200,000,000 second preferred and common stock, part of which will be in the hands of the public, have on railroad rates in Mexico? When it is argued by American railroad officers that capitalization has no effect on rates, the existence of competition is always given as proof of the assertion. But in Mexico there will be no competition to overrule the natural incentive to pay dividends on all outstanding stock. This is only one of the interesting questions for the future brought up by the recent railroad policy of the Mexican government.

NEW PUBLICATIONS.

American Street Railway Investments. Issued in connection with the Street Railway Journal. 1907 edition: 462 pages, 9½x12¾ in.; cloth; price, $5.00. The McGraw Publishing Co., 114 Liberty Street, New York.

The current volume contains the usual full statistical data about street railways in the United States, giving a brief statement of the history, capitalization, earnings, expenses and traffic statistics of each company together with a statement of plant and equipment, a list of officers and a date for the information about each company. The book is illustrated this year with 44 maps and covers the reports of more than 1,400 operating and controlled companies in the United States and Canada. In the beginning of the book, compilations are made as in previous years of companies arranged in groups according to their gross earnings, and it is interesting to note that in the 1906 fiscal year there were 63 companies which earned over $1,000,000 each, as against 53 companies in 1905. The

five companies having the largest earnings in 1906, as in 1905, were the Interborough Rapid Transit Company of New York, which earned $20,411,097; the New York City Railway Company, which earned $19,092,385; the Brooklyn Rapid Transit Company, $18,797,264; the Philadelphia Rapid Transit Company, $17,676,249, and the Boston Elevated, $13,634,612. There were also two other companies which earned more than $10,000,000 in 1906, the Pittsburg Railways Company and the Chicago Union Traction Company. In all, there were 15 companies which earned more than $5,000,000 in 1906, as against 14 in 1905. There were 20 companies which earned over $4,000,000, as against 16 in 1905, and 29 companies which earned over $3,000,000, as against 22 in 1905. There were 44 companies which earned between $500,000 and $1,000,000, 184 companies which earned more than $100,000 and less than $500,000, and 190 companies which earned less than $100,000. The most interesting part of the showing is that decreases were practically nonexistent, while each of the groups showed a very substantial gain over 1905; thus the gain of the companies in group one, having gross receipts of over $1,000,000, was 16 per cent. in 1906 over 1905; the gain in group two, having gross receipts between $500,000 and $1,000,000, was over 31 per cent.; that of the third group, having receipts between $100,000 and $500,000, was over 24 per cent., and the gain of the group having gross receipts between $50,000 and $100,000 was 29 per cent. This is probably the best argument that could possibly be given for the stability of American street railway enterprises.

CONTRIBUTIONS

A Radical Change in Rail Design.

68 William St., New York, July 10, 1907.

To the Editor of the Railroad Gazette:

It seems to us that the present is the time for a radical change in design of rails. It must be evident to any engineer that the design of a section for use on a railroad with heavy rolling stock and good roadbed calls for a different distribution of material from that required by a new road with much lighter cars and locomotives and poorer permanent way.

Railroad engineers have heretofore been limited in their designs by the ability or unwillingness of the rolling mills to produce other than standard sections. The introduction of very broad flanged beams as rolled on the Grey Universal Mill has opened up new possibilities, and we would suggest that railroad engineers should design new rail sections, which in their judgment are most suitable for the different divisions of their roads, and in so designing cut loose from all preconceived ideas as to what, in their minds, it is possible for the rolling mills to produce and simply show what would be ideal for their conditions. There is no necessity to retain any of the old characteristics, height (area of head, web and flange), and widths need not be restricted to measurements approximating those heretofore in use; all that need be considered is what is most desirable for their own individual purposes. The effort to standardize various weights of rails and induce railroads to use such, regardless of their climatic and other conditions, has brought about unsatisfactory results. The railroad man defers to the rail-maker, instead of the latter endeavoring to meet the views of the former. The railroad engineer should design his section and the rolling mill should roll, as near to his requirements as their outfit will allow. It should not be that the rail-maker tells the railroad what it will give and the railroad engineer has to accept. This has been the condition and the results have been disastrous. The situation needs a thorough overhauling, and it is up to the railroad engineer to show what he would like to have without regard to what he has had to use. If he wants higher rails and wider flanges, this need not mean heavier rails. If the railroad first determines what is ideal, it is then up to the rail-maker to see how near he can come to producing such ideal. We are convinced that better service can be obtained by changing the method of rolling rails. We are also of the opinion that the time is ripe for changing the whole plan of railroad permanent way. The wooden tie is a costly relic of bygone days, and a relic which costs untold millions to perpetuate. The rail as now designed has two separate and distinct functions calling for two diametrically opposing qualities, one to resist the positive bending moments, resulting from the wheel loads, and the other to resist the abrasion and crushing effect of heavy and repeated wheel pressures. The first requirement might be satisfied by a permanent section of structure which would support for its entire length the frictional resisting section, which must be so carried as to allow its being quickly replaced when worn sufficiently to call for removal. By having one section for the load-bearing medium and another for the frictional resisting medium two separate qualities of steel can be used, and each can be so graded as to meet the requirements for which it is designed.

Railroads are in a rut and no one seems disposed to get out of it. Why should they continue to demand from the rail-maker what he cannot make, or rather, what he has so far failed to satisfactorily supply—namely, a single bar of steel which has at the same time the maximum wearing qualities and the highest efficiency of load-bearing characteristics? If they have one bar suited for one function and another for the other function and each designed both as to shape and quality to best serve its individual purpose, they will get better service, cheaper renewals and greater safety. The time is ripe for getting out of the rut and for dispensing with both the wooden tie and the old T-rail, the former necessitating almost continuous renewals and the latter necessitating the renewal of not only the part that is worn out by reason of oft-repeated heavy wheel contact pressure, but also that part which is designed to transmit such wheel loads to the roadbed.

Henry Grey & Son,
Consulting Engineers.

The Block-Signal and Train-Control Board.

This is the title of the board which has been appointed by the Interstate Commerce Commission under the acts passed by the last two sessions of Congress, to investigate and report on the subject of automatic stops and other questions connected with block signaling. The members of the board are: Professor Mortimer E. Cooley, Dean of the Department of Engineering, University of Michigan, chairman; Azel Ames, Jr., Signal Engineer, Electric Zone of the New York Central; Frank G. Ewald, Consulting Engineer of the Illinois State Railroad Commission, and B. B. Adams, Associate Editor of the *Railroad Gazette*.

The immediate purpose in establishing this board appears to have been to give suitable publicity to the present "state of the art" of automatic apparatus for stopping trains, as called for in the communication which was sent to Congress by the Interstate Commerce Commission on January 3 last, wherein the commission advised Congress that it was credibly informed that such devices had been sufficiently perfected to justify the government in testing them. The clause in the appropriation bill which authorizes the commission to expend money in this direction was, however, drawn so as to cover not only the investigating and testing of automatic stops, but also investigation in regard to the use of and necessity for block signals on railroads. The functions of the new board will, therefore, include the examination of any or all of the subjects which were dealt with in the report on the block system which was made to Congress by the commission last February (*Railroad Gazette*, Vol. 42, pages 277, 479, 507 and 544). That report, it will be remembered, spoke of the need of further investigation of signaling under the following four heads:

(1) The telegraph block system on the larger roads (mainly double track) as regards the personnel and the routine, the use or non-use of distant signals, and the practice of permissive block signaling.

(2) The telegraph block system on single track lines and minor roads as regards the personnel, the routine, distant signals and permissive signaling, and also as regards the use of time rules and despatchers' orders to make up for incompleteness in the block signaling arrangements.

(3) The automatic block system should be investigated on all roads with respect to the efficiency of the apparatus and of the methods of inspection and care and the integrity of the records of signal operations in respect to their completeness.

(4) The automatic block system on single track lines should be investigated with respect to the features named in the foregoing paragraph, and also as regards the use simultaneously with the block signals of despatchers' orders and other measures designed to prevent collisions irrespective of the block signal system.

Prof. Cooley, who is appointed chairman of the board, was graduated from the United States Naval Academy in 1878, but resigned from the service in 1885, since which time he has held the chair of Mechanical Engineer in the University of Michigan. Prof. Cooley made a valuation of the physical property of the railroads of Michigan ordered by the legislature in connection with taxation a few years ago, and has done other similar work for that state. Last year he was employed by the city of Chicago in connection with the valuation of the street railroads of that city, and he was one of the authors of the valuable report on that subject which was noticed in the *Railroad Gazette* of December 28, 1906, page 567.

Captain Ames is a graduate of the Massachusetts Institute of Technology and was an officer in the engineering corps of the United States army during the Spanish-American war. He was Supervisor of Track on the Hudson division of the New York Central, then Signal Engineer of the Boston & Albany, and subsequently of the Lake Shore & Michigan Southern before being promoted to his present place.

Frank G. Ewald has been Consulting Engineer of the Illinois Railroad and Warehouse Commission for the past ten years, prior to which he was employed by the city of Chicago in charge of tunnel work for the water system of that city. Before that he was employed in the engineering department of the Atchison, Topeka & Santa Fe.

B. B. Adams has for 20 years been one of the editors of the *Railroad Gazette*. He has had long experience in railroad work and is the author of "The Block System." He was for two years Secre-

tary of the Railway Signal Association. He has had charge of the preparation of the accident bulletins of the Commission for the past five years, and, with Mr. C. C. Anthony, performed the technical work in connection with the block signal report which the Commission made to Congress last winter.

W. P. Borland, Secretary of the Board, is a railroad man of long experience who has been employed by the Commission for the past five years.

The headquarters of the board will be at the office of the commission in Washington, and the Secretary is Mr. W. P. Borland. The commission has requested the co-operation of the American Railway Association in the conduct of any tests which may be made and the signal committee of the association, in response to this request, has appointed a sub-committee to take up the matter consisting of Messrs. F. C. Rice (C., B. & Q.), A. M. Schoyer (Pennsylvania Lines); W. G. Besler (C. of N. J.), A. T. Dice (P. & R.), E. C. Carter (C. & N.-W.), and H. C. Moon (L. S. & M. S.).

New Passenger Station at Evansville for the Evansville & Terre Haute.

The Evansville & Terre Haute Railroad has begun work on a new station at Evansville, Ind., on the site of the old one at the corner of Eighth and Main streets. In order to put the waiting room in the most convenient relation to the tracks, the station building will front on Eighth street and be built across the ends of the tracks. The [illegible] of the building [illegible] street, the distance from the [illegible] of the building to any track is as short as could be secured. The [illegible] distance from the property line in order to give plenty of room for vehicles in Eighth street.

The main waiting room is at the center of the building with the ticket office, baggage office, smoking room and women's waiting room around it. The [illegible] room is at the [illegible] end of the building at the corner of Main and Eighth streets, and opens off the waiting room. The sizes of these rooms are as follows: Waiting room, 50 ft. square; ticket office, 17 ft. x 11 ft.; smoking room, 19 ft. x 16 ft.; women's room, 19 ft. x 19 ft.; lunch room, 20 ft. x 20 ft.

Between the main building and the track [illegible] is a passenger concourse 25 ft. wide and 166 ft. long. The baggage room opens directly on this concourse on the track side, and the concourse has an exit porch on Main street. This latter gives direct communication between the concourse and the street so that passengers do not have to pass through the main building—a convenient and effective arrangement, especially when there are large crowds. The concourse entrance porch has a marquise, so that passengers arriving at or leaving the station by carriage or motor need not be exposed to the weather.

Express, mail and baggage are received and delivered by teams in a special courtyard on the Main street side, separated from the street by a brick wall. The baggage, mail and express, therefore, will be handled with the utmost convenience, out of sight of

Proposed Station at Evansville, Ind., for the Evansville & Terre Haute.

the public and in such a way as not to conflict in any way with the passenger service.

Besides the rooms on the first floor of the station already mentioned, there is a room at the east end, 40 ft. x 47 ft., for the general freight agent. The second and third floors, each with an area of 12,000 sq. ft., will be used for the general offices of the company.

The style of the exterior of the building is that of a freely interpreted classic on Colonial lines. There are round-headed windows below and an unbroken frieze formed by the windows of the third story, this frieze running around the whole building below the heavily overhanging roof. The main body of the wall surface will be red brick with stone trimmings. The frieze of the windows will match the stone in color and the roof will be of gray-green tile which contrast well with the red of the wall surface. In order to make the buildings most easy of access the front and back of the waiting room open out through three large doorways toward the street and toward the concourse respectively. This triple entrance on Eighth street is marked by monumental stone columns. In adopting the classic forms, the overhanging roof and the colorings mentioned, the idea was to produce a building which would be in sympathy with the architectural traditions of the South.

The auxiliary building for baggage, mail and express will be across the passenger concourse from the station building, 63 ft. long,

General Plan of Evansville Station.

one-story high, and parallel to the tracks. The five tracks will be protected by a train shed, and beyond this there will be umbrella sheds for unusually long trains. To avoid smoke and dirt, the heating plant will be placed under the nearby freight house.

The architects for the station are D. H. Burnham & Co., Chicago. The principal contract was let to August Ohm, Terre Haute, Ind. It is expected to have the station ready for service in the fall.

The Interstate Commerce Commission's Report on the Harriman Investigation.

The report of the Interstate Commerce Commission on the investigation into combinations of carriers' generally known as the "Harriman inquiry" was made public on July 14. After summing up the expansion of the Harriman system and influence and reviewing the reorganization of the Chicago & Alton, which is said to be "rich in illustrations of various methods of indefensible financing," by a syndicate in which Mr. Harriman was one of the members, the Commission sums up as follows:

A.—The effect of the control of the Southern Pacific by the Union Pacific has been to unify and amalgamate the management of these two railroad companies and their steamship lines and to eliminate competition between them in transcontinental business and in business to and from Oriental ports.

B.—The Union Pacific, as has been shown, controls the San Pedro, Los Angeles & Salt Lake, the stock of which is deposited in the hands of a trustee. This line was originally intended as an independent road, extending from Salt Lake, where it connects with the Union Pacific and with the Denver & Rio Grande, to Los Angeles and San Pedro, Cal. There is therefore no competition between this line and the Union Pacific and Southern Pacific.

C.—It appears that the Union Pacific also owns $10,000,000 par value of the stock of the Atchison, Topeka & Santa Fe, and about $30,000,000 more is owned by individuals connected with the Union Pacific, making $40,000,000, or substantially 17 per cent. of the entire capital stock of the Santa Fe company. Who owns this stock outside of the $10,000,000 Mr. Harriman declined to state. Two directors of the Union Pacific are also directors of the Santa Fe company, and there is now a division of the Oriental traffic by the Pacific Mail Steamship Company between the Union Pacific and the Santa Fe systems. It appears that there has also been a division of the fruit traffic between certain California territory and the East, each taking a certain percentage, and that north of San Francisco the Union Pacific and the Santa Fe have joined and amalgamated their interests in the Northwestern Pacific Railroad and that a joint control has been inaugurated similar to that of the Chicago & Alton.

D.—Prior to the acquisition of the Southern Pacific by the Union Pacific the Denver & Rio Grande system, extending from Denver, where it connects with various lines to the east, to Salt Lake and Ogden, was given equal facilities over the Central Pacific, and thereby practically formed another transcontinental line. Since the amalgamation of the Union Pacific and Southern Pacific and the construction of the San Pedro road this line has been denied equal facilities in the receipt and transportation of freight over the Central Pacific and the San Pedro lines. Its business, therefore, has decreased, and its ability to compete with the Union Pacific and Southern Pacific impaired. On this account the Gould lines are aiding the construction of another line from Ogden to San Francisco.

E.—The joint control of the Chicago & Alton by the Union Pacific and the Chicago, Rock Island & Pacific has undoubtedly eliminated competition between the Alton and the Rock Island between Chicago, St. Louis and Kansas City.

F.—These are conspicuous illustrations of the development of the theory of "community of interest" and "harmony of management," which Mr. Harriman suggested when he demanded representation upon the Santa Fe board.

G. If the policy of purchasing and controlling stocks in competing lines is permitted to continue, it must mean suppression of competition.

The Commission concludes by making the following three recommendations:

First—The function of a railroad corporation should be confined to the furnishing of transportation. Railroads should not be permitted to invest generally in the stocks, bonds and securities of other railroad and of steamship companies, except connecting lines, for the purpose of forming through routes of transportation, including branches and feeders. It is in the interest of the public to facilitate the consolidation of connecting lines.

The credit of a railroad company is founded upon the resources and prosperity of the country through which it runs. Its surplus funds and credit should be used for the betterment of its lines and in extensions and branches to develop the country contiguous to it. The testimony taken upon this hearing shows that about 50,000 square miles of territory in the state of Oregon, surrounded by the lines of the Oregon Short Line Railroad Company, the Oregon Railroad & Navigation Company, and the Southern Pacific Company, is not developed; while the funds of those companies which could be used for that purpose are being invested in stocks like the New York Central and other lines having only a remote relation to the territory in which the Union Pacific system is located.

Railroad securities should be safe and conservative investments for the people. To this end the risks of the railroad should be reduced to a minimum. Everyone knows that railroad securities fluctuate more or less, according to the prosperity of the times, and also by reason of the wide speculation in such securities. It, therefore, adds an element of hazard to a railroad's capital and credit to have its funds invested in the stocks of other companies, thereby endangering its solvency and its ability to pay reasonable dividends upon its own capital stock. It is a serious menace to the financial condition of the country to have large railroad systems fail to meet their obligations or go into the hands of receivers, and the object of legislation and administration should be to lessen the risks of railroad investments.

Second—It is contrary to public policy as well as unlawful, for railroads to acquire control of parallel and competing lines. This policy is expressed in the Federal laws and in the Constitutions and laws of nearly every state in the Union. We have examined the Constitutions and laws of all the states, and find in about 40 of them prohibitions against consolidation of capital stock or franchises of competing railroads, of the purchase and acquisition by a railroad of competing lines. Competition between railroads as well as between other industries is the established policy of the Nation. And while the acquisition of a small minority of the stock of a competing line might not decrease the competition, yet the acquisition of any considerable amount of stock, with representation on the Board of Directors of such railroad, unquestionably has the effect of diminishing competition and lessening to that extent its effectiveness. So long as it is the policy of the General Government and of the states to maintain competition between naturally competing lines, the ownership of any stock by one railroad in a competing railroad should not be permitted, and such lines of railroad should be prohibited from having any common directors or officers.

Third—The time has come when some reasonable regulation should be imposed upon the issuance of securities by railroads engaged in interstate commerce. We are aware that in the construction of new lines of railroad, developing new territory, as it has been necessary in many instances to sell railroad securities at large discount, and to sell bonds with stock bonuses, and even in such cases it has many times been difficult to raise the necessary capital. Men will not invest their money and take the risk for small rates of interest.

But this principle does not apply to old established railroad systems having good credit. Such railroads should be prevented from inflating their securities for merely speculative purposes. Railroads should be encouraged to extend their systems and develop the country. It is of the utmost importance also that railroad securities should be safe and conservative investments for the public, and should yield good and ample return for the money invested. Reasonable regulation will tend to make them safer and more secure investments, and thereby benefit not only the railroad companies but the public.

Socialism and the Railroads.*

BY COL. H. G. PROUT.

We stand face to face with a situation in our national life of great gravity. We are at this moment in full movement of an historical epoch of deep significance to us as individuals, to our nation and to the human race. The situation which I have in mind is created by the attitude of the American people toward aggregations of capital. Great individual fortunes, corporations, trusts so-called, any devices by which a few men can control large amounts of money, have become objects of suspicion and of active hostility to a great part of our fellow citizens.

AN HISTORICAL PARALLEL.

The situation has a close historical parallel in the French Revolution. Then the sense of injustice became intolerable and the plain people cut off the heads of the king and the nobles and burned their palaces and confiscated their lands. The Texas editor who wants us to hang the bankers would have sent his thrifty neighbors to the guillotine if he had lived in France in 1793. Will the resentment of the mass of the American people go as far as to destroy great property values, to impoverish those who have been so wicked as to make a little money and to invest it in the securities of productive enterprises? They have begun the process without knowing what they are doing. Will they go on with it?

This is the most solemn question that has confronted this nation since the Civil War. If we stand aside and allow the answer to the question to be determined by that great class of politicians

*An address delivered before the Traffic Club of Pittsburg.

and editors who try to sit on the top of the wave of popular feeling and drift with it, in the hope of being landed high and dry on some sunny slope of personal prosperity; if, I say, we allow the answer to this solemn question to be determined by that selfish and irresponsible class we deserve the calamity that will no doubt overtake us.

I have tried briefly to state in general terms, the situation now before this nation. Let us try to bring it a little nearer home. Let us see how it especially affects the railroads. I speak as a railroad man, because I have got most of my living from the railroads, and for years I have been a friendly and sympathetic student and observer. Some folks say I have been a partisan of the railroads.

The attitude of the people of the United States toward the railroads of the United States is one of the strangest social phenomena within my observation or reading. Consider for a moment what the railroads have done in the history of this nation. The building of the United States was the most colossal real estate enterprise the world ever saw or ever dreamed of. Nothing like it can ever happen again; nothing approaching it. It would be impossible to estimate the value of the part played by the railroads in this real estate operation which we call the building of the nation. It would be almost impossible to overstate it. With pride and with amazement I think of the enterprise, the courage, the genius of the men who risked reputation and fortune in pushing railroads over the uninhabited lands or the thinly peopled areas of our country in the second and third quarters of the century just closed. Those were the heroic days when men had dreams and saw visions. Those were the glorious days of the youth of the nation. States and counties and towns stood and beckoned to the railroad builders, and gave them franchises and rights of way and local bonds. That is why to-day a four-track railroad runs trains at sixty miles an hour over a street crossing at grade through a great city. It is not because the railroad man is depraved or reckless, but because the pioneers said, "Come, help us build the city; help us to get rich"; and the men and women of this land and of England and of Holland, who had saved up a little money, ventured their savings in this colossal speculation, lost their savings very often, and made it possible to build us the cities to cover our continent with a network of railroads.

RAILROADS AND THE PUBLIC.

It is not strange that under the conditions of our railroad building unwise things and wicked things were sometimes done. We are all foolish and wicked, more or less, and the measure of our folly and of our sin is largely a question of opportunity and of the moral atmosphere in which we live. The building of the railroads and of the cities and of the villages of this continent, the building up of the great industries in steel and oil, in packing and in milling gave abundant opportunities, and the builders did not have very much time to stop and think. It was not strange that indiscretions should have been committed in finance and in the relations of the railroads to the traders and the manufacturers of the nation. It is not strange that certain somewhat crude notions should have been established as to the correct relations of railroads to society.

Twenty years ago last March the Interstate Commerce act went into effect. At that time most railroad officers took a very simple view of their obligations toward the public. It was commonly held that a railroad belonged to its stockholders; that the stockholders had put their money into the property and were responsible for its debts; that the duty of the hired man, viz., the president, the vice-president, the general manager, the traffic manager, the division superintendent, and so on down, that the duty of this hired man was to make money for the stockholders, to enable them to pay interest on the bonds, to eventually clear off the debts resting upon the property, and to gradually increase the value of the equities in that property. In brief, the general view taken was that a railroad property should be managed just as a mill is managed, or a dry goods store, or any other large property. It was held by the thoughtful railroad man of twenty years ago that the relations of the railroads to the public would be properly established and maintained through the action of enlightened selfishness. It was believed that in the long run the interests of the railroads and of the public were the same; that the railroad's officers would appreciate this fact, and that the public would appreciate this fact, and that just and harmonious relations would work themselves out exactly as they do in all other human affairs. My instincts and my habits of thought tempt me to still believe that to be the sound view of the relations of the railroad to society; but in the twenty years that have elapsed since the Interstate Commerce act went into effect there has been a great change in the public conception of what we may call the political economy of railroads, and there has been an important change in the minds of a considerable number of railroad officers. This change has come about very largely through the incessant discussion of railroad matters that has been stimulated by the constant activities of the Interstate Commerce Commission.

RAILROADS AND THE GOVERNMENT.

The notion has now become very prominent that the railroads are not to be treated as private properties, but as public institutions at least as much public institutions. A great number of our fellow citizens, including therein many of the most intelligent railroad officers, now believe that railroad affairs should be subjected to Government control. I should say that a majority of our fellow citizens believe this. The question of difference is simply as to the degree of control that the States or the Federal Government are permitted to exercise. Personally, although I am a Republican in politics, in political economy I am a Democrat of the old school and I have a thoroughgoing and fundamental belief in the doctrine that the Government is best which governs least. I contemplate with dread an enlargement of the functions of Government and particularly the invasion of the field of railroad control by the officers of the State and Federal Governments. But I recognize that control of the railroads by the various governments within our country is bound to be tried on a very considerable scale. I still believe that it will fail, except in some broad and simple way; but I am quite sure that we shall go through a good many years of experiment with railroad control. This theory of the control of railroads is only one manifestation of the wave of socialism which is sweeping over the country and which has one of its principal fountains in the White House. It is the oncoming of that great wave which alarms me for the future of our country, and which has such special menace for those who are responsible for the prosperity of the railroads.

I have spoken of the attitude of our people toward the railroads as a strange phenomenon. This is true when you think of the part which the railroads have had in building the country, and when you think further of the part that the railroads play in our daily life. Outside of agriculture, railroading is the most important industry in the country. It employs more men than any other industry except agriculture. It pays out about eight hundred and fifty millions of dollars a year in wages, being 60 per cent. of the total operating expenses. It pays in dividends $238,000,000. The wages and taxes paid by the railroads amount to nearly four times as much as the dividends paid on railroad stock; in fact, the dividend payments amount to only about three and six-tenths per cent. on the stock; ten years ago the dividends paid amounted to but one and seven-tenths per cent. A little more than 37 per cent. of all the railroad stock of the country pays no dividends. Ten years ago about 70 per cent. of the railroad stock of the country paid no dividends. These few figures give a notion of what the prosperity of the railroads means to the working people and to the manufacturers and traders of the country, and they give us a notion also of the really very small returns which railroad properties make to their owners.

IMPORTANCE OF RAILROADS.

I shall not trouble you with any recital of the well-known figures of ton-miles and passenger-miles by which we measure the public service of railroads, but I will call your attention to the fact that there is not a human being in our nation, there is hardly a civilized human being in the world, whose life is not every moment affected by the railroads of the United States. The prosperity and the happiness of every man, woman and child in the civilized world depends more or less on the prompt, cheap and regular movement of freight over the railroads of the United States. Here in the United States, the prompt, cheap and regular movement of freight is, excepting the crops, the most important element in our daily happiness and in our continued prosperity. The appreciation of this fact is one important element in the intense popular feeling against the railroads.

But people do not know how light is the burden of the transportation tax. They do not know that we have the cheapest freight rates in the world and the best freight service. They do not know that the free play of commercial forces uncontrolled by governments has given us a flexibility and an adaptation of rates and service such as no other country has ever seen. They do not stop to think that an eight-cent loaf of bread has paid one-third of a cent for transportation from the wheat fields of Dakota to the freight station in New York; that is, one twenty-fourth of its cost to the consumer is transportation tax. They do not stop to think that a mechanic, working one day, earns enough to pay for the transportation from Chicago to Liverpool of his food for one year. A long time ago Abram S. Hewitt said that Sir Henry Bessemer was the great apostle of Democracy, that he had done more than any other one man to destroy the power in Great Britain of the privileged classes. He meant that Bessemer's discoveries and inventions had reduced the cost of transportation and so brought down the cost of living and enabled the poor man to cut himself loose from the soil of the little parish or county in which he had been reared. Cheap transportation had opened up to the poor man the markets of the world from which to draw his food and clothes, and had given to him the markets of the world in which to sell his labor.

These are elementary facts that I am reciting, but it is well for us to get back now and then to elementary facts, in order that

we may see our way more clearly through the complex conditions that surround our daily lives.

RAILROADS MUST HAVE MONEY.

If the railroads are going to continue to do their part in the further development of our country and in the further progress toward liberty, happiness and prosperity of all the people of the earth, it is obvious that they must not be hampered or crippled. This principle applies to their administration and to their financial credit. That their administration may be the most efficient, the freest play must be given to the operation of the great elements of ambition, energy and enterprise; and that they may be able to finance their future requirements, their credit must be sustained. You will remember that Mr. Hill has lately said that the money requirements of the railroads of the United States to meet the natural demand of our growing population will be about eleven hundred million dollars a year for five years. Mr. Loree, a clear-headed man with a gift for analysis, has lately told me that he had gone through his own estimate, independently of Mr. Hill, and had arrived at nine hundred million dollars a year as the natural requirements of the railroads.

RAILROADS MISREPRESENTED.

I have already told you that the railroads of the United States are paying now only about two hundred and thirty-eight millions a year in dividends, and that over 37 per cent. of railroad stock pays no dividends, and that ten years ago 70 per cent. paid no dividends. It is obvious that they cannot earn the money to extend and improve road and equipment to meet the proper requirements of our people. Where are they to get it?

I shall not stop here to consider the debated and debatable question as to who is the most powerful in destroying the credit of the railroads—the financier who represents what the President calls predatory wealth, or the President himself as representing the wrath of the people. I merely point out that at this moment the railroads are between the devil and the deep sea; and, further, that anything which cripples the railroads is a calamity of the first magnitude for the nation.

It is a national misfortune that the railroads are so generally and systematically misrepresented in the public press. Fair discussion, discussion in the spirit of justice and truth, is almost never seen in the daily newspaper treatment of railroad matters, whether it be of accidents, of freight rates, of passenger rates, of whatever may be the subject under discussion. The consequences of this attitude are most serious. Indeed, I go so far as to say that the malicious wrecks that have occurred lately should be charged to the editorial offices of the daily newspapers. By those newspapers the railroads are treated as outlaws. People of feeble reasoning powers and of emotional temperament are easily led to think that it is proper to attack an outlaw in any way that amuses them or gratifies their hatred or envy.

That predatory wealth of which the President is so fond of talking has really very little to do with the policy of the railroads of the country in general. Perhaps the President himself would be surprised to know how little, although I am inclined to think that he does know, and that he says more than he really believes, as a part of his general scheme of keeping the Republicans in power and keeping the Democrats out of power. It has been suggested that when Bryan went in swimming the President stole his clothes and ran off with them. At any rate, the President has maneuvered Bryan and his followers out of all their really strong positions.

PREDATORY WEALTH AND RAILROADS.

But predatory wealth has very little to do with the policy and conduct of the railroads. You know and I know that the great mass of the owners of the railroads are honest and law-abiding citizens. You know and I know that the directors and administrative officers of the railroads are just like the rest of us—no better and no worse. In intelligence and executive capacity they rank high, because they are disciplined in an exacting school, and they are selected because of their capacity to carry responsibility. In moral character they are probably above rather than below the average. The assumption that they are scheming to cheat their neighbors, that they are trying to contrive ways to annoy their patrons, that they are indifferent and incompetent in practical operation of their railroads, would sound childish if it were not so serious and so far-reaching in its consequences.

Of course, we know that wrong things are done by railroad officers. We have heard, for instance, a great deal about rebates; but if we reflect, we discover that rebates are not new, simply they have been made illegal. We know that they have been used for years, and even for generations, as a means of building up communities and industries along lines of railroads. Probably, in the primitive times many of those railroad managers who granted rebates thought that they were doing a correct and public-spirited thing. Unfortunately, correct notions about these matters are almost never presented in the daily press. It is unfortunate, too, that there are so few men having exact information and correct judgment on these matters who have time and disposition to write or speak for the education of the public. In that respect the death of Mr. Samuel Spencer was a great loss to the railroads. He was one of the few railroad officers of high rank and of great experience who had the faculty of analysis, and clear, simple and attractive presentation, and, who, joined to that faculty, had the consciousness that it was his duty toward the railroads and toward the public to speak and write on the social science of railroads, as opportunity offered.

I am afraid that what I have been saying sounds a good deal like the Lamentations of Jeremiah; and I am afraid that, like Jeremiah, I can suggest no very practicable and easy way of bettering the conditions that I have tried briefly to put before you. Some things do appear to me, however, as being quite practicable and useful.

BUILD UP CORRECT PUBLIC OPINION.

It seems to me that it is a duty of the officers of the railroad companies, and those who are closely related to railroad companies, and who have means of special information, to try to build up correct public opinion. This some of us can do by talk with our neighbors; some of us by occasionally writing for publication here and there; some of us by an occasional public speech; some of us by direct personal contact with our Senators and Representatives in Congress and the members of our State Legislatures. It seems to me that this is an obvious and neglected duty that all of us can perform, and, in the aggregate, with a good deal of profit, and it is a duty, not to the railroads alone, but to the nation.

Beyond this, there is a good deal that every railroad man can do in his daily business life. Much of the public feeling against railroads has its root in little disagreeable things in the relations between subordinate officers and employees and the public. Quite a number of years ago it became my duty to spend three or four weeks among the railroads in England. As I was coming away, I went to say good-by to the general manager of the Great Northern Railway, to whom I was under obligations for courtesies. I told him that I had been running about in yards and stations and railroad warehouses and a lot of places where I had no business to go, that I had practically lived on the railroads for three weeks, and that, from the time when I set my foot on the British Islands until the moment of leaving, I had not had an uncivil word or act from any British railroad servant. This did not seem a very surprising thing to the general manager, but it was a very rare and surprising thing to me. In our own country it is the exception to get civility from the minor officials and employees. Every time that a man buys a ticket he runs the risk of more or less gross incivility. It would be hard for us to overestimate the accumulated influence of the display of bad manners toward the public, so characteristic of the minor officials of the railroads of our country. I have not the slightest doubt that this has been an influence of very great importance in creating the widespread hostility of which we see so many signs and which is expressing itself now in costly and disastrous legislation.

CLAIM DEPARTMENT OBSTRUCTION.

I wonder how many of you ever thought of the relation between the claim department and hostile legislation. To the outsider, it seems as if the claim department of a railroad was a highly efficient organization for obstruction. The desire to ascertain the truth and to help the shipper, or the consignee, or the person who has suffered damage or injury, to get justice, is apparently no part of the duty of the claim department. Of course, I am aware of the fact that the railroads must protect themselves against swindling claims; but I do protest that it is contrary to the instincts of the Anglo-Saxon to be considered a swindler until he proves himself an honest man. Do you wonder, when you think of these things, that the great, self-respecting, proud American public, with a keen sense of its own rights and dignity, should resent that sort of treatment?

I told you at the outset that I consider myself a railroad man, and that I speak with the greatest friendliness; in fact, these little matters of discourtesy, injustice and arrogance slide off from me like water off a duck's back, because I know that the men who do these things do not properly represent the gentlemen above them, and it has been one of my principles of conduct to try to cultivate a sense of humor and not give undue importance to little things. But I have ventured to remind you of these little things by way of showing you one way in which you can help your railroads and your country, namely, by incessantly instilling in the minds of your subordinates the prime duties of courtesy, patience and fair mindedness in dealing with the public.

The railroad ticket tax imposed a year ago by the German Empire was estimated to produce about 24,000,000 marks the first year. The Secretary of the Treasury recently announced that the prospect is that only about 12,000,000 marks will be realized by it. The diversion of travel from the higher to the lower classes has been greater than was estimated.

New Top-Mast Motor Signal.

The General Electric Company, Schenectady, N. Y., is now bringing out after a long and severe test under all weather conditions a new two-position electric motor signal of the top-mast type, similar in outward appearance to its three-position signal, with which the reader is familiar. This signal, shown in Figs. 1 and 2, and known as the M-113, embodies several new and interesting mechanical and electrical features.

Figure 3 is a back view of the signal mechanism in the position corresponding to the proceed indication of the blade. The supporting frame of this mechanism, carrying the bearings for the shaft and gearing, also forms the case, which is weather proof. The bottom of the case *A* forms a socket by which it is secured to the top of the mast, and inside this socket is a removable insulating bushing *B* which eliminates possibility of grounding, even if the wiring comes in contact with the case or an insulation is broken down. A similar socket *C* is provided at the top of the case to hold the pinnacle, or for an extension of the mast, in case one or more signals are to be placed above it.

The form of the case is such that, with a suitable bracket (*D*) for supporting the lamp, any of the present standard semaphore spectacles may be used. The whole external design presents a symmetrical and graceful appearance. The motor is similar to that used in the other type of the General Electric Company's signals, except that it is provided with both series (*E*) and shunt (*F*) field winding, and with a ball ratchet to prevent backward rotation of the armature. The object of this modification is explained below.

The high speed gear and the motor pinion are protected by a case attached to the inside of the frame, while the intermediate

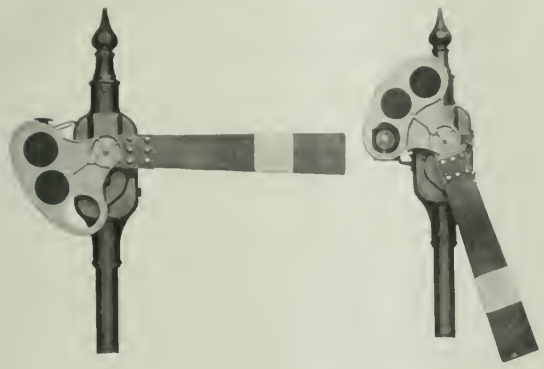


Fig. 1. *Fig.* 2.

General Electric Top Mast Signal.

gear and its pinion are protected by a gear case made of a single piece and bolted to the outside of the frame, with which it makes a weather-proof joint. To the face of the main gear *G* are attached driving pins of case-hardened steel, which move the signal from stop to proceed position by engagement with the pawl *H* of the slot-arm. The slot-arm *J* is mounted on a squared portion of the signal shaft by means of a broached hole in its hub, and carries a magnet *K*, the armature *L* of which is attached to one end of a bell crank lever, which by a pawl at its other end engages with the driving pins whenever the slot-magnet is energized. The series coil of the slot-magnet is connected in the motor circuit, and the shunt or high resistance coil is connected outside of the control contacts which break the motor circuit. Current is carried to the slot-magnet without the use of flexible moving wires, segmental collector rings and brushes being employed as in other G. E. signals.

On the signal shaft, directly back of the main gear, is mounted an eccentric *M*. The strap of this eccentric is cast in one piece with the cylinder of the dash-pot, or buffer, *N*. In front and also connected to the main shaft is a counting device *O* for registering the number of signal movements.

When the signal circuit is closed, current will flow through the shunt coil of the slot-magnet, and in another circuit through its series coil, and thence through the motor control sector *P* and its contact fingers *Q* to the motor. The slot-magnet being energized, the pawl *H* is held in the path of the driving pins, and as the motor revolves one of these pins is forced against the pawl, thereby turning the slot-arm and the signal shaft to which it is connected, thus carrying the signal arm toward the proceed position. When the arm of the signal comes almost to its extreme "proceed" position, the motor current is broken by means of the controller *P*, but this breaking of the current does not arrest the movement of the signal, for the inertia of the revolving armature and other parts keeps it going. While the armature is thus driven by its own inertia it becomes a generator, maintaining the field excitation. Immediately after the current between the motor and the battery is broken, a low resistance circuit is closed between the motor brushes, thus converting the armature into a powerful magnetic brake to arrest further movement of the signal. As soon as the motor stops the ball ratchet above mentioned prevents any backward rotation of the armature and the signal is thus held in its clear position until the main circuit between the signal and the battery is opened. The circuit-closer for electric brake control is shown in the cut at *R*. At *S* are a number of fingers for extra circuits. The glass cover of the compartment is shown removed at *T*.

It will be understood that the higher the voltage of the battery and the less the friction of the machine the armature will be the speed of the motor at the time the battery current is cut off, and the greater will be the inertia of the moving parts. It is also evident that the greater the speed of the motor the higher will be the E. M. F. generated in its armature, and the greater will be the

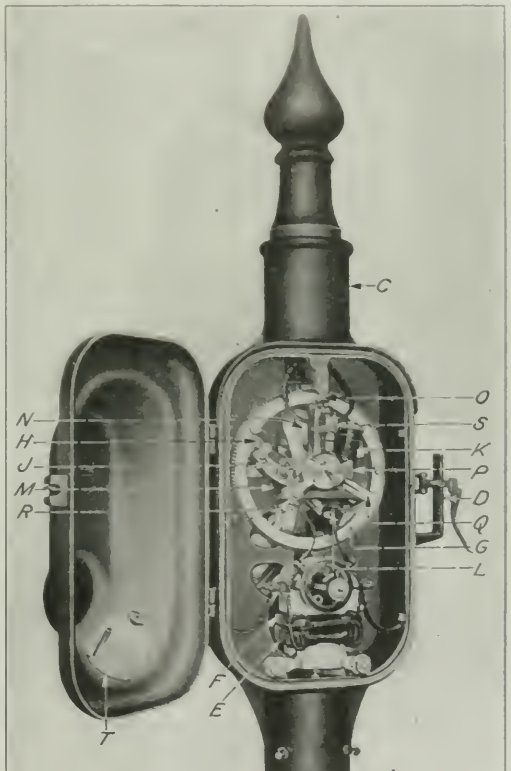


Fig. 3—General Electric Company's Top-Mast Semaphore Mechanism.

current opposing its forward movement when it is acting as a generator. Therefore the motor will make approximately the same number of revolutions after its current is broken, stopping the signal arm at the same position under all conditions; so that a friction brake is not needed.

When the main signal circuit is opened and the slot-magnet de-energized, its heavy armature falls away from the poles, this movement being also assisted by the pressure of the driving pins against the pawl. The pawl being thrown back from engagement with the driving pin, the signal is free to assume the position to which it is normally carried by gravity. As the signal arm comes to its stop position, the rotation of the slot-arm causes its armature to swing back against the poles of the magnet, so that it is in position to be held firmly in place when current is again applied.

While this signal was specially designed for use in two positions only, it can be operated as a three-position signal when an extra circuit controller is used, and a back contact provided on the line relay. When used as a three-position signal, and when indi-

cating a train backing into the section of track for which the signal gives distant indications, the arm will go from proceed to stop before assuming the caution position. Where such a movement is not objectionable this signal is applicable.

The design of this signal is such that all parts are readily accessible, and they are easily removed from the case, when necessary. The motor and other parts are readily reversible to provide for moving the signal either up or down from the horizontal position.

Progress in the Philippines.

The following are quotations from an interview, published in the *Journal of Commerce*, with Charles A. Conant, one of the directors of the Manila Railway, a New Jersey corporation, through which the Speyer syndicate is building new railroads in the Philippines. The Manila Railway has taken over the Manila & Dagupan, the only steam railroad now in operation in the islands. In regard to the proposed extensions of the Manila Railway, Mr. Conant said:

About 428 miles of new line will be built on the island of Luzon. The existing line, which was opened some 14 years ago with English capital, runs for about 120 miles from the outskirts of Manila to Dagupan, almost due north, and also includes 88 miles of branches. It is now proposed to extend this line some 35 miles farther north to San Fernando de la Union, and to build a number of spurs and branches connecting with Manila the principal towns of the western part of the island. There will also be a detached line of considerable length built at Albay Province, the southeast peninsula of Luzon, which will connect with the steamship line and open up territory which could be reached only by a very circuitous route if it were all rail from Manila.

The railroad receives no grants of money or property, directly or indirectly, in connection with this construction. The United States Congress authorized the Government of the Philippine Islands to guarantee 4 per cent. interest for 30 years on bonds issued for the construction of lines in the Philippines. The Philippine Commission advertised for bids under this law, and bids for construction with guaranteed bonds were accepted for certain detached lines in some of the other islands. In the island of Luzon, however, the Manila Railway was so firmly established that it was not easy for any rival syndicate to cut the ground from under its feet, even with Government aid. Mr. Speyer, therefore, after offering to build some aided lines in connection with others which were to be unaided, decided finally to ask simply for franchise rights for the proposed extensions, without asking any financial aid from the Government. He felt that under such a grant the railroad would have greater freedom in choosing its routes and conducting its operations, and that with entire responsibility for its finances it would not be tempted to enter upon projects which did not commend themselves to its own engineers.

The Manila Railway originally received a subsidy from the Government. There is a curious story about that. The Spanish Government was so eager to encourage railroad building that they provided in the charter of the Manila Railway for a regular annual payment of interest on a part of the cost of construction. Such payments were suspended by the American Government. An effort was made to set up the claim that it was not a continuing obligation of the governing power, since the sovereignty had changed hands. It is doubtful if the courts would have sustained the repudiation of an official contract on this ground alone; but it was contended that the road had allowed its tracks and rolling stock to be used by the insurgents, and especially for carrying on trade, in violation of the orders made against trading with provinces which were in revolt. The railroad, on the other hand, put in a claim for heavy damages to its property and loss of revenue by the seizure and use of its cars and locomotives for Government purposes. While the road had large claims against the Government under these heads, there was a clause in the original contract which might have hampered the road materially if it continued to grow. This was a stipulation that when the gross receipts exceeded a certain amount a large payment was to be made into the public treasury. The road has been so successfully conducted since the insurrection terminated in 1901 that considerable amounts have accrued under this obligation to the Government. Thus there was a condition of claims and counterclaims. The railroad cut the Gordian knot by renouncing all claims against the Government in return for a renunciation by the Government of its claim to a share in the earnings of the road. The road, however, will pay into the public treasury a percentage of its gross receipts. This percentage will increase at fixed dates.

The extension of the railroad is the one step needed to put the islands on the high road to commercial prosperity. We have become so accustomed to railroads that we hardly realize their economic importance. They not only open up new sources of production, but they afford a safeguard against starvation in times of uneven crops and protection against political revolution, which are very important. A railroad corrects the variability of the crops by permitting the surplus product of one province to be taken to another where the crop may have failed. Millions of lives have been saved in British India through this one fact. In China in the great famines it has often been the case that thousands have perished because the transportation facilities did not exist to bring to them the contents of the bursting granaries of other sections. From a political point of view the railroad and the telegraph render attempted revolution difficult, because they permit prompt transmission of news and prompt despatch of troops to the center of disturbance.

Railroad development has been slower than some anticipated when the American occupation began. It is still less than six years, however, since Governor Taft superseded the military authorities with the full powers of civil government. Six years is but a day in the life of a nation, and it could not be expected that everything would be accomplished in so short a time. Much has already been done, however, to develop the island commercially and more undoubtedly will be done in the near future. The new breakwater at Manila, which is now practically completed, will make the city, with the proposed new piers, the best equipped port in the Orient. A contract has recently been awarded for about $443,000 for two large steel and concrete wharves, one 600 by 70 ft., the other 650 by 110 ft. The military authorities have already completed a wharf for their own use, and on September 12 last the transport 'Logan' lay alongside it to unload—the first large transpacific liner to lie beside a pier in the Philippines. All harbor dues have been abolished in the islands, and as tonnage and light dues had already been done away with, Manila is now a free port, so far as shipping is concerned. The American warehouse system permits the free transshipment of goods destined for delivery in other Oriental countries, and should aid in making the city and bay of Manila a great distributing center. The harbor has been dredged to the depth of 30 ft. wherever such a depth is desirable. Within a year transportation has been put on a healthy commercial basis by doing away with the Government inter-island steamers, which were absolutely essential for military and civil purposes when the islands were in a state of confusion, and letting the mail and transportation contracts to commercial companies.

American capital has been going into the islands. This subject is discussed in the annual report of the Philippine Commission for 1906. Among the cases there cited of the employment of American capital are the contracts for the harbor works let to Americans, not only at Manila, but at Iloilo and Cebu; the adoption of a modern telephone service in Manila, which will be gradually extended throughout the island of Luzon; electric lighting plants at Iloilo and Cebu; the traction system in the city of Manila, which has been substituted for the dirty little horse cars in which no European or American would ride, a modern electric service; contracts for new water-works and sewer systems for the city of Manila; one of the inter-island transportation companies, and large companies for getting out lumber, for printing, for the manufacture of cocoanut products, for distributing American machinery, and for many other purposes. It is declared by the commission that all this progress has been made, not by depriving Filipinos of industries that before were theirs, but by the introduction of new capital and new business sagacity that have enabled Filipinos in nearly every case to obtain greater and larger remunerative employment and greater prosperity than ever before.

The Harriman Lines and Reciprocal Demurrage.

The following is a letter addressed to officers and agents of the Union Pacific signed by A. L. Mohler, Vice-President, and General Manager of the Lines East of Green River:

Agitation in favor of the enactment of state and national laws embodying that which is misnamed "reciprocal demurrage" is based to a very large extent upon a misunderstanding of present conditions and the results which would follow such legislation. It is important that employees of this company, coming in contact with the shipping public, should be posted upon the underlying principles of the subject in order that they may be able to present to the advocates of such legislation the unfairness as well as the consequence thereof. The question of adequacy of car supply naturally divides itself under the following headings:

(A) Freight locomotives and cars represent about one-fifth of the total capital invested in a railroad, and are practically the only portion of the property which provides revenue; the value of the remaining four-fifths depending entirely upon the use made of this one-fifth.

(B) Locomotives and cars can only be of value to their owners when moving under load or towards the loading point. Promptness of despatch in transit and methods adopted by railroads to secure increased daily loaded movement of cars.

(C) Cars are at times very valuable to consignees for storage purposes on the basis of the present low demurrage rates.

One of the most important questions that has engrossed the attention of the entire country during the past few months has been the inadequacy of freight car supply to meet the extraordinary

demands made upon our railroads to move a freight traffic unprecedentedly heavy by reason of bumper crops and the prosperous condition of all lines of industry throughout the country. Whilst this unusual state of affairs has taxed even the financial resources of the government in furnishing funds required through activity in money centers, and has resulted in congestion and overworking of existing facilities in all branches of trade, with shortage of labor, higher wages and higher cost of living, etc., it has been to railroad transportation to which inquiry has been practically alone directed. Yet, it can be truthfully said that the railroads, of all others, because of their past experience and their close touch with the pulse of business progress, long ago anticipated the present increased traffic, as well as anticipated what would naturally follow leading up to a shortage of cars, as it was self-evident with the tremendous growth of prosperity consignees' and consignors' warehouse and storage facilities would be overtaxed, resulting in more cars being tied up for storage purposes, which alone contributed more to and stimulated more the shortage of cars for the movement of traffic than anything else.

While this is true of the railroads in general, we can more confidently speak of what has been done by the Harriman lines as a whole, with which we are connected, operating about 15,000 miles of main line westward from Omaha, Neb., Kansas City, Mo., and New Orleans, La., to Los Angeles and San Francisco, Cal., and Portland, Ore., traversing states whose area is half that of the entire United States. During the past year on no part of the line has there been an insufficiency of equipment to move traffic. The San Francisco fire of April 18, 1906, completely destroyed the facilities for receiving and storing freight at by far our greatest traffic center, causing an aggravated blockade, tying up at its maximum over 6,000 cars, or 9 per cent. of our entire equipment. As it was impossible to reproduce the destroyed facilities, we had, under the circumstances, to be extremely lenient with consignees, and the congestion continued in greater or less degree for nearly six months. During this time local points along the line of the Union Pacific proper were largely dependent upon receiving empty car equipment from California, which had moved west under load, and as sufficient empties could not be sent east, this contributed its portion to the car shortage in the Middle West.

During the past five years the Harriman Lines have anticipated, perhaps, as much or more than any other system, the increasing development of the territory they serve, and have made vast additions to their rolling stock, the expenditures for which in this period have amounted to over $60,000,000. In the five years, 1902 to 1906, including equipment under contract, we have purchased 1,194 new locomotives and 40,196 new freight cars, most of these being steel cars which require less repairs, will be less time out of service, and therefore capable of handling a greater traffic than the wooden ones. Our car orders for this year alone amounted to 14,000 cars, or 20 per cent. of our entire equipment.

All of the engines are of the heaviest hauling capacity used anywhere, bringing our locomotive standard to as high an average condition and efficiency as exists on any road in the United States, whilst the cars added were principally of 50 tons carrying capacity with steel underframing. This new equipment is equal in tonnage carrying capacity to over 70,000 cars of the standard type used only a few years ago, and is far greater in tonnage capacity than the entire equipment owned only four years ago. In this time we have added over five tons to the average carrying capacity of every car we own. This great activity in car construction has been carried on during a time of extremely high material and labor prices, extra cost being added for steel construction to lessen damage from accident, the cost of our new cars being nearly double that prevailing 10 years ago.

To show how our lines have increased their equipment in advance of traffic requirements, below is given a statement going back four years to 1902 and looking forward to 1907 when we shall have received the equipment really ordered in 1906, but which will not be delivered until the spring of this year:

Thus in the heaviest period of 1906, we had only 6 per cent. greater traffic than in 1904 and [illegible] had [illegible] to [illegible] on account of new equipment provided 18 per cent. more locomotive traction and 14 per cent. more freight car capacity.

The average speed of freight trains on the Harriman Lines excluding stops is about 16 to 18 m.p.h. To meet competitive conditions and to market perishable products, the speed of trains has been increased on our lines and we have established a manifest system under which the movement of a large part of our traffic is vastly expedited and delays eliminated. As a result cars are being handled more expeditiously and moved a much greater distance per day than on the average road, as per the following comparison:

	Miles run per car per annum.		
	Loaded.	Empty.	Total.
All railroads of United States	5,820	2,[illegible]	[illegible]
Union Pacific system	8,861	2,985	11,8[illegible]
Southern Pacific Company	7,312	2,910	1[illegible]

These averages for our cars are for owned cars only. Foreign cars, which are largely confined to long haul business, we move faster and average 50 miles per day, or at the rate of about 18,000 miles run per annum.

As an aid to more efficient use of equipment we on June 1, 1901, established on the Harriman Lines a car clearing house, whereby all freight cars owned by all our separate lines are pooled and handled as a common ownership. Under this system cars are expeditiously moved from parts of the system where there may be a surplus to districts where most needed. Our officers everywhere are held to strict accountability for failure to properly watch car movement and utilize equipment capacity. By a rational system of tonnage rating, based on speed requirements as well as tractive power, locomotives are properly loaded to obtain their full value as traffic movers, whilst loading of cars is closely watched and their tonnage capacity utilized to its fullest possible extent. Shipments are combined to save car equipment where it is an object for this purpose on long hauls and where no material delay to freight will result. Elaborate statistics are kept of the use made of cars and locomotives, and officers making a poor record are held to strict accountability. Large capacity cars are kept in long haul business where greatest ton mileage can be handled. Car tracers are employed to check up car movement, and in various other ways we are seeking the maximum efficiency of our equipment, both for economy's sake and to render the best possible service to the public, as manifestly it is to the interests of any road to handle every ton of freight it can. Our equipment is always kept in the highest standard of condition, repairs being made as occasions offer, preferably in the lighter seasons. Our locomotives and freight cars were never in better condition generally than they are to-day. During 1906 we made repairs on 4,344 locomotives and 340,115 freight cars as compared with 329,230 cars in the previous year. For these repairs we expended $17,000,000. All these details, thoroughly suggestive to the mind of any practical railroader of to-day, have resulted in the excellent showing made by the Union Pacific and Southern Pacific Lines as compared with "All railroads of United States" on "Miles run per car per annum" shown in the foregoing tabulated information.

The statement is often made that yard facilities for handling cars have not been increased in proportion to the increased traffic. This is certainly not true for the lines of the Union Pacific and Southern Pacific systems. With each new car ordered computations are made and estimates prepared for additional tracks and terminals to hold the entire equipment ordered, although, of course, only part of it is in terminals at any one time. For example, in the four and a half years since June 30, 1902, with an increase of 15 per cent. in number of cars owned, an increase of 16 per cent. in car mileage and an increase of 17 per cent. in train mileage, we have increased our mileage of double main train 214 per cent. and have added 1,100 miles, or 30 per cent. to the length of yard tracks and sidings. For each car owned we now have 362 ft. of yards and sidings as compared with 322 ft. four years ago.

	June 30, 1902.	June 30, 1906.	Increase over 1902	June 30, 1907.	Increase over 1902.
Tons of freight carried one mile, thousands	10,339,057	3,738,198	33 per cent.	14,587,958	41 per cent.
Tonnage capacity freight cars owned	1,638,410	2,177,293	33 "	2,721,776	66 "
Total hauling capacity of locomotives as expressed by total w't on drvrs, tons.	98,720	145,340	47 "	166,505	69 "
Freight train miles	29,576,176	31,579,901	7 "	32,238,032	9 "
Total freight car miles	785,584,562	913,429,442	16 "	945,390,661	20 "

Thus estimating an average increase of traffic for 1907 as prevailed in previous years to move 41 per cent. of traffic, we will have available 66 per cent. more car capacity and 69 per cent. more locomotive capacity than we had five years ago.

The measure of the tax on railroad facilities is the traffic moved during the busiest season. Selecting the heaviest month out of the past three years, we have the following:

Tons of Freight Moved One Mile.

October, 1904	1,201,000,000
October, 1905	1,261,000,000
October, 1906.	1,279,600,000

With the car shortage agitation, the most important question to all railroads has been the detention to cars by shippers and consignees. We have endeavored to clearly show that the increased traffic has been anticipated by the Harriman Lines by the purchase of new equipment, and we might add that long ago anticipating the increased traffic, experience, which proves to be the best teacher, called forcibly to our attention the fact that during the wave of prosperity there would, as before stated, naturally follow a further growth of laxity on part of the commercial world, whose warehouse and storage facilities were overtaxed, to release cars promptly,

preferring to hold and utilize them for warehouse purposes. Stringent and positive instructions were issued long in advance of the heavy movement, impressing upon the minds of our agents and all concerned that they must force consignees to release cars promptly. Only one-eighth of a day is actually required to move a freight car the average distance it is hauled, the remaining time being consumed in terminal yards awaiting movement in trains, on sidings after being unloaded, on yard tracks at disposition of shipper awaiting loads, and, perhaps, more important of all, delayed at stations under load waiting to be released by consignees who are holding to unload or holding on re-consigning orders.

In order to increase the efficiency and promote their own earnings, railroads are always endeavoring to reduce delays for which they are responsible, and if their patrons would lend their aid to do likewise, vast good would be accomplished. The limitation of every railroad system in times of heavy traffic is the terminal situation, and the proper terminal situation depends upon the exertions of every shipper and consignee to unload cars with the least possible delay. Some consignees have ample facilities for the prompt handling of their maximum business, but the reverse is the rule. Many consignees order freight in large amounts expecting to sell it before it arrives, in which effort they are frequently unsuccessful in whole or in part. Much freight is consigned to brokerage or commission houses, the prompt disposition of which depends upon future market conditions. Some consignees with ample facilities delay cars badly by neglect and poor business methods.

These conditions have made necessary the present demurrage rules. The consignees know that the carriers would greatly prefer the cars to the demurrage charges—but unfortunately their preference is the same and the company must perforce permit them to exercise their preference regardless of the interest of the carriers,

A New Monorail Car.

and to the detriment of all other shippers. No railroad company can get any benefit from the prompt loading, unloading and handling of cars without, at the same time, benefiting shippers and consignees, hence the claim of the carriers that existing rules are non-discriminating, reasonable, and in the highest sense "reciprocal."

But the proposed reciprocal demurrage bill includes a provision for penalizing the carrier for failure to furnish cars as called for within a specified time. Legislation to fine a corporation for omitting to do that which is imperative with the self interest of the corporation, is as unique as it is unjust, and could not obtain an audience except under the extraordinary political, commercial and industrial conditions now prevailing. Demurrage is collected from a shipper on account of his converting to individual use facilities furnished by the company for the benefit of the shippers as a whole. Reciprocal demurrage, as planned, is a penalty to be paid by a carrier, not for something it receives or unduly retains, but for failure to supply that which it does not and cannot possess, and from the possession of which it is to a considerable extent debarred by the failure of its patrons as a whole to realize and fulfill their obligations to other shippers and to the railroad company. If the carriers are to be so penalized, actual reciprocity would require shippers to furnish loading at all times for all cars available.

It should be remembered that penalizing a railroad for not furnishing equipment is equivalent to a rebate to a large shipper who has a large holding in manufacturing and elevating interests, thereby defeating the purpose of the Hepburn bill to prevent rebates. Why should railroads be penalized for not furnishing equipment to any greater extent than consignees for not furnishing storage facilities to adequately provide for the business and necessary storage? The consignee feels justified in paying $500 or $600 per year for demurrage in preference to enlarging his facilities at a cost of say $20,000 per year, thereby eliminating the responsibility of interest, taxes and depreciation on the investment which, in a few years, with a decline in business, would be a burdensome one.

The great majority of shippers located on the Union Pacific Company's lines are broad-gaged, intelligent and fair-minded men, and are not in sympathy with any proposed legislation which has for its effect the restriction of prosperity and the discouragement of increases in investments in the way of improved facilities and terminal enlargements. Every large city must have terminal facilities to provide for the growth of such cities, and when such municipality by malicious and unfair advisers prevents the enlargement of terminal facilities by a legitimate and equitable franchise, to that extent the rapid development of that city is retarded.

The officers and employees of the Union Pacific will, at all times, co-operate with patrons and shippers along its lines. The prosperity of shippers is absolutely essential to the successful operation of its property; therefore, there can be no question as to the importance of dividing prosperity between the transportation lines and their patrons; and this company will at all times be found on the side of aiding increased prosperity rather than to encourage conditions which are certain to result in the withdrawal of marvelous prosperous conditions at the present time existing, and which all enjoy, and which, to the writer, appears as the poorest time to grumble.

A New Monorailway.

A working model of a new monorail car which has created much interest in Great Britain, where it has been exhibited, is shown in the accompanying illustration. It is the invention of Louis Brennan, well known as the inventor of the torpedo which bears his name. Equilibrium is maintained by gyroscopic action and the car is balanced on a single rail at all times, whether moving or standing still and under all conditions of wind pressure, shifting load or centrifugal force. The gyroscopic mechanism consists of two flywheels mounted on special bearings in a case from which the air has been exhausted. The air and journal friction is thus reduced to a minimum, and only small power is required to keep them in motion. They are rotated in opposite directions at very high speed by small electric motors taking current from a storage battery placed in the car. The use of two gyroscopes overcomes the tendency toward excessive inclination or variations when running backward or forward. The mechanism occupies only a small space and weighs about 5 per cent. of the total weight of the car.

The model car is mounted on two bogies, each having a pair of wheels. These bogies are designed for free radial and vertical movement to permit the car to round sharp curves and ride easily on rough track. The two wheels of each bogie are coupled, and they are driven by electric motors geared to one wheel. The track consists of a single rail laid on blocks, and for crossing gullies a heavy cable. An experimental track of this kind with steep grades and sharp curves has been built and the model car successfully run over it with loads as high as 150 lbs.

The War Department of the British Government has begun the construction of a large car of this kind. It will be propelled by a gasoline-electric generator set. The motors on the wheels will be provided with change gears for ascending steep grades. This car will be tested for its availability in military railroad work where the monorail track construction would be especially valuable.

Foreign Railroad Notes.

There is pending in the French Parliament a bill providing for old age pensions to railroad employees. This bill was introduced ten years ago, and five years ago was submitted to the President of the Senate. In order to hurry him up a little, on the 8th of June last 400,000 postal cards were addressed to him by as many railroad men in all parts of France, asking his early attention to the matter.

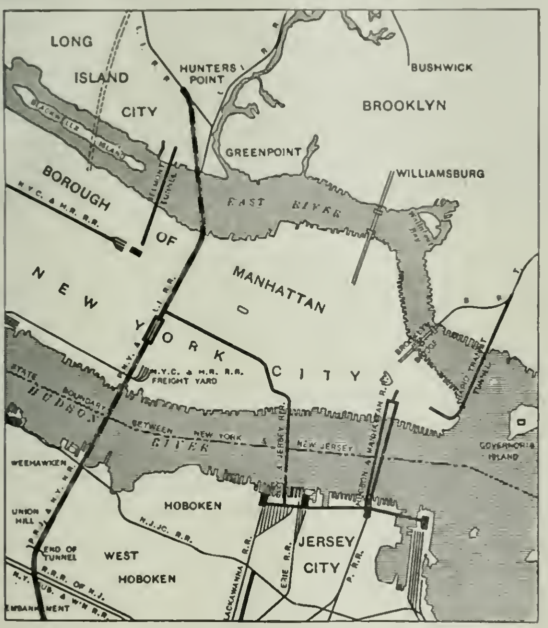
A committee of the Italian Parliament reported a plan for the reorganization of the state railroad administration which has one novel feature. There is to be a "traffic council" to advise as to the public needs in the way of transportation, apparently something like the advisory railroad councils in Germany, and one of its members is to be a journalist. The committee urged that the most important traffic questions are and must be discussed in the press and decided with its co-operation. The Minister of Public Works declared that he would not be willing to select the journalist councillor, and it was thought the appointment would be left to the Italian Associated Press.

Tunneling Operations in New York City.

The accompanying map showing the location of all the tunneling operations in New York City and vicinity is reproduced from a paper by H. T. Hildage, read before the American Institute of Mining Engineers. The following is a brief summary of recent progress on all of these tunnels:

Pennsylvania Tunnel & Terminal (Pennsylvania Railroad).—Double-track approach embankment west of Bergen Hill under construction. Twin tunnels in rock under Bergen Hill to Weehawken shaft about two-thirds excavated; work in progress. Twin tubes under North river to Eleventh avenue, Manhattan shaft, completed and work of sinking foundation piles and putting in concrete lining in progress. Excavation of approach tunnels from Manhattan shaft to station site at Ninth avenue about one-half completed. Excavation for station between Seventh and Ninth avenues nearly completed, erection of steel work in progress. Double-track cross-town tunnels under 32d and 33d streets excavated from East river shafts to a point near Sixth avenue, and work of lining in progress. Four East river tubes under way and about one-half completed. Long Island City tunnels in soft ground completed to portal near Borden avenue.

Hudson & Manhattan.—Both tubes completed under North river between Hoboken and Greenwich street; to be ready for experimental operation by Sept. 1. Open cut extension from Greenwich street under Sixth avenue to 33d street under construction. Tunnel connection between Hoboken and Jersey City under construction. Twin tubes between Cortlandt street and Jersey City under construction. Foundations completed for terminal station at Cortlandt and Church streets and erection of steel work in progress.



Tunneling Operations in New York.

(Tunnels under construction are shown in heavy black lines.)

Interborough Rapid Transit.—Brooklyn extension from Battery loop under East river to Joralemon street, Brooklyn, is partially completed. Both tubes are joined, but work is in progress to reinforce them with pile foundations before concrete lining is put in. Will not be ready for operation for some months to come.

Belmont Tunnel.—From 42d street and Park avenue under 42d street and East river to Long Island City. Work still going on in one tube. Other tube has met and tunnel is nearly completed under 42d street.

New York Central.—Reconstruction of Park avenue tunnel about completed. Work in progress on excavation of west half of new Grand Central Station yard.

Delaware, Lackawanna & Western.—Driving a second double-track tunnel parallel to present tunnel under Bergen Hill, Hoboken. About one-half completed.

For fighting fire in its anthracite coal mines, the Delaware, Lackawanna & Western is using a new form of chemical fire engine. It is built on a truck and can be attached to an electric mine locomotive and rushed to the point of danger at high speed. When a chemical engine plays upon [illegible] the heavy gases [illegible] cling to the floor and smother the [illegible]. Men are not annoyed by fumes and can [illegible] effective work. The complexities of mine working [illegible] in every direction as the thinner and less accessible [illegible] are being [illegible] so that increased attention to fire fighting is necessary.

Rest Requirements on French Railroads.

The Minister of Public Works of France has sent a circular to the railroad managers setting forth the requirements as to the time allotted to employees for rest. This must be at least 52 days a year, and it is desirable that these days should fall on Sunday. Employees whose work cannot be interrupted on Sunday must be granted at least three full days of rest a month. To these three days there must be added at least enough supplementary rest either in whole days or, if Sunday is cut out, in half days, to make up the balance. The days off may be separate or together according to the exigencies of the service and the convenience of the employee. But even where his duties are most exacting, there must be 52 days of rest a year. Where half days are taken, every effort should be made to have them fall on Sunday; and the same rule holds regarding full days; for this reason the managers are urged to reduce Sunday work of all kinds as much as possible.

The New York Central's Electric Lines.

Early in 1905 there was incorporated in New York state the Mohawk Valley Company, a holding company which controls the electric and street railway investments of the New York Central & Hudson River. Its $20,000,000 stock is held, 60 per cent. by that company and 40 per cent. by a syndicate, made up largely of Cleveland and New York men, and headed by Horace E. Andrews, President of the Cleveland Electric Railway. The directors of the Mohawk Valley Company are. Horace E. Andrews, William K. Vanderbilt, Jr., Walter N. Kernan and the following vice-presidents of the New York Central: W. C. Brown, E. V. W. Rossiter, John Carstensen and W. J. Wilgus. The executive organization is: Horace E. Andrews, President, John Carstensen, Vice-President of the New York Central in charge of accounting, and W. K. Vanderbilt, Jr., Vice-Presidents; Dwight W. Pardee, Secretary, and Edward L. Rossiter, Treasurer of the New York Central, Secretary and Treasurer, respectively, and A. L. Linn, Jr., General Auditor.

It is the plan of the Mohawk Valley Company to eventually have a continuous electric line parallel to the New York Central main line all the way from Albany to Buffalo, giving frequent local passenger and express service. Although this will be a continuous line between those points, there is no intention to operate through electric service over it. The fact that it will run through the streets of the principal cities is one reason against this, but the deciding reason is that the very purpose of having a parallel electric line is to leave the tracks of the steam road (which itself will in all probability within a few years be electrified) free for freight and fast through passenger service. The plan is to have the electric line take over, so far as possible, the short distance local passenger travel of the steam road. The superiority of an electric line in offering frequent service and carrying passengers directly to the central streets of the cities makes this possible. To put it concretely, one car every half hour furnishes vastly more satisfactory service for local travel than six cars every three hours. An electric line can offer such frequent service more cheaply than a steam line can run infrequent local trains.

One of the accompanying maps shows the present holdings of the Mohawk Valley Company and the large gaps still left in the ultimate continuous line across New York state. The company controls the whole trolley systems of Schenectady, Little Falls, Utica, Rome and, with one or two small exceptions, Syracuse and Rochester. The Schenectady Railway which, besides giving local service in that city, operates fast through service to Albany and Troy, is controlled jointly with the Delaware & Hudson, each company owning one-half the stock. The Delaware & Hudson owns also the United Traction Company operating the city systems of Albany and Troy and controlling the entrance of the Schenectady Railway into those cities, and the Hudson Valley Railway, running north from Albany and Troy with nearly 100 miles of line. The Mohawk Valley Company owns all or a controlling proportion of the stock of its other trolley companies.

It will be observed by this map that the longest through electric line now owned parallel to the New York Central main line is the Utica & Mohawk Valley Railway's line from Little Falls west to Utica. The West Shore line between Utica and Syracuse, 44 miles, has recently been electrified, thus extending the electric system to Syracuse and making a line from Little Falls to Syracuse, 75 miles, of New York Central auxiliary lines under electric operation. A map of this electrified section of the West Shore is also shown. This

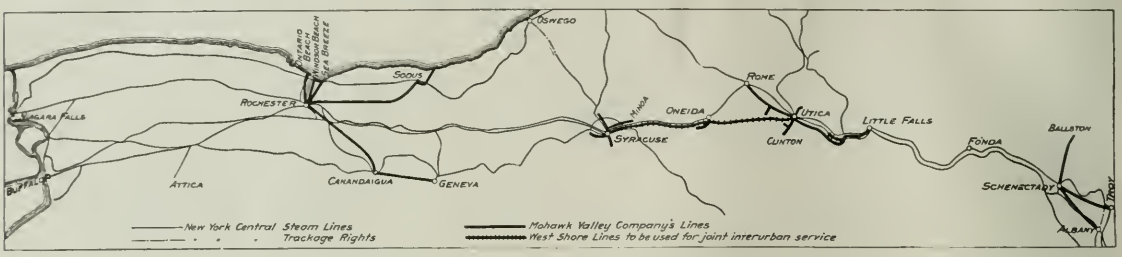
electrification was paid for by the Oneida Railway, which before its purchase was projected to be extended west to Syracuse. The work was done by the Oneida Construction Company. On June 15 this stretch of electrified line was officially opened and regular service over it is now in operation. Besides this, one track on a small section of the West Shore between Mohawk and Frankfort, five miles, was earlier electrified, giving the Utica & Mohawk Valley, which is double tracked all the rest of the way between Little Falls and Utica, a second double track between these points.

The work of electrification of the West Shore for the 44 miles between Utica and Syracuse for joint interurban service was carried out under C. Loomis Allen, Vice-President and General Manager of the Oneida Railway; W. J. Harvie, Electrical Engineer, and M. J. French, Jr., Engineer of Maintenance of Way. An agreement was made with the New York Central under which the Oneida Railway, besides electrifying the line, is to conduct the passenger business over the West Shore between Utica and Syracuse. The New York Central on its part agreed to abandon the local passenger trains on this stretch of track, but will continue to operate freight trains and through passenger trains by steam locomotives. Before electrification there were only two local passenger trains each way a day over this line, the only other passenger trains being two night through trains with sleepers. Yet this is a well populated territory. Besides other smaller places, the three towns of Oneida, Vernon and Canastota traversed have together 17,000 people. Here, then, was a local territory in need of better passenger transportation facilities but whose possibilities of larger traffic were not sufficient to justify increased operation of steam passenger trains. Electric traction offered the advantages of frequent service at small cost per unit. Also an electric line between Utica and Syracuse was needed as part of the Mohawk Valley Company's plan.

There are to be two kinds of electric passenger service over these West Shore tracks. Fast limited electric cars or trains will run hourly between the two cities, making only two other stops. This limited run will be made in 88 minutes for the 44 miles, but 28 minutes of this time will be used within city limits of the terminal cities. There are also to be hourly local cars or trains which are to run at the rate of 21 miles an hour and make the complete run in 118 minutes. These cars will make frequent stops, at every highway if necessary. Besides these two kinds of electric service there will be the regular steam service as at present, except for the steam local passenger trains.

To provide for passing the express trains around the local trains a third track has been laid between Clark's Mills and Vernon, 8½ miles, with cross-over connections to both outside tracks. It will be used by both east-bound and west-bound trains and will be protected by block and interlocking operators at both ends. A fourth track has also been laid between Oneida and Canastota, 5½ miles, where there are water stations and freight yards which might delay the movements of electric trains.

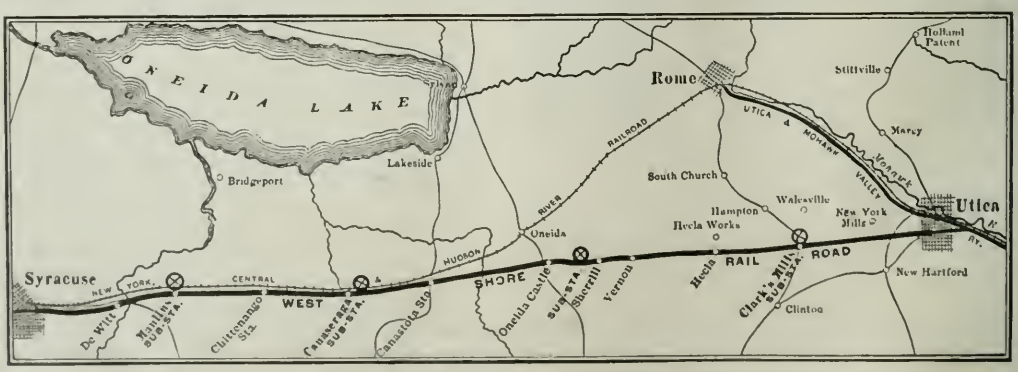
Power for operating the line is bought from the Hudson River Electric Power Company, which has hydraulic power plants at Spiers Falls and Mechanicsville. The transmission line for 60,000 volts is now being extended to Utica, but pending its completion the power company has installed in Utica a temporary steam plant equipped with Curtis turbines and delivering three-phase 60,000-volt current at 40 cycles to the railway. In the 44 miles between Syracuse and Utica there are four sub-stations approximately 10¾ miles apart. Each sub-station contains a 330-k.w., 60,000:370-volt oil-cooled transformer and one 300-k.w., 370-volt a.c. and 600-volt d.c. rotary converter, together with the necessary switches and other accessory apparatus.



The New York Central's Auxiliary Electric Lines.

The line is built for third-rail operation. The same type of third rail as in the electric zone of the New York Central in the New York terminal territory is used. The third rail is placed 32 in. out from the gage line and the contact surface is 2³⁄₁ in. above the top of the track rails. New York Central electric equipment can be run over the line without changing the position of the contact shoe. The third rail is normally located between the tracks on tangents and on the high side of the track on curves.

In order to operate over the street railway lines in both Utica and Syracuse a different type of car was adopted than would have been for the West Shore tracks exclusively. One of the cars is shown herewith. The main dimensions are: Length over end panels, 40 ft.; length over vestibules, 48 ft.; width over sills, 8 ft. 4 in. The underframing consists of two intermediate and two center sills of 6 in. I-beams extending under the vestibules, with malleable iron caps and supports for the main truss rods; which are 1¼ in. in diameter. The interior is finished in laid mahogany; the ceilings are full Empire decorated. The floor is covered with interlocking elastic tile, while a rubber mat is furnished for each vestibule. Storm sashes are furnished for the side windows, which replace window guards in winter. The cars are equipped with 24 reversible and 2 stationary plush seats with high backs and head rolls. Each car is also fitted with a toilet.



Electrified Line of the West Shore between Utica and Syracuse for Joint Interurban Service.

To provide for passing the express trains around the local trains a third track has been laid between Clark's Mills and Vernon, 8½ miles, with cross-over connections to both outside tracks. It will be used by both east-bound and west-bound trains and will be protected by block and interlocking operators at both

In the extension of the Mohawk Valley Company's electric

service the Falls Road of the New York Central—the second steam line shown on the larger map south of Lake Ontario between Rochester and Niagara Falls—is later to be electrified. Other gaps in the through line will be filled in, either by electrifying one of the existing steam lines or building new parallel electric roads, so that within four or five years the complete plan for an electric line, relieving the through steam line of local passenger traffic, will be in operation all the way between Albany and Buffalo.

The Mohawk Valley Company controls directly 331 miles of electric line, of which 166.6 miles are double track. The electrified West Shore lines for joint interurban service make up 49 miles more, a total of 380 miles of line under electric operation. The following table gives the names of the different controlled companies and their mileages in detail:

Table of Mileages.

	Miles of line			Miles of track		
Name of company.	Single.	Double.	Total.	Total main single track.	Sidings.	Tot'l main tracks & sidings.
Schenectady Railway	10.42	46.37	56.79	103.16	3.65	106.81
Utica & Mohawk Valley...	30.22	38.87	69.09	107.96	3.19	111.15
Rome City Street Ry......	5.45	0.61	6.07	6.68	.....	6.68
Oneida Railway	1.69	2.77	4.46	7.24	0.10	7.34
Syracuse Rapid Transit Ry	29.38	22.26	51.64	73.90	4.10	78.00
Rochester & East. Rap. Ry	40.60	.....	40.60	40.60	5.00	45.00
Rochester Railway	9.48	38.83	48.31	87.14	1.49	88.63
Rochester & Suburban ...	1.53	8.90	10.43	19.33	0.36	19.69
Rochester & Sodus Bay ..	35.62	3.46	39.08	42.54	2.23	44.77
Rochester Electric Ry.....	0.11	4.55	4.66	9.21	0.15	9.36
Total	164.50	166.63	331.13	497.75	20.57	518.32

West Shore [illegible] Electric Operation.

	Tracks One	Two	Three	Four	Of line	Miles of single track	Sidings	Of total track
Utica & Mohawk Valley	[illegible]					[illegible]		[illegible]
Oneida Ry	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]
Total including West Shore [illegible]*								[illegible]

*Miles of line. †Miles of track.

The 10 lines are operated as follows: The Schenectady Railway, of which E. F. Peck is General Manager, and the Rochester & Eastern Rapid Railway, running from Rochester to Geneva, of which J. H. Pardee is General Manager, are each operated separately. The other eight roads are in two groups, the eastern one made up of the Utica & Mohawk Valley, the Syracuse Rapid Transit, the Rome City Street Railway and the Oneida Railway, under C. Loomis Allen, Vice-President and General Manager; and the western group made up of the Rochester Railway, the Rochester & Suburban, the Rochester & Sodus Bay and the Rochester Electric Railway, under R. E. Danforth, Vice-President and General Manager. The different companies maintain their separate corporate organizations. They are not merged in the Mohawk Valley Company, but simply controlled by it.

Stretch of West Shore Electrified Three-Track Line.

In acquiring a through line such as that described, it was, of course, most important of all to secure entrance into the large cities. In consequence the entire local street railway systems of Utica, Syracuse and Rochester had to be taken over. This gives an added value, however, to the electric service to outlying points, as passengers arriving by the through lines outside the city can transfer to local cars which will take them direct to their particular destination within the city. Arrangements have already been made for through ticketing over both steam and electric lines. Passengers can now in New York city buy a through ticket over the steam road to the next large city nearest their point of destination and over one of the Mohawk Valley's electric roads to the outlying town where they wish to go. Joint tickets are also now sold in the opposite direction. On such tickets, in either direction, baggage can be checked to or from points on the Mohawk Valley lines, a matter of great convenience. This auxiliary electric service makes outlying towns on the electric lines much more accessible both in through and local service. Thus the parallel electric lines fulfil a valuable service as feeders and helpers of the steam lines, to the advantage both of the railroad and of the local territory served. The extension and successful carrying out of this idea is the moving force behind the Mohawk Valley Company's plan.

Type of Car for West Shore Electric Interurban Service.

New Blacksmith Shop of the Union Pacific at Omaha.

The new blacksmith shop of the Union Pacific at Omaha, Neb., was designed with particular reference to economical operation. The route of the iron from box cars to storehouse, thence to the shears and through the blacksmith shop, was determined in advance, and the machines located to give the most economical movement. In working up the preliminary designs of this shop, as is customary in the mechanical department of the Union Pacific, W. R. McKeen, Jr., Superintendent of Motive Power, acting as chairman, called together a committee to map out and discuss the methods of doing work in this shop. The committee consisted of the mechanical engineer and some of his draftsmen, the blacksmith shop foreman, assistant superintendent of motive power and superintendent of shops. The general foreman of the car department, general foreman of the machine shop, boiler shop foreman and storekeeper were all called into consultation as the work of their respective departments was discussed. Thus the requirements of all departments were carefully considered. The exact method of handling the iron through the blacksmith shop was decided on at that time.

The proportion of output to size of the shop is believed to equal if not excel any similar shop in existence; also it is thought that there are less hand forges in this shop than in any other in the country. Special use is made of the Bradley hammer, of which

New Blacksmith Shop of the Union Pacific at Omaha.

The Bolt Shop; an Annex to the Blacksmith Shop.

Bradley Hammers Working on Store Orders; Union Pacific Blacksmith Shop.

Frame Fire and Foreman's Office.
From track at left is for moving heavy required forgings.

Union Pacific Blacksmith Shop at Omaha.
Material cars serving machines, in foreground.

there is a battery of five on car work. Work on track tools, etc., is done with economy. The hand forges are grouped, with steam hammers working in conjunction with each group, thus facilitating the work of hand forging and decreasing helping labor. By the use of mechanical forging machines, bulldozers and other modern iron-working tools, material can be turned out much more cheaply than before.

One source of great economy has been the systematizing of work so that parts for cars and locomotives are carried through the blacksmith shop on store orders, the parts being made in large numbers and carried in stock, instead of manufactured by hand, one at a time, as formerly. All of the furnaces use crude oil for fuel. The large furnaces are equipped with modern water-tube boilers, which not only furnish steam for running the steam hammers and heating the buildings, but supply considerable steam for the power plant.

It is the policy to provide the most healthful possible conditions for employees. To that end the Sturtevant system for carrying off smoke from the forges and furnaces has been installed in the blacksmith shop; also a lantern in the top of the building for ventilation in the summer, and the suction or exhaust system of ventilation in the roof for relieving the inside of the shop of any smoke which may escape from the other system. With this triple system of ventilation the atmosphere is always clear and agreeable.

The drop-forging department has been developed to a wonderful extent and a great many locomotive parts which for years have been made by hand are now made under the drop hammers much more cheaply. The method of working up the scrap and of forging old axles and heavy iron by the regular furnace or hammer gangs is a great economy.

In connection with the blacksmith shop is the nut, bolt and stud machinery in an annex to the shop, where all threaded articles are manufactured. This bolt shop, which is shown in one of the photographs, is equipped with bolt cutters, nut tappers, screw-cutting machines, stud machines, staybolt drills, etc., and delivers the finished product from the blacksmith shop direct to the storehouse.

Material is conveyed from the iron house to the different machines on 24-in. gage push cars. From a machine it passes to a second push car, and so on, being handled through the shop without touching the ground. The cars are moved in trains by a storage-battery truck.

The foreman of the Omaha blacksmith shop is R. A. Mould. He has an assistant and a clerk.

Progress on the Western End of the St. Paul's Pacific Extension.

The route of the western end of the Pacific coast extension of the Chicago, Milwaukee & St. Paul from Butte, Mont., to Missoula, parallels in a general way the existing main line of the Northern Pacific. From Missoula the route parallels the Coeur d'Alene branch of the Northern Pacific to a point near St. Regis, Mont., where it turns southward and crosses the Bitter Root mountains through a new and hitherto almost unknown pass. The work in this district is in charge of Winston Brothers Company of Minneapolis. This firm has the contract for a big tunnel west of St. Regis. Very little active construction has taken place. The work now being done consists mainly of preparation and organization. Active work on the big tunnel will begin shortly.

From the Bitter Root tunnel to Tekoa, Wash., the new line follows the valley of the St. Joseph river, crossing the south end of Lake Coeur d'Alene near Chatcolet and paralleling the operated line of the Oregon Railroad & Navigation to Tekoa. This stretch has a light, water grade, with heavy rock cuts and fills necessary along the bluffs and cliffs of the river. This division is being built by H. C. Henry, of Seattle, Wash., who is general contractor for all of the line west of the Bitter Roots. At present it is largely in the initial stages of organization. The engineers are busy cross-sectioning, while the contractors are clearing the right-of-way and getting ready for active construction. At the same time most of the heavy cuts have been opened and station men are at work on the light grading. No bridge work has been done. This is probably the least completed section of the new line.

The construction from Tekoa, Wash., to Ellensburg is in a more advanced state. The general route is from Tekoa directly southwest through Whitman and Adams counties, crossing the Northern Pacific at Lind, Wash. Thence the line goes southwest to the village of Othello in the southwestern corner of Adams county; then follows Crab creek to the Columbia river. From the Columbia river crossing to Ellensburg the general direction is northwest through the Poisoned Spring district. Several townsites in this district, in Adams and Douglass counties, have been platted and will shortly be on the market. The region is literally covered with contractors and the work is well under way; most of it has advanced beyond the line-changing stage. Considerable progress has been made on bridges.

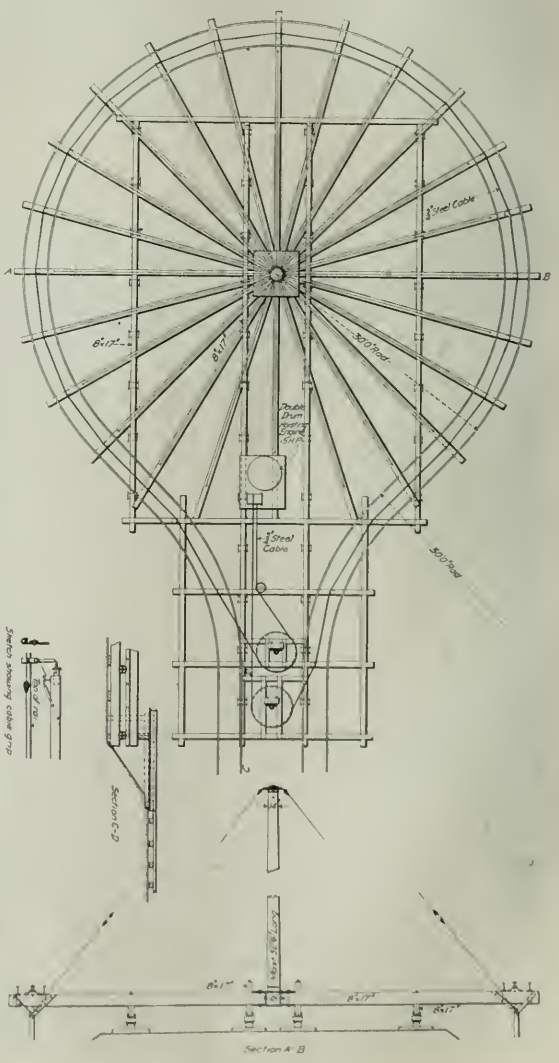
From Ellensburg, Wash., to the Cascade mountains the line parallels the Northern Pacific. A great deal of grade has been finished between Ellensburg and Easton, but there yet remains several months' work on the heaviest cuts and fills. The line crosses the Cascades through a long tunnel under Snoqualmie Pass at the north end of Lake Kilchelos and goes down the west slope through the North Bend region. Near the tunnel the work is in its first stages; in some sections the right-of-way clearing has just been begun. West of North Bend construction is much further advanced; miles of grade and considerable bridge work have been finished. This district will be the first to be ready for track laying. Between Seattle and Tacoma the grade is half completed but no bridge work has been done. No work has been done on either the Seattle or Tacoma terminals.

In general, the line has been finally located, and throughout the whole stretch from Butte to Seattle actual construction has begun. Some sections will shortly be ready for the track, but it will be at least 18 months before many parts of the heavy solid-rock work is finished.

An Unloader for High Fills.

The E. B. & A. L. Stone Company, of Oakland, Cal., is one of the contractors who are building the Western Pacific Railway. It has been necessary for them to make a number of high fills, and to expedite these a machine has been designed which is shown at work in the accompanying photographs and in detail in the accompanying drawing.

The machine consists of a circular track supported on 8 in. x



Unloader for High Fills.

17 in radials, with the additional support of rods suspended from a mast. A cable, which is held in place by rollers, leads around between the rails. A train of contractors' cars loaded with earth is hauled around this circular track by the cable which is operated by a donkey engine located on the machine, as shown. While the cars are being pulled around, the locomotive engine switches from the delivering to the receiving track. As the cars are unloaded while in motion, the empty train is in place by the time the engine has made the switch. The cars can be dumped inward or outward at any point on the machine.

When sufficient earth has been dumped, the unloader is moved forward 10 ft., a process which requires about an hour or an hour and a half. This is generally done at noon or in the early evening. The base of the unloader is carried about 4 ft. below grade, and the fill is brought up to grade at the back end as the machine is moved forward. Four stringers 16 ft. long are attached to the machine and are dragged forward when it is moved ahead. Rail sections 10 ft. long are used to fill in the space behind, resting on these stringers. The first trainload of dirt, after the machine has been moved, is used to fill in the open space behind over which the stringers stretch. While filling, the settlement is taken care of by raising the machine with jacks and blocking up. This requires one carpenter and two laborers continually. Five men on top of the machine, including the man who runs the donkey engine, attend to the dumping of the cars and chalking up. The timbers and iron of the machine are of such lengths that they can be loaded on an ordinary flat car. The machine is all bolted together and can be taken apart by a small gang of men in two days.

High Fill on Line of Western Pacific; Unloader at Work.

Unloader Used on High Fills; by E. B. & A. L. Stone Co.; Western Pacific.

This unloader has for the past four months been in use on a 112-ft. fill near Altamont, Cal., working day and night. Previous to that it was successfully used on a 125-ft. fill, now completed. It has not yet been possible to determine the number of cars that can be handled, as a 70-ton Bucyrus steam shovel in good digging has not been able to keep the unloaded busy more than half the time. The machine was designed for the special purpose of making high fills by F. F. Lloyd, who is connected with the E. B. & A. L. Stone Company.

The Mt. Blanc Tunnel.

According to the *Revue Industrielle* the construction of a tunnel under Mt. Blanc is needed in order to place the French railroads on an equality with those of Germany in the transportation of passengers and freight between the north and Italy. The recent completion of the Simplon tunnel and the approaching opening of the Loetschberg has placed France in a very unfavorable position commercially in comparison with Belgium and Germany. Communication between France and Italy is limited to two lines, those of the Littoral and Mt. Cenis, and it is for the purpose of protecting the railroad interests of the country that the Mt. Blanc tunnel is required. By means of this route Paris and Dijon will be in direct communication with Milan and Genoa, and the whole commercial, industrial and agricultural territory of the basin of the Loire and the Saone will be able to ship direct to the two great commercial centers of Italy.

It appears that this Mt. Blanc proposition is not a new one, but even preceded the creation of the railroad system, for as early as 1836 M. Vaguer proposed a route from Courmayeur to Chamounix by way of a gallery beneath Mt. Blanc. Eight years later, in 1844, the idea was revived by an advocate, M. Martinet, and an engineer, M. Alby. In 1846 it was discussed by the Casuel canton and in 1862 by the canton of Gorret. Again in 1870, 1873 and 1879 the project was discussed and abandoned because of the hostility of rival interests. The route now proposed starts from Chamounix and shortly afterwards enters a tunnel 13,500 meters (44,280 ft.) long beneath the crest of the mountain, which runs to Courmayeur. This is really the only logical route. In fact, the dominant question is that of driving the tunnel, for after leaving the tunnel there is a choice of approaches.

The Mt. Blanc Railway will be built half on French and half on Italian territory. It is expected that Italy, which contributed so largely to the construction of the St. Gotthard and the Simplon, will not refuse its assistance to the Mt. Blanc, especially as this last will be of such great importance to it.

Passenger Locomotive for the Duchy of Oldenburg Railroads.

The Hannoversche Maschinenbau-Actien-Gesellschaft of Hanover, Germany, has recently celebrated, with festivities appropriate to the occasion, the delivery of the 5,000th locomotive built by these works. On that occasion there were present representatives of the governments of the towns of Hanover and Linden and other public authorities of numerous administrations of German and foreign railroads, as well as representatives of neighboring industrial firms.

These works were brought prominently before the American public ten or a dozen years ago, in that they were largely instrumental in the construction and development of the compound locomotive as designed by the late August von Borries, who was at that time the head of the locomotive department of the State Railroads of Hanover. They were founded in 1835 by Georg Egestorff, who was succeeded by the present firm. It was not, however, until 1846 that the first locomotive was delivered, and it was ten years later before 100 had been built. The 500th was built in 1870; the 1,000th in 1873; the 2,000th in 1888; the 3,000th in 1897, and the 4,000th in 1903. Of the 5,000 locomotives built up to the present time, about 1,100 were built for roads outside of Germany, and of these by far the larger number were sent to Russia. Deliveries have also been made to Roumania, Japan, Java, Denmark, Turkey, India, Austria, Portugal, Italy, Bulgaria, Holland, China, Siam, Finland, Argentine, Sweden, Greece and Chili; so that the firm is widely known not only because of its connection with important works but from the wide territory over which its engines are running.

The locomotive that is the subject of this sketch has been built for the railroads of the Grand Duchy of Oldenburg. It is of the 4-4-0 type with a bogie in front, and is of the standard type used on the State Railroads of Prussia. It is a two-cylinder compound with cylinders having a ratio of 1 to 2.25. In connection with these, the Lindner starting device is used, by which live steam is allowed to enter the low-pressure cylinder when the reverse lever is at either one of the extreme positions. Staby's smoke consuming device is also used and the second dome on the boiler is the one from which steam is drawn for the working of the apparatus. Again, in accordance with the prevailing practice upon the Prussian State Railroads, a superheater is used. It is of the Ranafier smokebox type and is formed by the sub-division of the receiver into 46 seamless iron tubes of 1⅝ in. diameter each,

and so arranged as to act as a spark arrester at the same time. The heating surface of these tubes is 154 sq. ft. measured upon the outside, and their capacity is 1.75 times the volume of the high-pressure cylinder. Six express locomotives have, thus far, been fitted with this type of superheater on the railroads of the Grand Duchy of Oldenburg, and it will be placed on 11 more now in course of construction.

As compared with the engines to which American eyes are accustomed this one appears low. Its design is distinctively German and the peculiarities of the arrangement of certain of the parts in detail are such that they would attract immediate attention. For example, the exhaust from the Westinghouse brake pump is carried up outside the boiler jacketing and the stack. This arrangement has been used to but a limited extent in this country, probably because of the unsightliness of the pipe, though it does possess the advantage of not fanning the fire when the engine is standing. In addition to this it is quite probable, though there are no figures at hand to support the statement that the interposition of this extra exhaust into the stack must interfere with the efficiency of the main exhaust by introducing eddies in the steam jet that interfere with its proper action.

The Walschaert valve gear is arranged for an outside admission, and with the radius rod lifted direct by the lifting shaft arm instead of through a hanger as in the usual practice in the United States.

The practice of covering the bolts, and the saving of heat by radiation losses also puts the base sheets out of the running. These are a few of the items that are deserving of attention and consideration in this design. Some might well be copied while others do not appear to be as efficient or simple as similar details that are to be found in American engines.

The following are some of the principal dimensions of this engine, and in these attention is called to the large proportion of the total weight that is upon the trucks:

Cylinder, diameter, high-pressure	18 in.
Cylinder, diameter, low pressure	27 "
Piston stroke	23½ "
Wheels, diameter, driving	69 "
Wheels, diameter, truck	40 "
Wheel base, truck	7 ft. 3 "
" rigid	8 " 6½ "
" total	24 " 3 "
Heating surface, tubes (fire side)	1,188.0 sq. ft.
" " firebox	96.7 "
" " total	1,284.7 "
" " superheater	154.0 "
Grate area	24.6 "
Tubes, number	231
" diameter (outside)	1¾ in.
" length	12 ft. 9½ in.
Diameter boiler shell	55 "
Steam pressure	176 lbs.
Weight empty	47 tons
" on drivers	28 tons 10 cwt.
" in working order	51 tons 7 cwt.
Center of boiler above rails	7 ft. 4½ in.
Tank capacity (water)	4,400 gals.
Tractive power	12,950 lbs.

Passenger Locomotive for the Railroads of the Grand Duchy of Oldenburg.

No brakes are put on the truck wheels, but the drivers are fitted with two shoes for each wheel. This is a practice that was strongly urged in this country at one time, but which has not received an extensive application except on a single road. The advantages claimed for the arrangement are that it relieves the boxes and rods of all strain due to brake pressures; that it secures a more uniform wear on the wheels and can be made much lighter than where the pull is all in one direction. In the case of these German engines a double connection is used, a rod running on each side of the wheels, with vertical equalizers below each brake lever so that with the exception of the use of horizontal equalizers and a single pull rod on the engines in America, the principle underlying the foundation rigging of this brake is the same as that of the Beals brake that has been used for so many years on the New York, Ontario & Western Railroad. The double shoe is also used on the tender wheels of these engines.

It will be noticed, in the reproduction of the photograph, that the staybolts of the firebox apparently come through the lagging and jacketing. Of course this is not the case but those markings are thimbles that are placed through the covering at each staybolt, making it possible not only to inspect each staybolt but to remove and replace any one of them without disturbing the jacketing in any way. This is not an uncommon requirement in Europe but is quite unknown to American practice. The advantages are apparent upon first sight and the only disadvantage lies in the additional first cost, but this would be met in part at least by the first occasion that should arise necessitating the renewal of a staybolt. As for the safety thus insured there can be no comparison with the

Weight on drivers / Tractive power	4.93
Total weight / Tractive power	8.88
Weight on drivers / Total weight	.555
Tractive power x diameter drivers / Heating surface	693.07
Heating surface / Grate area	52.26
Firebox heating surface / Total heating surface	0753
Weight on drivers / Total heating surface	19.70
Total weight / Total heating surface	39.53
Total heating surface / Volume of h. p. cylinder	3.46 cu. ft.
Total heating surface / 2 x volume of h. p. cylinder	185.65
Grate area / Volume of h. p. cylinders	3.55

Tube heating surface equated to firebox heating surface (Vaughan's formula)	332.74 sq. ft.
Total equated firebox heating surface	429.47
Ratio, equated heating surface to total heating surf.	33.43 per ct.

GENERAL NEWS SECTION

NOTES.

Three thousand Japanese laborers are being brought to British Columbia for the Grand Trunk Pacific.

In Ohio it is reported that both the New York Central and the Pennsylvania are making reductions in the forces of their men in their city freight soliciting offices.

The Electric Express Co. has been organized at Boston to do the express business on the electric city and interurban railroads controlled by the New York, New Haven & Hartford.

Vice-President Fay, of the Southern Pacific, expects to have the whole of that company's line from New Orleans, La., to Houston, Tex., equipped with automatic block signals within three months.

The Department of Agriculture on July 15 sent to the Department of Justice 41 cases on which to bring suit against railroads for keeping live stock in cars beyond the legal length of time.

The new State Railroad Commission of Montana has held a meeting and declared that the freight and passenger rates now in force shall be deemed the maximum lawful rates, except as regards coal on the Great Northern and lumber on the Northern Pacific. The rates on these commodities will be considered by the commission.

The Supreme Court of Georgia has sustained the right of the State Railroad Commission to prescribe through rates over the lines of the Central of Georgia and the Wadley Southern the same as though both roads belonged to the same company, the commission having found that the Wadley Southern is controlled by the Central of Georgia.

The Governor of Wisconsin has signed a bill making an eight-hour day for telegraphers, and one to prevent watering stocks. The new law requires public service corporations to get permission from the State Railroad Commission before issuing any stock or bonds and prohibits selling stock for less than par or bonds for less than 75 per cent. of par.

At El Paso, Tex., recently 30 employees in the freight yard of the Galveston, Harrisburg & San Antonio were discharged for having struck, and the dismissals are sanctioned by the union to which the men belonged because they took action without first reporting their grievance to the union headquarters. The cause of the strike was the dismissal of a yardmaster.

In the United States Court at Chicago last week the Atchison, Topeka & Santa Fe was indicted on a charge of granting rebates aggregating $12,000 to the United States Sugar & Land Co., of Garden City, Kan. The indictment contains 65 counts, all having to do with shipments of building material carried by the road when the sugar company was building its refinery.

Surprise tests of enginemen appear to be growing in favor, and the fashion of giving the results of the tests to the public also seems to be spreading. The latest aspirant for public notice is the Lehigh Valley, on which road a number of tests were made on April 12 and 27, May 1, 9 and 23, and June 7, 10 and 14, all the tests showing complete obedience to the rules.

By vacation of a stay order last week in a preliminary injunction issued a year ago 54 ticket scalpers in Chicago are compelled to quit business or fight their way in court against 17 complaining railroads, assuming the burden of proof as to the legality of their business. This issue is involved in a case before the United States Supreme Court, but a decision is not expected for a year.

The State Railroad Commission of Wisconsin has ordered that the grain elevators at Superior owned by the railroads be opened for the use of the general public at reasonable rates. The grain dealers have long wanted this privilege because of an expected advantage in having grain inspected under the law of Wisconsin instead of under the law of Minnesota as is necessary at Duluth, across the river.

A. F. Dillinger, reporting on the condition of the Canadian Northern after the tie-up of that road last April, tells the Canadian Railway Commission that the causes of the breakdown were lack of motive power and cars and of roundhouses and repair shops; the severity of the winter; want of proper apparatus to keep tracks clear of snow, and complete absence of systematic organization. The report recommends that 15 snow plows and 10 flangers be purchased, that five more roundhouses and five more repair shops be built in the West, and that the company adopt a systematic organization.

The Interstate Commerce Commission announces that a final hearing on the proposed uniform bill of lading will be held October 15. A joint committee of representatives of the carriers and shippers has reported to the Commission that practically all of the carriers in the official classification territory and the original petitioners have agreed to the proposed form of bill of lading submitted to the Commission, and have requested the Commission to approve and prescribe that form.

The Canadian Railroad Commission has ordered that the trunk lines of that country cease discriminating against Windsor and other points in western Ontario in favor of Detroit and other points west of the St. Clair river. The rates from Detroit and Port Huron to eastern cities must be the maximum rates from Windsor and other points in that region. An order with a similar purpose is issued in regard to rates from points in Ontario near Niagara which it is declared have been too high as compared with rates from Buffalo.

The Pennsylvania Railroad has issued revised rules for handling explosive and inflammable freight. The large yellow label which must be put on boxes, barrels, etc., does not read "*Dangerous*," etc., but has been changed to, "Notice to Pennsylvania Railroad employees. CAUTION. This package must be carefully handled," etc. The words at the end of the old notice, "Fire or other danger or loss may result if these directions are not followed," have been omitted at the request of a large number of shippers, who were troubled by some consignees being afraid to accept goods which they deemed so dangerous.

Judge Thomas G. Jones, in the United States Circuit Court at Montgomery, Ala., July 13, declared unconstitutional the law recently passed in Alabama intended to prevent railroads from going to the United States courts when sued by the state for non-compliance with its law. According to the law in question, the mere act of beginning a suit in the Federal Court would work the abrogation of the license of the road to do business in Alabama. Judge Jones holds that such legislation violates the contract made between the state and the corporation, and therefore is invalid under both the state and the United States constitutions.

The terms of the agreement between the New York Central & Hudson River and the New York, New Haven & Hartford, as to the New Haven's purchase from the New York Central of electric current to be used between Wakefield and Grand Central Station, were settled some time ago. A memorandum to that effect was initialed by the presidents of the respective companies some time before the daily newspapers began a series of stories of the progress of the negotiations and the difficulties and disagreements, with general suggestions that these were responsible for the delay of the New Haven in using electric power to reach Grand Central Station. The price to be paid has not been made public, but the basis for the terms was the cost of production, together with the proper allowance for interest and depreciation on the New York Central plants.

Two Cents a Mile in Wisconsin.

The people of Wisconsin appear to have taken a second thought on the question of passenger fares in that state and to have rescinded what was supposed to be their approval of the decision of the State Railroad Commission when it held that 2½ cents a mile was a proper maximum on the principal railroads of the State. The legislature has now passed a law, which has been signed by the Governor, limiting all fares to 2 cents a mile on every railroad having yearly gross receipts of $3,500 a mile.

Rock Island Employees' Magazine.

Publication of a magazine for employees of the Chicago, Rock Island & Pacific has been begun. It will be issued the latter part of each month, and it is intended that every person on the Rock Island payroll shall receive it regularly, free of cost. The first number contains an announcement by President Winchell, of the Rock Island Lines, beginning with a statement substantially as above, and explaining the scope and objects of the publication. The magazine is to be a 64-page publication beginning with No. 3, by which time it is expected to have it fully organized. The current number contains 16 pages and No. 2 will have 32 pages. It will also have a suitable cover design, to be chosen from drawings which the employee readers have been asked to submit. The first issue contains some good reading,

giving promise of a publication of real value and excellence when the full purpose, as set forth by the president, has been incorporated into its columns. The editor and manager is H. E. Reisman, 323 La Salle Street Station, Chicago.

Canadian Fire Precaution Rules.

The Dominion Railway Commission has issued new regulations to govern all Canadian roads in protection against fires. There must be a fire extinguisher at each end of each passenger coach, of a pattern approved by the board, under penalty of $25. A watchman must be provided for every 2½ miles of track, or, if furnished with a track bicycle, for each five miles of track. A barrel of water must be provided at every trestle and one at every 100 ft. Companies are required to keep the whole width of the right of way near any trestle free from brush. The use of lignite coal is prohibited.

A New Paulus Track Drill.

The Buda Foundry & Manufacturing Co., Chicago, has produced a new style of Paulus track drill, which is illustrated herewith. It is much like the older style but has a number of improvements. These are briefly as follows:

The frame, which can collapse backwards to allow trains to pass without disturbing the setting of the drill, is heavier and stronger than before, being of T section, which secures comparative lightness with greater stability, and makes it possible to do heavy work without racking the frame. The variable-feed arrangement shown in Fig. 2 is simple. The pawl which operates the feed-screw ratchet wheel is actuated by a rocker shaft. This rocker shaft is kept in motion by the eccentric which revolves with the spindle. The arm that rests on the eccentric has a small roller bearing which relieves friction and wear. Over the feed-screw ratchet wheel is a small semi-circular shield which is slotted at the end hid from view and held in position by the thumbscrew at the side of the base. When in the position shown, the pawl slides along the top of the shield and drops into only one notch, but if the shield is allowed to slip back, the pawl will drop into the notches sooner and thus give a feed of one, two or three notches as desired. The ball-bearing thrust is placed between the feed screw and the spindle and is dust proof.

Another feature is the simple arrangement to feed the bit up to the work and return it quickly. This is done by a small crank handle at the rear of the frame. The spindle does not revolve while being moved to or from the rail. By the adjustable-handle arrangement, while using large bits with heavy feed in hard rail, a greater leverage can be obtained by the operator. When smaller bits are used with lighter feeds it is more desirable to have the handles shortened up, thus giving greater speed. The gearing has been changed, as compared with the former design, so that the work of the operator is lightened.

While either twist or flat bits may be used, the drill is shown equipped with the Rich spindle and chuck, and Rich flat high-speed steel bit. The makers claim that the flat bits will drill 10 to 15 times as many holes as other kinds before requiring to be re-sharpened. Also there is double the usable steel. The chuck is designed to permit only enough of the bit to project to penetrate the work, thus increasing the torsional strength.

Fig. 1—New Style Paulus Track Drill.

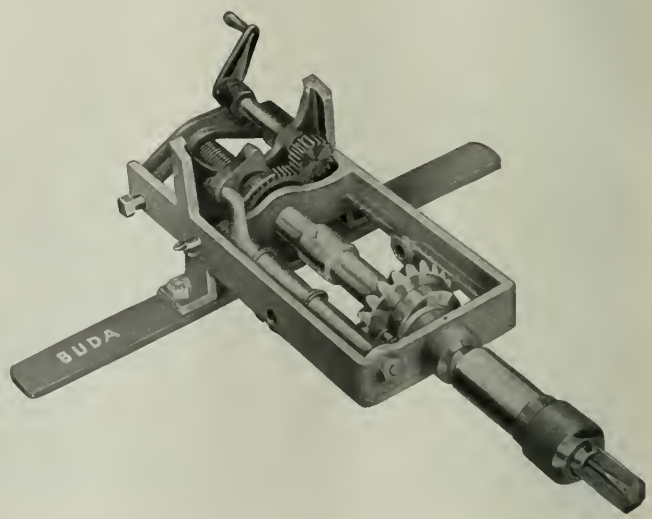


Fig. 2—Detail View of Base; New Paulus Drill.

Progress on the St. Paul Extension.

The point at which the St. Paul's Pacific extension crosses the Missouri river has been named Mobridge. Work is under way on the bridge but slow progress has been made as the temporary bridge has been washed away three times since the breaking up of the ice last spring, the last time by an unusually heavy June rise. The bridge is being built with caissons of which as yet only one has been sunk. The stone work on this pier is up to the water line. The new line west of the river is nearly finished to the point where it crosses into North Dakota at the northeast corner of Butte county, South Dakota. See article on page 72 covering progress on the western end.

Reduced Passenger Fares in the West.

The substance of the fragmentary unofficial statements given to the newspapers in Chicago concerning changes in passenger rates appears to be that between Chicago and the Rocky Mountain states rates on the principal roads, both interstate and intrastate, are to be put on the basis of 2 cents a mile as soon as the tariffs can be prepared; and that east of Chicago a similar change is contemplated but will not be made for two or three months yet. West of Chicago a 2,000-mile interchangeable book is to be sold at $40 and the mileage bureau will be abolished. East of Chicago the 1,000-mile book at $25, good only for the purchaser, with a rebate of $5, will be continued.

Doing Away With the Call Boy.

It is announced at Altoona, Pa., that the enginemen, firemen and trainmen of the Pennsylvania living in that city are to have telephones put into their houses at the expense of the railroad company so that they can, by that means, be called when they are wanted for duty, thus putting the time-honored peripatetic caller out of business.

The Stickney Tract.

Railroads centering in Chicago find it impracticable to utilize the joint car clearing yard, established 15 years ago by H. H. Porter and his friends on what is known as the Stickney tract, at a cost of $5,000,000, with accommodations for 5,000 cars. The yards have been idle for several years. About six months ago a movement was started to give them another thorough trial and the formulation of a plan was entrusted to a committee, but it has done

[illegible] The yards are [illegible] and the expense involved in their [illegible] prohibitive and the [illegible] dead. Miles of [illegible] rails are [illegible] are going into decay and a big investment [illegible] yielding no returns.—*Press Despatch.*

INTERSTATE COMMERCE COMMISSION RULINGS.

The Commission has postponed to October 1 all further action on the question of posting tariffs in stations. On that date a hearing will be held at Washington, and the order made June 10, designed to secure a better compliance with the law requiring the posting of two tariffs in every [illegible] temporarily suspended.

Wheat Rate from Oklahoma to Texas Reduced.

In an opinion by Commissioner Prouty decision has been announced in the case of W. O. Mitchell v. Atchison, Topeka & Santa Fe and others. The complainant, a resident of Oklahoma City, Okla., and a shipper of wheat, alleged that the rates charged by defendants for transportation of that commodity from Oklahoma City to Gainesville and Fort Worth, Tex., are excessive. The short-line distances are 140 miles to Gainesville and 202 miles to Fort Worth, and the rate in both cases was at the date of the hearing 28½ cents per 100 lbs. The Commission held that this rate on wheat is unreasonable, and required defendants to establish in lieu thereof a rate of 20 cents to Gainesville and of 22 cents to Fort Worth.

Estimated and Actual Weights of Shipments.

In an opinion by Commissioner Lane, the case of W. N. White & Co. v. Baltimore & Ohio Southwestern and Baltimore & Ohio, is decided. The complaint alleged that defendants' carload rate on apples from certain points in Illinois to New York City was unreasonable in that an arbitrary weight greater than the actual weight was imposed. Subsequently the railroads amended their tariffs so as to make them apply only to actual weight on such apples. On this showing the complaint was dismissed. In this decision the Commission said that it has recognized the right of carriers, in order to facilitate the movement of business, to fix an estimated weight on certain standard packages on which a rate is based. This estimated weight is taken into consideration in making the rate itself, and of such estimated weights shippers have the right to complain before the Commission and secure relief. But the facts in this case did not justify a finding that the estimated weight complained of was a violation of the Rate Law, therefore the claim for reparation is denied.

Rates on Staves Through East St. Louis Upheld.

In an opinion by Commissioner Lane the Commission has announced decision in the case of Omaha Cooperage Company v. Nashville, Chattanooga & St. Louis and others. Rates on oak staves and headings from Hollow Rock, Tenn., to East St. Louis when destined to South Omaha were claimed to be unreasonable compared with the rates from the same points of origin to East St. Louis when destined for Alexandria, Mo., or Keokuk, Iowa. The South Omaha rate is a combination of the 14-cent rate of the N., C. & St. L. and Illinois Central plus the "local" rate of 10 cents of the C., B. & Q., whereas the Keokuk or Alexandria rate is a joint rate of 19 cents, 14 cents to the two first carriers and 5 cents to the C., B. & Q. The complainant made no complaint against the C., B. & Q. rate. It appears that some years ago the division gave the C., B. & Q. its full "local" from East St. Louis to Keokuk or Alexandria, and the two eastern carriers 2 cents less than their joint rate to East St. Louis; but the division as now made gives these two roads the same earnings on cooperage products carried from Tennessee points to East St. Louis, whether destined to South Omaha, Alexandria or Keokuk. The complaint is dismissed.

Embargoes Against Individuals Unlawful.

The Interstate Commerce Commission has announced decision, in an opinion by Commissioner Lane, in the case of E. L. Rogers & Co. v. Philadelphia & Reading. It appeared that in July, 1906, defendant issued a special embargo on complainant's shipments of hay and straw destined to the Reading's 23d and Arch streets station in Philadelphia. The Commission holds that such embargo was an unlawful discrimination. Whatever may be said of an embargo against one commodity only in a time of congestion, nothing can be said for an embargo which refuses transportation facilities to some establishments while according such facilities to their competitors. If the exercise of such a power were to be at all tolerated, carriers would be able to issue sentence of commercial death against some of their patrons, while continuing to serve others. The Commission also holds that it has jurisdiction to forbid such [illegible] rates and to award reparation [illegible] and [illegible] resulting from [illegible] as [illegible] in the [illegible] fails to show that the shipments [illegible] were [illegible] claim for [illegible] injury [illegible] tained by the [illegible].

Railroad Ordered to Make Through Route and Rate With Steamship Company May Secure Itself.

The Commission, in an opinion by Commissioner Prouty, has announced decision in the case of the Enterprise Transportation Co. v. Pennsylvania Railroad and New England Navigation Company. The purpose of the proceeding was to compel the Pennsylvania to make a through route and joint rate with the complainant from Jamestown, Rhode Island, to Philadelphia, Pa., for transportation of fish.

The Commission holds that no satisfactory through route exists from Jamestown to Philadelphia within the meaning of the language of the Rate Law. Even if the present arrangement should be regarded as a satisfactory through route, complainant's right to maintain this proceeding would not be affected thereby, since, at the time the complaint was filed, through route from Jamestown by defendants' lines had been abandoned and for a time thereafter was not in operation.

The Commission ordered the Pennsylvania and the complainant to establish, for the transportation of fish, from Jamestown to Philadelphia, a through route, and apply thereto a joint rate of not more than 31 cents per 100 lbs., except that the Pennsylvania may, if it wishes to do so, apply to the Commission for an order requiring complainant to indemnify it against any loss it may suffer in the premises by reason of the financial irresponsibility of complainant.

Connections with Industrial Road Must Be Made; Divided Opinion of the Commission.

The Interstate Commerce Commisson, in an opinion by Commissioner Prouty, has announced decision in the case of McRae Terminal Railway v. Southern Railway and Seaboard Air Line. The complainant, owning a railroad about one mile long, from a point near the Southern in McRae, Ga., to a point near the Seaboard Air Line, alleged that these roads decline to make with it physical connections at its termini. The Commission holds that as such connections are practicable, can be made without hazard to the public, and the complainant's prospective business is sufficient to justify the connections, the defendants should give complainant the physical connections asked for, but they should be made at the expense of complainant. Definite order is withheld pending action of the defendant carriers and taking of further testimony. In deciding this case, the Commission refers to the decision of the Supreme Court of the United States in the case of Wisconsin, Minnesota & Pacific v. Jacobson, holding that an order of the State Commission of Minnesota directing a physical connection between two railroads of that state in pursuance of a statute of the state was a valid exercise of authority, and the Commission sees no reason why Congress may not, as it has done, exercise the same authority over a railroad handling interstate traffic which the state can exercise with respect to state traffic.

Dissenting opinions are filed by the Chairman and Commissioners Clark and Harlan.

Through Rate Reduced to Sum of Locals; State Legislation No Bar to Power of the Commission.

The Interstate Commerce Commission, in an opinion by Commissioner Harlan, decides the case of Hope Cotton Oil Co. v. Texas & Pacific and St. Louis, Iron Mountain & Southern. The complaint alleged that defendants' joint through rate of 67 cents per 100 lbs. on cotton seed, carloads, from points north of Shreveport, La., on the Texas & Pacific, via Texarkana to Hope, Ark., on the St. L., I. M. & S., is unreasonable, and that a reasonable rate would be a through rate equal to the sum of the present local rates in and out of Texarkana, which is 17.5 cents per 100 lbs. After complaint was filed, defendants put in effect between the points of origin in Louisiana and Hope a joint through rate of 30 cents per 100 lbs. on cotton seed in carloads with a minimum weight of 30,000 lbs. per car. The Commission holds, upon the record, that the present through rate of 30 cents is unreasonable and that it should not exceed 17.5 cents, the sum of the locals, with a minimum carload weight of 30,000 lbs. The carriers are ordered to put the reduced rate in force on or before August 26.

The Commission further says that while a rate fixed by a state statute or a state commission is naturally and properly entitled to respectful consideration, it has no greater sanctity, as applied to interstate traffic, than a rate established by a railroad; and the Commission will not hesitate, on proper evidence that a rate so

established would be unjust either to a carrier or to a shipper, to refuse to accept it as a basis for fixing an interstate rate.

Compression Privileges on Cotton.

The Interstate Commerce Commission, in an opinion by Commissioner Lane, has decided the case of Muskogee Commercial Club and Muskogee Traffic Bureau v. Missouri, Kansas & Texas. In this case it appeared that defendant's rule for compression of cotton in transit allows uncompressed cotton, on demand of shippers, to be taken out of Muskogee, Ind. T., and points north, including the Tulsa division, for compression at South McAlester, Ind. T., but does not allow uncompressed cotton to be taken out of or through South McAlester for compression at Muskogee. A large part of the cotton grown in the territory tributary to Muskogee is sold in the East, and is always compressed before being loaded for the long haul. Under the practice of compressing at South McAlester, uncompressed cotton originating at Muskogee and points north is hauled by defendant to South McAlester, unloaded at that compress, compressed, reloaded and then hauled back over the same line of railroad, passing again through Muskogee to defendant's eastern terminus, involving an extra service of 124 miles for which defendant receives no compensation. The Commission held, upon these facts, that defendant's rule for compression of cotton results in undue prejudice against Muskogee, and that defendant should grant all the privileges to one compression point herein considered that it grants to the other.

The Commission also held that the fact that a compress company at South McAlester has another compress at Fort Smith and threatens, unless the foregoing preference is given to its compress at South McAlester, to divert its cotton traffic to another railroad, does not justify discrimination in the rules or practices of defendant, as the competition described is not the character of competition that relieves from the operation of the statute.

The question of compression of cotton in transit, says the Commission, is not one with which a railroad may deal entirely as it sees fit and without respect to the effect which its practices have on the transportation of cotton. Either the carrier must publish a rate on uncompressed cotton and another rate on compressed cotton and divorce itself entirely from the matter of compression, or else such compression as is given by the railroad becomes subject to the jurisdiction of the Commission. Where a railroad company declares a policy which allows compression of cotton in transit at the nearest point it cannot vary that rule so as to give certain shippers the opportunity to avoid it and thereby receive an advantage which is not given to shippers generally.

Toll by the Coast Line Route to San Francisco Abolished.

The Interstate Commerce Commission on July 12, in an opinion by Commissioner Lane, decided the San Francisco Toll Case, which involved the right of the Southern Pacific to charge as a part of its rate to San Francisco a state toll of 5 cents a ton. The Southern Pacific enters San Francisco by two lines, one from the northeast, known as the Ogden route, which reaches San Francisco bay at Oakland; and traffic by this route is ferried across the bay, landed on the wharves in San Francisco, and hauled thence to its station and yards. The second route, known as the Coast Line, comes from the southeast, following generally the line of the ocean shore, and enters San Francisco by the all-rail peninsular route, landing its traffic at the railroad company's station. The Ogden line is much the older of the two, and was, until merged with the Southern Pacific, the Central Pacific. The Coast Line, by which freight is transported to and from San Francisco without crossing San Francisco bay or the wharves or water front of San Francisco, has been open only since June, 1901.

The title to the land which constitutes the water front of the city and county of San Francisco is in the state of California, and the general charge and management of this water front, and of the docks and wharves erected along the same, are in the board of state harbor commissioners, which is vested by law with the right to collect charges for dockage, wharfage and tolls, and to fix and regulate the rates of dockage, wharfage, cranage, tolls and rents for their use. In accordance with this power, the board has fixed a schedule of tolls on merchandise passing over these state premises, ranging proportionately downward from 5 cents a ton to 1 cent on 400 lbs. or less.

Commissioner Lane continues: Traffic moves from the east via the Coast Line to San Francisco, and is there delivered to the consignee, to whom is presented an expense bill showing, among other items, the articles carried, their weight, the rate of transportation, total freight charges, and, in addition, under the heading "Toll," the amount which the consignee would have been required to pay upon the shipment had the shipment moved by the transbay route instead of by the Coast Line. In other words, the rate to San Francisco is exactly the same by both routes; but when the traffic moves across the bay from Oakland to San Francisco the Southern Pacific collects a toll which it in turn pays to the state for the use of its wharves; whereas if the shipment moves by the Coast Line and enters San Francisco without crossing the bay, an expense bill of precisely the same character, and including a charge for toll, is presented to the consignee. Thus the question arises, Why should the railroad be allowed to charge a toll on Coast Line shipments which it is not required itself to pay, and which is not in any way a charge which the railroad has to meet, and for which it renders no service?

The theory on which transcontinental rates are made is that the rail carriers are compelled to meet the competition of the water carriers doing business out of San Francisco bay. Prior to the time of transcontinental rail carriage transportation from the Eastern states to San Francisco was wholly by water or by the Panama or Nicaragua routes; and when the first transcontinental railroad line reached tide water it found itself compelled to meet this competition. On this theory the transcontinental lines have justified, and properly so, lower rates to San Francisco than to intermediate points. The rate to Pacific Coast Terminals is designated by railroad men as a compelled rate—one which the carriers themselves would not make were they not required to do so by water competition.

When the Ogden line reached San Francisco bay at Oakland it found that to deliver goods in San Francisco it was compelled to pay an arbitrary toll fixed by the state for crossing the state lands abutting the bay upon which the wharves surrounding San Francisco were built. It therefore inserted in its tariffs a note to the effect that, in addition to the regular transportation charges, freight arriving at San Francisco would be required to meet an additional toll charge—a charge which the freight brought to San Francisco by ocean carriers was also compelled to meet. Later, when the Coast Line was built, the same tariff was made applicable to freight carried by that route, and thus it results that freight into San Francisco by the coast route bears an arbitrary charge of 5 cents a ton for crossing a wharf which it never crosses.

The Southern Pacific's contention, however, is that it is entitled to make this charge on a shipment which does not cross the bay, because it may properly impose on transcontinental business any rate, not unreasonable in itself, which it can get in competition with water carriers, and therefore may include in its rate an amount equivalent to the state toll, because the water competition which it has to meet must always be compelled to meet the toll charges of the state.

This argument is adroit, but does not appeal to us as conclusive. The tariff would make it appear that this toll charge was actually imposed on all freight entering San Francisco. This, we perceive, is not the fact. Moreover, all eastbound freight leaving San Francisco is not subject to this charge, at least as a toll charge, no matter by what route it goes. The toll, it is contended, when toll is paid, is in fact included in the rate itself—is absorbed by the carrier and not specifically and separately charged as in the case of westbound business.

If the rate to San Francisco by the Coast Line, including the additional toll charge, is in and of itself reasonable, there is no reason why the tariff applicable to the Coast Line cannot be made to state, as the law requires, the full rate via that route to San Francisco. But it is to be noted that Sacramento, Stockton and other cities farther inland than San Francisco are given the benefit of terminal rates without such additional toll charge, although the one reason that is assigned for supporting such rates is their proximity to San Francisco, through which city alone they have the advantage of water competition.

The history of this toll provision leads to the conclusion that it was never intended as a part of the transportation rate; and certainly if the Coast Line had been first built its tariff would not have contained any such provision. Why, then, should we now regard it as properly inserted in a Coast Line tariff? Moreover, the law does not contemplate that a rate shall be made by including charges which the carrier does not in fact meet; and a tariff or schedule of transportation rates which makes the rate charged dependent upon one or more factors which do not enter into the transportation as it is actually conducted, does not conform to the law. To illustrate: A rate over the New York Central into New York city from the West could not properly be stated as $1 per 100 lbs. with a notation elsewhere in the tariff stating that all goods destined to New York city would bear an additional charge equivalent to the cost of lighterage from Jersey City to New York, which all rival carriers entering New York are compelled to pay.

It will be ordered, therefore, that the Southern Pacific shall cease from making any charge for toll at San Francisco when such toll charge is not actually paid by the carrier.

TRADE CATALOGUES.

Hicks Locomotive & Car Works.—A book illustrating the plants, equipment and products of this company has just been issued. It is a 100-page volume, 9¼ x 12, printed on calendered paper, with board covers. The company has two plants at Chicago Heights,

III. The West works include the locomotive and passenger car departments, the East works are the freight car shops. General and detail views of each plant are shown, also typical views of new and rebuilt locomotives turned out by the locomotive department and of locomotives overhauled for different large railroads. All kinds of cars from private and dining to baggage and express and freight equipment of all classes, are illustrated, also some special equipment, such as ballast spreaders and gasoline-electric motor cars. All the illustrations are excellent half tones, made from photographs. Their arrangement and the general make-up of the volume reflect credit on its compiler.

Railroad Track and Other Scales.—Bulletin No. 111 of the Huda Foundry & Manufacturing Co., Chicago, deals with scales. Railroad track scales, coal mine, depot and warehouse, wagon, elevator, portable and other scales, recording beams and quick weighing devices, are described and illustrated, and lists of parts given for each.

Structural Steel.—The Interstate Engineering Co., Cleveland, Ohio, is distributing advance sheets from Bulletin No. 8, soon to be issued. The circular, No. 101, illustrates some examples of structural steel work recently done by this company.

MANUFACTURING AND BUSINESS.

The Seaboard Air Line has given the contract for the oil-burning furnaces for its new shops at Jacksonville, Fla., to Tate, Jones & Co., Inc., Pittsburg, Pa.

Atwood Paxson & Company has been formed to deal in iron and steel products and railroad equipment and supplies, with office at 120 Liberty street, New York. Mr. Paxson was for some years with L. J. Buckley & Company, of New York city.

P. G. Ten Eyck, hitherto Treasurer and Chief Engineer of the Federal Railway Signal Co., Troy, N. Y., has been appointed Vice-President, with office at Albany, N. Y. The officers are now: J. T. Cade, President; Lawrence Griffith, Vice-President; P. G. Ten Eyck, Vice-President; Frederic Pruyn, Treasurer; C. E. Newman, Secretary.

Gilbert Greenbusch, C.E., of London, England, is in New York for a few weeks with address at 17 Battery Place. He is an American engineer, graduate of Stevens Institute, with ten years' residence in London, where he is an associate member of the British Institute of Civil Engineers. He has just completed his work as engineer in charge of construction of the lifts in the London underground electric railways and now proposes to introduce American mechanical and electrical specialties in Europe. He is well equipped in character, knowledge and acquaintance.

Hermann von Schrenk, well-known to readers of the *Railroad Gazette*, has resigned as Pathologist in charge of investigations of timber diseases and methods for their prevention in the United States Department of Agriculture, and has associated himself with E. B. Fulks and Alfred L. Kammerer, Consulting Timber Engineers, with office at Tower Grove and Flad avenues, St. Louis. Mr. von Schrenk has been appointed Timber Engineer of the Rock Island, the St. Louis & San Francisco and the Chicago & Eastern Illinois railroad systems. His new office will be prepared to carry on investigations and make reports on all problems dealing with the best methods for handling and using timbers. It would seem that this is a field of great usefulness, since work of this character is highly important now and must constantly become more so as the timber reserves of the country become cut off.

Iron and Steel.

The Atchison, Topeka & Santa Fe has ordered 30,000 tons, and the Delaware, Lackawanna & Western 7,500 tons of rails from the Bethlehem Steel Co. for 1908 delivery. They are to be rolled in the new rail mill now nearly completed at Bethlehem and will be made from open hearth steel with a maximum of .04 phosphorus. The Santa Fe specifications require 25 per cent. crop on the ingots and the Lackawanna 20 per cent. It is reported, though it cannot be confirmed, that the price is $35 a ton, an increase of 25 per cent. over the pool price.

OBITUARY NOTICES.

Charles H. Nye, formerly and for a number of years Superintendent of the Cape Cod division of the Old Colony Railroad, now part of the New York, New Haven & Hartford, died at his home at Hyannis, Mass., on July 9. Mr. Nye was 85 years old.

W. H. Hayden, Advertising Manager of the Boston & Maine, died at Littleton, N. H., on July 8, a few hours after being thrown out of a carriage. Mr. Hayden went to the Boston & Maine at the end of last year, after having been in charge of advertising on the Central of New Jersey for five years. He was 35 years old at the time of his death.

Charles H. Rockwell, General Traffic Manager of the Chicago, Indianapolis & Louisville, died on July 6 at Indianapolis, Ind., of heart failure. Mr. Rockwell was born in 1852 at Terre Haute, Ind., and began railroad work in 1869 as an assistant yard clerk on the Cleveland, Columbus, Cincinnati & Indianapolis, now part of the Big Four. He worked his way up through several positions, on roads which are now part of the New York Central lines, until 1884 when he was made Auditor of the Cincinnati, Hamilton & Dayton. After serving as General Passenger and Ticket Agent of that road he went to the Pullman Company in 1888 as Secretary to the President, but a few months later was made General Superintendent of the Columbus, Hocking Valley & Toledo, now part of the Hocking Valley. Two years later he was appointed General Superintendent of the Chicago & Eastern Illinois, and in 1893 was made Assistant to the President of that road. Later in the same year he went to the Cincinnati, Akron & Columbus as General Passenger Agent. From 1895 to 1897 he was Auditor of the Western Passenger Association and then took the office which he held at the time of his death.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad conventions and engineering societies, see advertising page 24.)

International Railroad Master Blacksmiths' Association.

The fifteenth annual convention of this association is to be held at Montreal, Canada, August 20, 21 and 22. Headquarters will be in the Bath Hotel, where accommodation can be had at a rate of $2.50 a day for each person, including all meals.

The subjects to be presented are: Flue Welding, John Conners, Chairman;

Tools and Formers for Bulldozers and Steam Hammers, G. M. Stewart, Chairman;

Piece Work, Grant Bollinger, Chairman;

Discipline and Classification of Work, S. Uren, Chairman;

Case Hardening Methods, Time Taken and Samples, Geo. Masser, Chairman;

Best Fuel for Use in Smith Shop, Jos. Jordan, Chairman;

Frame Making and Repairing, Grant Bollinger, Chairman;

Thermit Welding, Geo. Kelly, Chairman.

Master Car and Locomotive Painters' Association.

The thirty-eighth annual convention of this association is to be held at St. Paul, Minn., September 10-13. Arrangements have been made for hotel accommodation on the American plan at the Hotel Ryan, at prices ranging from $3 to $4 a day for each person. The subjects for discussion are as follows:

Painting of Steel Passenger Cars, a composite paper by John D. Wright (B. & O.), H. M. Butts (N. Y. C. & H. R.), and R. J. Kelly (Long Island);

Disinfecting Passenger Cars at Terminals, H. E. Smith (L. S. & M. S.), R. W. Mahon (N. Y. C. & H. R.), A. J. Bruning (L. & N.);

Cleaning, Coloring and Lacquering of Metal Trimmings, B. E. Miller (D., L. & W.), Geo. Warlick (C., R. I. & P.), C. A. Cook (P., B. & W.);

Painting Locomotives and Tenders, J. H. Kahler (Erie), W. A. Buchanan (D., L. & W.), E. Daly (C., C., C. & St. L.);

Linseed Oil Substitutes and Drying Oils, W. O. Quest (P. & L. E.), W. H. Smith (Southern Ry.).

There is also to be an essay on Problems of the Present-day Paint Shop, by Chas. E. Copp (B. & M.).

There will also be a number of queries as follows:

Have you found any coating that will resist rust? Discussion opened by Chas. E. Becker (C., C., C. & St. L.).

Denatured Alcohol—Is it a satisfactory substitute for grain alcohol? Discussion opened by W. J. Orr (Erie).

Is it advisable to apply three coats of body color to a car? Discussion opened by J. Gearhart (Penn.).

Can light colored freight car stencil paints be improved? Discussion opened by W. Bailey (B. & M.).

Is pressed fiber as durable as a three-ply wood veneer? Discussion opened by O. P. Wilkins (N. & W.).

What should be the nature of a detergent? Discussion opened by B. E. Miller (D., L. & W.).

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Alabama & Vicksburg.—See New Orleans & North-Eastern.

Ashland, Odanah & Marengo.—The officers of this company are as follows: President, L. K. Baker, with office at Odanah, Wis.; Vice-President, J. Stearns, with office at Ludington, Mich.; Secretary and Treasurer, E. B. Hill; General Freight Agent, F. J. Darke; Superintendent, E. Mercier, and Auditor, D. J. McMahon, all with offices at Odanah.

Boyne City, Gaylord & Alpena.—The office of Traffic Manager has been abolished. C. J. Wilson has been appointed General Freight and Passenger Agent and Assistant Superintendent. G. W. Laing, Purchasing Agent, has been appointed also Auditor. W. L. Martin has been appointed Superintendent. Frank Butler has been appointed Trainmaster.

Brinson Railway.—The officers of this company are as follows: President and Superintendent, G. M. Brinson; Vice-President and Traffic Manager, Charles Neville, heretofore General Freight and Passenger Agent of the Georgia Coast & Piedmont; Auditor, E. K. Bonney, all with offices at Springfield, Ga.

Cairo Northern.—The officers of this company are as follows: President, W. T. Whiteman; General Manager, E. M. Decker; Traffic Manager, T. Tilford; General Freight Agent, C. P. Bowen, and General Passenger Agent, W. S. Bowen, all with offices at Cairo, Tex.

Central of New Jersey.—F. T. Dickerson has been appointed Assistant Secretary, succeeding Joseph James, Jr.

Charlotte Harbor & Northern.—The officers of this road, which will be opened for traffic on August 1, are as follows: Second Vice-President and General Manager L. M. Fouts, with office at Jacksonville, Fla.; General Freight and Passenger Agent J. L. de Treville, with office at Arcadia, Fla.; Superintendent C. B. McCall and Auditor W. J. Gilligan, both with office at Hull, Fla.

Chicago & Calumet River.—F. N. Hoffstot, President, and J. W. Friend, Vice-President, of the Pittsburg, Allegheny & McKee's Rocks, have been elected also to these offices on the Chicago & Calumet River.

Corvallis & Eastern.—G. W. Talbot, Vice-President and General Manager, has resigned to go to the Oregon Electric with the same title.

Georgia Coast & Piedmont.—W. R. Basset has been appointed Auditor, succeeding W. B. Scott. See Brinson Railway.

Mississippi Eastern.—Walter Stone has been appointed Auditor, with office at Quitman, Miss.

Mobile, Jackson & Kansas City.—L. S. Berg, formerly President of the New Orleans Terminal, has been elected President of the Mobile, Jackson & Kansas City, succeeding B. M. Robinson, resigned.

New Orleans & North-eastern.—L. A. Jones, Auditor, has been elected also Vice-President of this road and of the Alabama & Vicksburg and the Vicksburg, Shreveport & Pacific, succeeding D. D. Curran, who was recently elected President.

New York Central & Hudson River.—William J. Wilgus, Vice-President, has resigned and his service with this company will end on October 1 next. He does not expect to enter other railroad service; it is probable, rather, that his future work will be in an advisory capacity. He leaves indelible marks on the property of the company of which he has been a general officer only eight years. He became Chief Engineer in May, 1899, and began at once to standardize the roads, track and structures. His large blue print volume of standard drawings of ballast, track signs, signal posts, culverts, bridges and structures of all kinds is a monument of industry and skill. He fulfilled the instruction of the then President, Mr. Callaway: "Make it so that I can wake up anywhere on the line and look out of the window and know I am on the Central." His far-seeing advocacy, as well as construction, of the Beech Creek extension, which insures the company's supply of bituminous coal, was much to his credit. He will long be best known for having planned, designed and executed the electrification of the New York City terminal, an engineering work of the first magnitude and made difficult by the necessity for keeping the terminal open for the heavy traffic of two great railroads while it is being entirely reconstructed, both under and above ground. Of his most startling innovation in engineering methods, comparatively little has been said. His entirely novel method of tunnel construction is now being carried out under his own supervision for the Michigan Central's traffic under Detroit river, and the cost of it, as contracted for, is just one-half the price bid by Sir Weetman Pearson's contracting firm. There is no reason to expect that the ambitions of this engineer, less than 42 years old, are at all satisfied, or that there will be any considerable intermission in his activities.

William J. Wilgus.

See Toronto, Hamilton & Buffalo.

New York Public Service Commissions.—John S. Kennedy, of Corning, N. Y., has been appointed Secretary of the Commission for the Second district. Mr. Kennedy had been for several years Secretary of the New York State Railroad Commission. T. H. Whitney is Secretary of the Commission for the First district, the office of which is at 320 Broadway, New York City.

Pittsburg, Allegheny & McKee's Rocks.—See Chicago & Calumet River.

Rio Grande, Sierra Madre & Pacific.—The authority of the officers of this company have been extended over the Sierra Madre & Pacific.

Shreveport, Houston & Gulf.—The officers of this company are as follows: President, W. T. Carter, with office at Houston, Tex.; Vice-President and General Manager, G. A. Kelley; Secretary and Treasurer, C. C. Gribble, and Auditor and Traffic Manager, L. D. Garrison, all with offices at Manning, Tex.

Sierra Madre & Pacific.—See Rio Grande, Sierra Madre & Pacific.

Silver Lake Railway.—L. S. Ward has been appointed Treasurer, with office at Rochester, N. Y., succeeding G. L. Eaton, resigned.

Southern.—J. S. B. Thompson, General Agent of the Executive Department at Atlanta, Ga., has been appointed Assistant to the President, with office at Atlanta.

Toronto, Hamilton & Buffalo.—D. W. Pardee, Secretary of the New York Central & Hudson River, has been elected also Secretary of the Toronto, Hamilton & Buffalo.

Vicksburg, Shreveport & Pacific.—See New Orleans & North-eastern.

Operating Officers.

Atchison, Topeka & Santa Fe.—A third grand division has been created and H. W. Sharp, Superintendent at Kansas City, Mo., has been appointed General Superintendent of it, with office at La Junta, Colo. D. Farley succeeds Mr. Sharp.

Atlantic Coast Line.—The First division is to be divided into two divisions, to be known as the First division and the Second division. The new First division will consist of the lines between Richmond, Va., and Florence, S. C., and the Second division of the lines between Florence and Savannah, Ga. The present Second division, from Savannah, Ga., to Jacksonville, Fla., will hereafter be known as the Third division, while the present Third division, consisting of the lines in Florida, will become the Fourth division. A. W. Anderson, General Superintendent of the present First division, has been appointed General Superintendent of the new Second division, with office at Florence. W. H. Newell, Superintendent of Transportation of the present First division, has been appointed General Superintendent of the new First division, with office at Rocky Mount, N. C. J. C. Murchison, Superintendent of the Wilmington district, succeeds Mr. Newell, with office at Wilmington, N. C. All appointments are effective August 1.

Brooklyn Rapid Transit.—W. S. Menden, Chief Engineer, has been appointed General Superintendent, succeeding D. S. Smith, resigned.

Central of Georgia.—J. J. Cotter has been appointed Superintendent at Cedartown, Ga., succeeding R. J. Armstrong, resigned.

Chicago & Illinois Western.—H. Bates, foreman of locomotive and car repairs, has been appointed General Superintendent, succeeding D. P. Plummer.

Colorado & Northwestern.—C. M. Williams has been appointed Superintendent, with office at Boulder, Colo.

Colorado Southern, New Orleans & Pacific.—G. Kennedy has been appointed Trainmaster at Eunice, La.

Illinois Central.—T. L. Dubbs, Superintendent at Nashville, Tenn., has been appointed Superintendent of the Birmingham division. L. E. McCabe, Trainmaster at Louisville, Ky., succeeds Mr. Dubbs.

Interoceanic of Mexico.—See National Lines of Mexico under Engineering and Rolling Stock officers.

Lehigh & New England.—J. V. Lyddon has been appointed Trainmaster at Pen Argyl, Pa., succeeding J. E. Curry, resigned.

Malheur Valley.—See Oregon Short Line.

Minidoka & Southwestern.—See Oregon Short Line.

National Lines of Mexico.—H[illegible] Taylor, who was recently appointed Assistant General Manager, was born at Montgomery, Ala., in 1870. He graduated from the Alabama Polytechnic Institute in 1889 and immediately began railroad work as a draftsman on the Birmingham Mineral division of the Louisville & Nashville. He worked his way up on this road until he became resident engineer in charge of construction of the Coosa river bridge near Shelby, Ala. In 1891 he went to the National of Mexico as engineer and supervisor; he served as brakeman, conductor and yardmaster until 1895, when he was made Trainmaster at Laredo. Five years later he was made Division Superintendent, and in 1902 Superintendent of Construction of the Mexico-Gonzalez line. In [illegible] he was appointed General Manager of the Interoceanic of Mexico, where he remained until his recent appointment as Assistant General Manager of the National Lines of Mexico in charge of engineering and maintenance.

National Railroad of Mexico.—See National Lines of Mexico under Engineering and Rolling Stock officers.

Oregon Short Line.—C. M. Hunt, Superintendent of the Pacific & Idaho Northern, has been appointed to the new office of Trainmaster of the Third, Fourth and Fifth districts of the Idaho division and the Boise branch of the Oregon Short Line, the Minidoka & Southwestern and the Malheur Valley, with office at Nampa, Idaho.

Pacific & Idaho Northern.—See Oregon Short Line.

Rio Grande Western.—A. B. Apperson, Assistant Superintendent at Helper, Utah, has been appointed Assistant Superintendent at Salt Lake City, Utah, succeeding H. J. Roth. R. R. Sutherland succeeds Mr. Apperson.

St. Louis, Brownsville & Mexico.—G. B. Huestis, General Superintendent, has been appointed Superintendent of the First division, consisting of the line from Brownsville to Kingsville and the Hidalgo branch, and the office of General Superintendent has been abolished. Oliver Rowe has been appointed Superintendent of the Second and Third divisions, consisting of the line from Kingsville to Algoa and the joint track from Corpus Christi to Robstown. E. T. Gibson has been appointed Trainmaster of the whole road. W. B. Upp has been appointed Car Accountant, succeeding C. J. Crane. The offices of all are at Kingsville, Tex.

Trinity & Brazos Valley.—W. A. Allison, who was recently appointed Superintendent of Telegraph, was born at Glade Spring, Va., in 1875, and began railroad work in 1891 as a telegraph operator on the Norfolk & Western. He was appointed train despatcher in 1897, and soon after went to the Baltimore & Ohio in the same position. He was later appointed to the same office on the Missouri, Kansas & Texas, and in 1899 went to the Illinois Central as despatcher at McComb, Miss. He was made chief train despatcher at that place in 1903 and in 1905 was appointed Trainmaster of the Memphis division of the Yazoo & Mississippi Valley, where he remained until he resigned in June of the current year to go to the Trinity & Brazos Valley.

W. A. Allison.

Traffic Officers.

Atlantic Coast Line.—A. C. Kenly, Freight Claim Agent, has been appointed Superintendent of Freight.

Bedford Stone Railway.—J. G. Ray has been appointed General Freight Agent, succeeding H. W. Walters, resigned.

Brookhaven & Pearl River.—W. J. Helmick has been appointed General Freight and Passenger Agent, with office at Brookhaven, Miss., succeeding Alfred Mead, resigned to go to another company. See Tremont & Gulf.

Chicago, Rock Island & Pacific.—H. C. Battles has been appointed to the new office of General Agent at Peoria, Ill.

Delaware & [illegible].—A. M. White has been appointed General Freight and Passenger Agent, with office at New York, succeeding W[illegible] Harrison, resigned.

Michigan Central.—H. R. Daly has been appointed General Agent at Grand Rapids, Mich.

Minneapolis, St. Paul & Sault Ste. Marie.—J. S. Carter has been appointed General Agent at Spokane, Wash.

Missouri Pacific.—J. B. T[illegible], General Agent at [illegible], has been appointed General Agent at Pittsburg, Pa., succeeding John Walsh.

National Lines of Mexico.—The territory to be covered hereafter by the General Eastern Agent at New York will include Pennsylvania, New England and the Atlantic states, as well as Nova Scotia, New Brunswick and that part of Ontario east of a north and south line passing through Port Huron, Mich. The territory of the General Western Agent at Chicago includes all the rest of the United States and Ontario except Texas, Oklahoma and Indian Territory, which will be in charge of the General Agent at San Antonio, Tex., who, however, will not have charge of the Texas-Mexican Railway.

St. Joseph & Grand Island.—H. C. Mitchell has been appointed General Agent at Pittsburg, Pa.

Sierra Valley Railway.—W. H. O'Neill has been appointed Assistant Traffic Manager.

Somerset Railway.—F. V. Berry has been appointed Assistant General Freight and Passenger Agent, with office at Oakland, Me.

Tremont & Gulf.—Alfred Mead, General Freight and Passenger Agent of the Brookhaven & Pearl River, has been appointed General Freight and Passenger Agent and Assistant Superintendent of the Tremont & Gulf.

Western Maryland.—F. M. Howell, General Passenger Agent, has been appointed General Passenger and Ticket Agent, succeeding to the duties of James D. Whittington, General Ticket Agent and Ticket Auditor, who has resigned on account of ill health, and whose former position has been abolished.

Engineering and Rolling Stock Officers.

Colorado & Northwestern.—Leonard Ruhle has been appointed Master Mechanic, with office at Boulder, Colo., succeeding M. Fitzgerald.

Colorado & Southern.—H. W. Ridgway, Master Mechanic at Trinidad, Colo., has been appointed Master Mechanic at Denver, Colo., succeeding D. Patterson, resigned.

Manitoulin & North Shore.—C. M. Colburne has been appointed Chief Engineer, with office at Sault Ste. Marie, Ont.

Mexican International.—See National Lines of Mexico.

National Lines of Mexico.—G. P. De Wolf, Superintendent of Terminals of the National Railroad of Mexico at Mexico City, has been appointed Assistant Chief Engineer of the Mexican International, with office at C. Porfirio Diaz, Coahuila, Mex., succeeding C. J. Carroll, resigned to go into other business. E. W. Bowans, Trainmaster of the Interoceanic of Mexico at Pueblo, succeeds Mr. De Wolf.

Purchasing Agents.

Georgia & Florida.—J. M. Turner, General Manager, has been appointed also Purchasing Agent.

LOCOMOTIVE BUILDING.

The Southern is about to buy 50 light locomotives.

The Central Vermont is said to be figuring on 10 locomotives.

The Grand Trunk Pacific, it is said, is about to buy 50 eight-wheel locomotives.

The Grand Trunk, it is understood, is to buy 100 locomotives within the next two months.

The Yosemite Valley has ordered one eight-wheel locomotive from the American Locomotive Company.

The Green Bay & Western has ordered one mogul locomotive from the American Locomotive Company.

The Santa Fe, Raton & Des Moines has ordered one ten-wheel locomotive from the American Locomotive Company.

The Hanyang Steel & Iron Works has ordered one four-wheel tank engine from the American Locomotive Company.

The Burden Iron Company has ordered one four-wheel switching locomotive from the American Locomotive Company.

The Carnegie Steel Company has ordered one six-wheel switching locomotive from the American Locomotive Company.

The Memphis Warehouse Company has ordered one six-wheel switching locomotive from the American Locomotive Company.

The Intercolonial has ordered 22 locomotives from the Kingston Locomotive Works and the Locomotive & Machine Company of Montreal.

The Louisville & Nashville has ordered eight consolidation Baldwin and switching locomotives from the American Locomotive Company.

The Savannah, Augusta & Northern, which is to build a road in Georgia, has ordered two mogul locomotives from the American Locomotive Company. W. J. Oliver, Knoxville, Tenn., is understood to have the contract for building the road.

CAR BUILDING.

The Dayton & Troy Electric, Dayton, Ohio, will buy two large interurban cars.

The Central of Georgia is said to be preparing specifications for 1,000 freight cars.

The Missouri, Oklahoma & Gulf has ordered from 50 to 100 cars from Barney & Smith.

The Cold Blast Transportation Company, Chicago, is asking prices on 200 stock cars.

The Hanover & York has ordered six cars from the Niles Car & Manufacturing Company.

The Central of New Jersey has ordered 1,000 freight cars from the Cambria Steel Company.

The Pittsburg, Shawmut & Northern is said to be preparing plans for a number of coke cars.

The Chicago, Burlington & Quincy has ordered 1,000 steel gondola cars from Barney & Smith.

The Intercolonial has ordered 3,000 freight cars, mostly from the Crossen Manufacturing Company and Rhodes, Curry & Company.

The Illinois Central has ordered 3,000 steel underframe box cars of 100,000 lbs. capacity from the American Car & Foundry Company.

The Storz Brewing Co., Omaha, Neb., is said to be building four refrigerator cars at the Plattsmouth, Neb., shops of the Chicago, Burlington & Quincy.

The Southern is about to buy 75 passenger coaches, four dining cars, six combination mail and baggage cars, six combination passenger and baggage cars and 200 cabooses.

The Las Vegas & Tonopah, as reported in the *Railroad Gazette* of June 28, has ordered three standard 60-ft. coaches and three standard 60-ft. baggage cars from the Pullman Co., for October delivery. The special equipment for both includes:

Heating system	Safety
Light	Pintsch
Paint	Murphy System

The Marquette & South Eastern, as reported in the *Railroad Gazette* of July 5, has ordered 20 flat cars of 80,000 lbs. capacity from the Hicks Locomotive & Car Works, for July 25 delivery. These cars will be 41 ft. long and 9 ft. wide, over all. The special equipment includes:

Bolsters	Bettendorf
Brake-beams	Simplex
Brakes	Westinghouse
Couplers	Tower
Draft rigging	Miner
Journal boxes	Symington

The Connecticut Company, which buys the equipment for the electric lines of the New York, New Haven & Hartford, has ordered the following cars:

New Haven Line	16	double truck,	30 ft.	closed cars.
Hartford Line	24	" "	30 ft.	" "
Bridgeport Line	10	" "	30 ft.	" "
South Norwalk Line	3	" "	30 ft.	" "
Derby Line	10	" "	30 ft.	" "
New Britain Line	2	" "	30 ft.	" "
Millidale Line	2	" "	30 ft.	" "
Waterbury Line	11	" "	30 ft.	" "
Stafford Springs Line	4	" "	30 ft.	" "
New York & Stamford	12	" "	30 ft.	" "
Norwich Line	1	" "	33 ft.	" "
Middletown Line	8	" "	33 ft.	" "
Rhode Island Lines			30	" "

The company has also ordered snow plows from the Wason Car Co. as follows:

Hartford Line	3	Bridgeport Line	1
Stafford Springs Line	1	Derby Line	3
N. Y. & S. Line	1	Waterbury Line	2
Middletown Line	1	Millidale Line	1
Norwich Line	1		

Special Equipment.

Bodies	Wason
Brakes	Allis-Chalmers
Heaters	Consolidated electric
Motors for New Haven Line, Hartford Line, Stafford Springs Line, New York & Stamford and Rhode Island Lines	General Electric Co.
Motors, for all other cars and for all snow plows	Westinghouse
Registers	New Haven
Trolleys	Sterling-Meaker
Trucks	Standard Motor Truck Co.'s
Wheels	Schoen rolled steel

RAILROAD STRUCTURES.

Alfalfa, Tex.—Surveys, it is reported, are being made by the Galveston, Harrisburg & San Antonio for a new yard here.

Birmingham, Ala.—The new passenger station, built at a cost of $1,500,000, was recently opened for traffic.

Columbus, Ga.—The Columbus Railway Company is planning to put up a two-story brick car barn.

Frankfort, Ind.—The Toledo, St. Louis & Western, it is said, will spend about $150,000 in the enlargement of its shops here.

Garden City, Kan.—The Atchison, Topeka & Santa Fe will build a new passenger station and additional tracks here to cost about $25,000.

Havre de Grace, Md.—The Baltimore & Ohio has given the contract for construction of the substructure of the new double-track bridge over the Susquehanna river at this place to Eyre-Shoemaker, Inc., of Philadelphia, Pa., and it is expected that the work will be started at once. The contract for the superstructure was let about six weeks ago to the American Bridge Company. This bridge will be double-track throughout, require about 45,000 cu. yds. of masonry in the substructure and between 14,000 and 15,000 tons of steel work in the superstructure. It will be 7,000 ft. long and the largest bridge on the Baltimore & Ohio system. It will take about three years to build the bridge and the cost will be about $2,000,000. The masonry work will consist of a new abutment at the west end and a pier on the west bank, four new intermediate piers in the west channel, 21 piers on Watson's Island and one new pier in the east channel.

Kansas City, Kan.—The Atchison, Topeka & Santa Fe, it is said, has given a contract to H. G. Douglas, of Topeka, Kan., for putting up shops to replace those recently destroyed by fire.

Kansas City, Mo.—The Kansas City Southern, it is reported, has bought land between Second and Third streets and Broadway and Wyandotte streets, on which additional tracks are to be laid and other improvements made to increase terminal facilities.

Lima, Ohio.—The Lima & Toledo Traction Company is planning to put up a new passenger station to cost $50,000.

Memphis, Tenn.—A permit has been given to the Illinois Central to put up a brick freight house, at a cost of about $50,000, to replace the structure destroyed by fire some time ago.

Mobile, Ala.—Local reports state that the Louisville & Nashville will not use the new union passenger station, but will build a station for its own use.

St. Louis, Mo.—The Missouri Supreme Court in a recent decision upheld the validity of the St. Louis $3,500,000 bridge bond issue. This will make possible the issuance of $1,000,000 of the bonds, so that work on the proposed bridge over the Mississippi river can be started.

Sherman, Tex.—Work has been started rebuilding the Frisco shops recently destroyed by fire. The four brick buildings to be put up are to cost about $60,000, and the machinery $55,000.

Sunbury, Pa.—The Pennsylvania, it is said, is planning to build a bridge over the Susquehanna river to carry four tracks.

Teague, Tex.—The Trinity & Brazos Valley machine shops, roundhouse and terminals to be built at this place will cost about $500,000.

Valdosta, Ga.—The Georgia Southern & Florida has plans ready for putting up a brick passenger station 74 ft. x 104 ft. to cost $30,000. Platforms, with umbrella sheds, will be 460 ft. long.

Vancouver, B. C.—The Canadian Pacific announces that extensive additions to its wharf facilities is to be made. Bids are wanted for dredging and the building of stone walls. The proposed wharf is to be 670 ft. long x 162 ft. wide.

West Chester, Pa.—Contract reported let by the Pennsylvania to Corcoran Brothers, for grading and improving its yards at this place. New tracks are to be added and the terminal facilities increased.

Winnipeg, Man.—A sub-committee has recommended to the Board of Works that the City Engineer be instructed to prepare plans for a subway for both the Canadian Northern and Grand

Trunk Pacific Railways at the Main street crossing near the Norwood bridge. It is also recommended that in the agreement with the Grand Trunk Pacific provision be made for two overhead steel bridges over the tracks between Cambridge and Pembina streets, and for a subway at Cambridge street.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

Adirondack & St. Lawrence.—This road is in operation from De Kalb Junction, N. Y., south to Hermon, four miles.

Ashland, Odanah & Marengo.—This road has been opened for business from Odanah, Wis., to Echo [illegible]n, 26 miles.

Brandon, Saskatchewan & Hudson's Bay.—See Great Northern.

Brinson Railway.—This road has been opened for business from Savannah, Ga., north to Springfield, 25 miles.

Butte, Anaconda & Pacific.—Freight trains are now running on this road from Anaconda, Mont., to Browns, six miles.

Cherryvale, Oklahoma & Texas.—This company, which was incorporated to build about 700 miles of line from Cherryvale, Kan., to El Paso, Tex., has had its charter amended to provide for building branch lines as follows: Caney, Kan., southeast to Fayetteville, Ark., 150 miles; Pawhuska, Okla., southeast to South McAlester, Ind. T., 200 miles, and Childress, Tex., southeast via Abilene to Aransas Pass, 600 miles. The offices of the company are at Caney and Independence, Kan., and at Perry, Okla. The capital stock of the company is $18,000,000. S. M. Porter, of Caney; A. W. Shiltise, F. D. Brewster and J. H. Brewster, of Independence; R. E. Wade and J. H. Masters, of Perry, incorporators. W. R. Stubbs, of Kansas City, is also interested in the project. (March 15, p. 381.)

Caro Northern.—This road has been opened for business for 16½ miles between Caro, Tex., and Mount Enterprise.

Chesapeake & Ohio.—The Guyandotte Valley district has been extended from Logan, W. Va., to Ethel, five miles.

Chicago & Illinois Midland.—This road has been extended from Pawnee, Ill., east to Taylorville, 16 miles.

Chicago & North-Western.—The extension from Bonesteel, S. Dak., west towards the Rosebud Indian Reservation, finished to Herrick last year, has been extended from Herrick west to Gregory, 14.9 miles.

The Pierre, Rapid City & North-Western, building from Pierre, S. Dak., west to Rapid City, 165 miles, is reported finished.

Chicago, Milwaukee & St. Paul.—The White River Valley, Railroad from Chamberlain, S. Dak., west to Rapid City, 219 miles, is reported finished.

El Paso & Southwestern.—On the Western division a new branch called the Warren line has been opened for business from Lowell, Ariz., via Warren to Corta, 4.3 miles.

Eureka Hill.—This company has given a contract to Baxter, Straw & Stove, of Provo, to build a five-mile line from Silver City, Utah. C. W. Nibley, President, Salt Lake City, and R. B. West, Chief Engineer, Silver City.

Grand Trunk Pacific.—According to reports from Montreal construction work on this line between Saskatoon, Sask., and Edmonton, Alb., is being pushed. About 1,700 men are now at work on this section. It is expected to have 150 miles graded by the first of next month so that rails can be laid.

Great Northern.—The Brandon, Saskatchewan & Hudson's Bay on the Minot division has been opened for business from St. John, N. Dak., north to Brandon, Man., 73½ miles.

Gulf, Colorado & Santa Fe.—The Jasper & Eastern has been opened for freight and passenger traffic from De Ridder, La., to Cravens.

Indian Territory Roads (Electric).—J. C. Cameron, of New York City, has submitted a plan to residents of Ada, Ind. T., to build an electric line, including a branch, south for 13 miles.

Kansas City, Mexico & Orient.—Surveys are reported under way for extending this road from San Angelo, Tex., to San Antonio.

Laramie, Hahns Peak & Pacific.—This company, which has built a line from Laramie, Wyo., on the Union Pacific, west 30 miles to Centennial, will, according to local reports, shortly begin grading on a proposed extension from Centennial to Walden, Colo., about 70 miles. Financial arrangements have been made to finish the line to the coal fields in North Park.

Macon, Americus & Albany (Electric).—According to local reports bids are asked for to build this proposed electric line from Macon, Ga., southwest to Albany, 150 miles. (April 19, p. 565.)

Malheur Valley.—See Oregon Short Line.

Michigan Roads.—Bids are wanted [illegible] by J. E. [illegible], Engineer of Construction of the Vans Harbor Land & Lumber Company of Gladstone, Mich., for grading and laying tracks on [illegible] of road for a steam railroad from Cooks Mills, Mich., to Vans Harbor, Delta county.

Mississippi Central.—O. A. Gibson, of Natchez, who has a grading contract for some of the work on the extension of this road from Brookhaven, Miss., west to Natchez, has been given an additional contract to lay tracks on a 22-mile section of this extension. (May 17, p. 695.)

Nevada Roads.—A line from Las Vegas, Nev., south via Eldorado canyon to Searchlight, 60 miles, it is said, will be built by George P. Spittall, of Searchlight.

New York City Roads.—Bridge Commissioner Stevenson reports to the Public Service Commission that the Williamsburg bridge will within the present year be fitted for the operation of elevated railroad electric trains over the structure.

Norfolk & Southern.—The Pamlico division has been extended from Washington, N. C., south to New Bern, 35 miles.

The Eastern district of the Raleigh division has been opened for business from Washington, N. C., west to Farmville, 30 miles.

North Yakima & Valley.—This road has been opened for business from North Yakima, Wash., west to Naches, 14 miles.

Oregon & Washington.—See Oregon Railroad & Navigation Co.

Oregon Railroad & Navigation Co.—Plans have been finally completed for building the Oregon & Washington northward to Seattle and Tacoma. At Seattle there is to be a tunnel a mile long to enable the line to reach the business center of the city without causing congestion of traffic on the water front streets. At Tacoma also there will have to be a tunnel, to avoid steep grades. This tunnel will be 8,700 ft. long. At the Tacoma terminus the company has bought seven blocks of land, two of which will be the site for the passenger station.

Oregon Roads.—A company is being formed in Oregon, with Steven Carter, of Eugene, as the principal promoter, to build a line from that place west to the Pacific coast at the mouth of the Siuslaw river, about 60 miles. It is proposed to begin work at once on the first 30 miles.

Oregon Short Line.—The Malheur Valley has been opened for business from Ontario, Ore., west to Vale, 15 miles.

On the St. Anthony branch the Yellowstone Park Railroad has been extended from Marysville, Idaho, north to Mesa, 14.4 miles, thence north 6.8 miles.

Pierre, Rapid City & North-Western.—See Chicago & North-Western.

Public Belt Railroad.—Additional contracts for building this line around New Orleans, La., to consist of a double-track main line, with a single-track line along the river front, a total of about 20 miles, are to be let shortly. Work is under way by Thomas Egan, of New Orleans, who has a contract for some of the work. Mayor Martin Behrman is President, and Hampton Reynolds, Engineer.

Rio Grande, Sierra Madre & Pacific.—The Temosachic-Bacerac branch of the Sierra Madre & Pacific has been opened for business from Temosachic, Mex., via Rincon to Madre, 32 miles. (March 15, p. 396.)

Shreveport, Houston & Gulf.—This road has been opened for business from Prestridge, Tex., to Manning, nine miles. (March 15, p. 391.)

Sierra Madre & Pacific.—See Rio Grande, Sierra Madre & Pacific.

Spokane & Inland Empire (Electric).—This company has extended its line from Oakesdale, Wash., south to Palouse, 22.7 miles.

Tacoma Eastern.—This company has extended its main line from Tilton, Wash., to Glenavon, three miles.

Tampa Northern.—This road has been opened for business from Tampa, Fla., north to Brooksville, 48½ miles.

Taylor, Somerville & Gulf.—Incorporated in Texas with $100,000 capital and office at Taylor. The company proposes to build a line from Taylor, Tex., east to Somerville, about 60 miles. The incorporators include: J. A. Thompson, R. C. Briggs, Howard Bland, A. A. Wheatley, J. R. Lyon, Charles Parke and J. A. Jones.

Tecolote Valley.—An officer writes that this company has finished surveys, and will let bids about September 1 for its proposed narrow gage line from Las Vegas, N. Mex., north via Mineral Hill mining district, passing within five miles of Mora, the county seat of Mora county, to Black Lakes, thence west to Taos, about 80 miles. All of this, with the exception of 22 miles, will be in the

mountain, and will necessitate the piercing of a number of tunnels. At Las Vegas the company's shops will be built, and a line is projected from that point south to the Tecolote mining district. Frank J. Buck, Chief Engineer, Elizabethtown. The offices of the company are at Las Vegas.

Texas Interurban.—Incorporated in Texas with $400,000 capital to build a system of interurban lines from Austin, Tex. The incorporators include: T. Moore, of Elizabeth, N. J.; E. Miller, of White Plains, N. Y., and W. W. McKay, of Hempstead, L. I.

Texas Roads.—Residents of Waco, Tex., are interested in a project to build a line from Waco, west via Hamilton to Brownwood, about 120 miles.

Toledo, St. Louis & Western.—Vice-President George H. Ross is reported as saying that the work of relaying 75-lb. rails between Toledo and St. Louis, which has been under way for about 2½ years, will be finished this month. About 120,000 yards of ballast at various points on the line is being added and orders have been given for six steel bridges to be built this year. Contracts have also been let for extensive ditching and widening of banks.

Virginia-Carolina Railway.—This line has been extended from Taylor's Valley, Va., eight miles, to Konnarock.

Virginian Railway.—Press reports state that this company, the successor of the Tidewater and the Deepwater Railways, which is building a line from Norfolk, Va., west and north to a point in West Virginia, has plans made for building a branch from a point on the main line in Virginia north to Richmond. The old roadbed of a line which was projected from Manchester to the mines at Midlothian, about 13 miles, is to be widened and extended into Powhattan to connect with the Tidewater & Western, which it is said has been bought by the Virginian Railway. The Tidewater & Western, formerly the Farmville & Powhattan, is a narrow gage line operating about 89 miles of road in Virginia. From Manchester entrance is to be made over the James river above Belle Isle, at the west end of the city.

Waco, Hamilton & Brownwood.—Incorporated in Texas with $120,000 capital and office at Austin. The company proposes to build a line from Waco, Tex., west through McLennan, Bosque, Hamilton, Comanche, Mills and Brown counties to Brownwood, 120 miles. J. B. Baker, J. S. McLendon, H. S. Shear and S. Sanger, of Waco; J. A. Austin, B. S. Smith and O. F. Johnson, of Brownwood, and J. L. Spurlin and J. T. James, of Hamilton, are incorporators.

Western Pacific.—Track is reported laid from Salt Lake City, Utah, west to a point 21 miles beyond the Utah-Nevada state line, 143 miles. Track-laying is being pushed from that point west, and will also be started this month at Winnemucca, Nev., and at Marysville and Stockton, Cal.

White River Valley.—See Chicago, Milwaukee & St. Paul.

Wichita Falls & Northwestern.—This road has been extended from Burkburnett, Tex., north to Kell, Okla., 14 miles.

Yellowstone Park Railroad.—See Oregon Short Line.

Yosemite Valley.—This road has been extended from Bagby, Cal., east to the Yosemite National Park at El Portal, 30 miles.

RAILROAD CORPORATION NEWS.

Atchison, Topeka & Santa Fe.—It was announced last week that the subscriptions to the $26,000,000 10-year 5 per cent. convertible bonds offered to shareholders at par would, it was estimated, amount to about $10,000,000. The issue was not underwritten.

Bald Eagle Valley.—The Pennsylvania is to exchange three shares of its capital stock and $50 in cash for each share of the outstanding 33,463 shares of the Bald Eagle Valley. The Bald Eagle Valley runs from Vail Station, Pa., to Lockhaven, 51 miles, with 43 miles of branches. It is leased to the Pennsylvania, which owns nearly half of the stock. The annual dividend rate has been 10 per cent., and in May, 1906, an extra dividend of 9 per cent. in stock was paid.

Bangor & Aroostook.—Brown Bros. & Co., New York, are offering at a price to yield about 5½ per cent $900,000 5 per cent. series D car trust notes, dated April 1, maturing in 20 semi-annual instalments beginning October 1 1907. The notes are secured on 300 flat cars, 706 box cars, 40 stock cars and 6 cabooses.

Buffalo Terminal Association.—See Wabash.

Chicago Railways Company.—A hearing on the following plan will be held on July 29 and the discharge of the receivers of the Chicago Union Traction and of its subsidiaries and the turning over of their property to the Chicago Railways Company will then be asked. The new company will make an issue of first mortgage 25-year 5 per cent. bonds to provide funds for rehabilitation, additions, etc. The amount of these bonds is not limited; the only restrictions are those as to the purposes for which they can be issued under the mortgage. There will also be $32,800,000 consolidated mortgage 20-year 4 per cent bonds, of which series A, $15,000,000, will be prior to series B, $17,800,000; also, $5,000,000 20-year 4 per cent. sinking fund income debentures, $4,500,000 5-year 6 per cent. collateral notes and $5,000,000 10-year 5 per cent. collateral notes. Income participation certificates of three classes aggregating $23,250,000 will also be issued. Immediate cash requirements are to be supplied by two syndicates; the first to furnish $12,000,000 for rehabilitation and the second $4,000,000 to cover the receivers' certificates, car trust and other notes, and organization expenses.

Chicago Union Traction.—See Chicago Railways Company.

Delaware & Hudson.—See Troy & New England.

Fort Dodge, Des Moines & Southern (Electric).—The common stock of this company has been increased from $1,500,000 to $5,500,000 and the preferred stock from $1,000,000 to $1,200,000. There have been authorized $6,500,000 refunding mortgage bonds, of which $3,500,000 is reserved to retire an equal amount of authorized first mortgage 4½ per cent. bonds of 1931. The company expects to open by September 1 a line from Des Moines, Iowa, to Fort Dodge, about 80 miles. It will be operated by electricity for passenger service and by steam for freight. A part of the road consists of trackage rights over the Newton & Northwestern line, from Kelly to Lanyon, 37 miles, which has been electrified. A branch is being built from Kelly to Ames and a four-mile branch from Colfax to Doddard is in operation, being leased to the Newton & Northwestern. The Newton & Northwestern runs from Newton, Iowa, to Rockwell City, 102 miles, and has been acquired by the F. D., D. M. & S.

Lake Shore & Michigan Southern.—See Mahoning Coal Railroad.

Mahoning Coal Railroad.—A dividend of 6 per cent. on the $1,500,000 common stock will be paid August 1, to stockholders of record July 18. This is the same rate as was paid February 1. The company is leased to the Lake Shore & Michigan Southern, which holds $865,900 of the common stock. In 1906 the company paid 10 per cent.

Minneapolis, St. Paul & Sault Ste. Marie.—The directors have authorized an increase of the common stock from $14,000,000 to $28,000,000 and of the 7 per cent. non-cumulative preferred stock from $7,000,000 to $14,000,000. Only about $4,000,000 of the new stock will be issued now.

Mobile, Jackson & Kansas City.—Control of this company, it is understood, has passed to L. S. Berg, the new President, and associates, the Yoakum interests having decided not to use the option which they held on the property.

Newton & Northwestern.—See Fort Dodge, Des Moines & Southern.

Norfolk & Ocean View (Electric).—This company, the successor of the Bay Shore Terminal, which was sold under foreclosure a year ago, has made a mortgage to the Baltimore Trust Company securing an issue of $1,500,000 5 per cent. bonds; of this amount $1,000,000 is to be issued at once to pay for the Bay Shore Terminal and for improvements, while the remainder is to be issued as needed for further improvements, extensions or rolling stock.

Pennsylvania.—See Bald Eagle Valley.

St. Louis, Brownsville & Mexico.—Whitaker & Co., St. Louis, are offering, at a price to yield 6.10 per cent., a block of the $1,600,000 5 per cent. notes due November 1, 1910, being part of an authorized issue of $3,000,000. The proceeds will be used for additional equipment, spur tracks and other facilities.

Troy & New England (Electric).—Control of this company, which runs from Troy, N. Y., to Averill Park, nine miles, has been acquired by the Delaware & Hudson.

Union Pacific.—It is understood that about $1,000,000 of the $75,000,000 20-year 4 per cent. convertible bonds were subscribed to. The issue was underwritten.

Wabash.—This company has arranged to extend for one year, at 5 per cent., $350,000 of the $835,000 6 per cent. Buffalo Terminal Association first mortgage bonds, which fell due on June 29. These bonds are secured on the Hamburg Canal strip, which the Wabash bought from the city of Buffalo for terminal purposes. They are guaranteed principal and interest by the Wabash.

White Pass & Yukon.—A semi-annual dividend of 4 per cent. on the £1,375,000 ($6,875,000) stock was paid on July 15. Previous dividends have been as follows: 2½ per cent. in 1903, 5 per cent. in 1904, 3½ per cent. in 1905, 5 per cent. in 1906 and 3 per cent. last January.

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EDITORIAL ANNOUNCEMENTS.

THE BRITISH AND EASTERN CONTINENTS edition of the Railroad Gazette is published each Friday at Queen Anne's Chambers, Westminster, London. It contains selected reading pages from the Railroad Gazette, together with additional British and foreign matter, and is issued under the name Railway Gazette.

CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.

ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

OFFICERS.—In accordance with the law of the state of New York, the following announcement is made of the office of publication, at 83 Fulton St., New York, N.Y., and the names of the officers and editors of The Railroad Gazette:

OFFICERS:

W. H. BOARDMAN, *Pres. and Editor*
E. A. SIMMONS, *Vice-President*
RAY MORRIS, *Secretary*
H. S. CHISOLM, *Treas.*
I. B. JONES, *Cashier*
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RODNEY HITT
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FRANK W. KRAEGER
HUGH RANKIN
BRADFORD BOARDMAN

CONTENTS

VOL. XLIII., No. 4. FRIDAY, JULY 26, 1907.

The state of New York is to regulate the working hours of railroad telegraph operators beginning October 1, or five months before the Federal law on that subject goes into effect. The New York act, given in another column, is so clumsily drawn that in parts it is difficult to make sense of it; but its main features appear to be: 1. Eight hours a day's work, except in extraordinary emergency, for all telegraph and telephone operators who have to do with the movement of trains, including despatchers at headquarters and towermen at interlockings. 2. Ordinary block signalmen communicating solely by bell code seem not to be included. 3. The penalty for violation lies against the railroad company, not the employee. 4. Half of any penalty recovered goes to the informer. 5. A road or part of a road running less than eight passenger trains each way each week day is exempt, unless it usually runs 20 freight trains each way each week day. The purpose of this law is commendable, but, like that already in force in Maryland, it may easily do much harm. On the Baltimore & Ohio some of the operators who had their hours reduced by the benevolent legislature for the purpose ostensibly of increasing the safety of trains, employed their freedom to work as operators for the Western Union, or in other outside business, thus increasing instead of diminishing the strain on their bodies and minds. This condition, and the impossibility of regulating by statute the management of operators in times of emergency, make plain the futility of a law of this kind, except as a lever to raise the operators' wages, which, no doubt, was its chief purpose. With suitable relief arrangements for Sundays and holidays, a ten-hour day is reasonable in the great majority of offices, and an eight-hour law is simply a crude measure for punishing those railroads which have paid stingy wages or have not employed enough relief operators. In the future as in the past the railroad superintendent who desires reliable service must depend, not on laws but on his own judgment and vigilance. To keep men from sleeping on duty, or from wasting their energies when off duty he will be obliged, first, to find operators with consciences and, second, to keep himself constantly informed as to how they habitually spend their time, for they will impair their efficiency by reason of bad judgment as well as from defective moral character. With roads as important as parts of the Delaware & Hudson main line exempted from this law, and with the different exceptions and hour limits in the Federal law, the situation on New York roads, after the Federal law goes into effect will be confusing. The most immediate and practical problem which an eight-hour law presents to the railroad manager is that of securing a supply of telegraphers. Good operators are scarce enough now. Unless we are going to use automatic block signals everywhere, or depend wholly on electric bells and telephones, it will be necessary to establish telegraph schools; and not only that, to also take the necessary measures to get competent young persons to enter the schools.

"It will be a sad day for the people of North Carolina when its citizens are prohibited by acts of the legislature from asserting any right guaranteed to them by the Constitution of the United States." *Justice Pritchard.*

The law passed by the last North Carolina legislature forbidding the larger railroads to charge passengers more than 2½ cents a mile went into effect July 1. The Southern Railway applied to the Federal Circuit Court at Asheville for an injunction, on the ground that this law was confiscatory and therefore repugnant to the Constitution of the United States. This injunction was granted, the court at the same time ordering that, pending a decision, the railroad should with each ticket issue a refund coupon representing in each case the difference between the existing rate and the rate proposed by the new law. This the railroad proceeded to do, charging for tickets at the old rates. Because they continued to sell tickets at the old rates the District Passenger Agent and the City Ticket Agent of the road at Asheville were arrested by the state authorities, indicted, tried in a state court and sentenced each to thirty days in the chain gang. Two days later Judge Pritchard, of the Federal court, issued writs of habeas corpus, under which the two passenger men were discharged, and the whole matter will be determined by the United States Courts. This action of the Federal

judge is suggestive of the protection which the United States courts can be depended on to give to corporations or individuals who are unconstitutionally oppressed by the operation of a state statute. It is particularly important, in view of the numerous cases in which the railroads are now facing serious reductions in earnings as a result of recently enacted state laws. Justice Pritchard in his opinion said:

"The penalties [$500 for each violation] prescribed by the state statute for charging more than the statutory rate are so enormous that if permitted to be enforced they would practically bankrupt the railroads in an exceedingly brief time and before a final hearing could be had in the case, and thus place the carrier in a position where it would be powerless to assert the right guaranteed to it by the constitution of the United States. If the criminal prosecution against the agents, conductors and employees is permitted to continue, the managers of the railroads cannot successfully operate their trains, carry the mails or continue their usefulness in interstate commerce . . . Any system of penalties which is intended to have the effect and which is so framed as to have the effect of closing the doors of the courts to a judicial inquiry as to rates, is, in consequence of that fact, unconstitutional and void. The penalty section of the act in question clearly attempts to do this. It imposes upon the company as a penalty for an unsuccessful attempt to appeal to the court, no matter how bona fide its bill is made, such enormous fines and penalties . . . as to burden the challenger of the act in the courts so as to make it, if the penalties were valid, practically impossible for such an appeal to be made."

There is nothing new or startling in this stand of the Federal court. The instance is only one more example—a gratifying one—of the value of the Federal courts as checks on hasty action of local officers. The people of North Carolina are entitled to have the low-fare question tested, but only in an orderly way. If 2½ cents is too low a rate, the state may, by arbitrarily enforcing it, bankrupt its servants, the railroads, which make living in that state possible. The final decision will probably be referred with all possible despatch to the United States Supreme Court. In Alabama the low-rate law had a clause punishing every railroad which should even attempt to have its rights adjudicated by a Federal court by taking away its right to do business. This clause was promptly condemned by the Federal court. North Carolina has been equally fatuous and has been halted with equal suddenness.

THE NEW EXPENSE ACCOUNTS.

In our issue of June 21 we commented on the new classification of operating expenses ordered by the Interstate Commerce Commission to go in effect as compulsory on July 1. We criticised this accounting system, primarily on the ground that while the proposed system provided well for one primary use of statistics, it provided quite imperfectly for the other, that is to say, it gave a very good check on income and expenditures but did not afford executive officers the best possible measure with which to control the operation of their property. Besides this defect the requirement that a specific charge be made each year for depreciation of equipment and the likelihood that this compulsory depreciation allowance would be extended to way and structures, while theoretically correct, in actual practice is sure to do a great deal of harm to undeveloped or only partially developed properties which have always believed, in accordance with American railroad tradition, that it was better to expend money on the property when you had it and say nothing about it than to advertise to all the world that you were not spending money on the property because you did not have it to spend.

We urged in our brief comment on this subject that the enforcement of these regulations be postponed for a year. The Commission has shown no interest in this proposal, however, although it has received letters on the subject from a very considerable number of railroad executives. The situation as it stands, therefore, is that the railroads must keep a very elaborate set of primary expense accounts exactly in accordance with the forms set for them by the Interstate Commerce Commission. If they desire to keep other sub-divisions of these accounts besides those indicated by the Commission they may do so, subject to the Commission's approval, but they must at all events keep a mass of records, which, we must frankly say, have not been drawn up with the skill and thought which should have been given to a subject so important. The first revised issue of the classification of operating expenses took effect July 1, 1894, and the second revised issue became effective July 1, 1901. We think that the Interstate Commerce Commission will be the first party at interest to admit that these two previous classifications were imperfect, since, if the Commission did not consider them imperfect, it would presumably not have sought to change them. We are of the opinion that the errors in the new system are on the whole more hurtful than those in the old, and we believe it to be a matter of the greatest regret that at the time a change is made, to the very severe inconvenience of all concerned—a change, moreover, which works permanent injury to the continuity of records—that this change should not embody the very best thought of the day and generation.

The railroad accounting officers who co-operated with the statistician of the Interstate Commerce Commission in preparing these accounts did their work well so far as regards the function of account keeping with which they themselves were interested, but it is rather a ridiculous situation that the executive officers in charge of the property should be forced to accept a defective system of accounting which their own subordinate officers approved without acting or being empowered to act for their respective companies. A president or a general manager or a general superintendent, who is accustomed to use statistics with the skill and with the results obtained therefrom which have for many years occasioned American railroad statistics to excel those of all other nations in their scope and usefulness, ought surely to have a voice in a proposed change.

We believe that in spite of some individual hardships, the statistical systems of American railroads have been greatly improved since the Interstate Commerce Commission took hold of the matter in 1894. We believe that these statistical systems needed change, and that it is quite possible that the statistical systems of 1907 can be made to improve upon them materially in a number of particulars, but we are sure that the systems as now outlined by the Commission do not so improve upon the existing methods of record. In the good name of American railroad operation, therefore, why cannot the Commission leave it to be understood that its new orders, as promulgated, are experimental orders, and during the next year why can it not give earnest thought to the suggestions which have been made, and confer, not exclusively with one branch of statistical users, but with the other branch as well; that is to say, with the presidents and vice-presidents and general managers and general superintendents of American railroads? What is the use of violently overthrowing an existing statistical system to set up an inferior one in its place?

TRACK CIRCUITS IN RAILROAD SIGNALING.

The track circuit was put into practical use in automatic block signaling for the first time about the year 1879, having been experimented with for several years previous. These experiments appear to have consisted mainly of installing test sections and observing the results obtained from the use of various relays and track insulations. In this manner some information was gained as to the apparatus best suited to the usual conditions under which track circuits must work. If, along with these experiments or at any time since then, any series of tests were made, under the various climatic and physical conditions to which track circuits are subjected, to determine the electrical and insulation resistance of the track rails, the electrical resistance of bond contacts, the insulation resistance of insulated joints, the resistance of wheel contacts etc., such data seems never to have been given out for the public benefit.

Experience thus far seems to have taught us that a relay, with an electro-magnet having proportions and weight within certain limits, wound to a resistance of about four ohms and operating for pick up and release of armature at a minimum of about .065 and .030 amperes respectively, is the most satisfactory with the usual track circuit.

As track circuits equipped with such relays are credited with giving good service and as a series of tests to determine the characteristics and behavior of track circuits would entail not only considerable labor and expense but the use of some instruments which most signal engineers do not have, it is easy to understand why this subject has not been more thoroughly investigated.

Every signal engineer at times has track circuit failures, some of them serious, which he cannot understand and which he cannot find a reason for. Take, for example, the case reported by an engineman the other day where an automatic signal did "queer stunts" after the train had entered a 3,000-ft. track section at the battery end. Had the signal engineer known that the maximum resistance of the track circuit with its 80-lb. rail could be as much as .9 of an ohm; that the probable insulation resistance of the rails from the ground during the weather existing at the time was about five

ohms, and that the insulation resistance of the insulated joints at the relay end of the section had dropped to four ohms each, he could have readily figured the probable cause of the unruly behavior of the signal as leakage of current to the four-ohm relay of the section in question from the adjacent track circuit battery.

The track circuit does not seem to have received its full share of the investigation and improvement that have been under way in signaling during the last few years, and particularly so since it is now considered an essential factor in block signaling. It is doubtful if many signal engineers in planning their installations give it much consideration other than, perhaps, to fix a limit on its length and to make special provision for protection where a foreign current is known to exist.

It is apparent that the track circuit is regarded by many as a fixed institution in signaling, and that the positiveness of its operation under almost any condition or circumstance is beyond question or need of study. In view of the information and data on the subject available, ought this idea to prevail?

At the last meeting of the Railway Signal Association the following questions were presented for consideration, but provoked little discussion:

"1. It is noticed that when track relays are shunted, current is not entirely absent with a train in the block. What current does the relay receive under such conditions?

"2. Would a relay, able to pick up at .030 ampere and release at 50 to 75 per cent. of the pick up, be desirable, also, with such a relay, could longer blocks be used?

"3. What would the ideal pick up and release points be for a 4-ohm relay?"

These questions might well have engaged the attention of the members present, and along with them the following might have proved profitable:

(*a*) Are long track sections as safe, as efficient and as economical as short ones?

(*b*) Is not the pick up current of .065 ampere and the release current of .030 ampere, as lately adopted by the Railway Signal Association for track relays, too low for safe working under usual conditions?

(*c*) Should track circuits be installed with the expectation of as safe operation with trains entering from the battery end as from the relay end?

(*d*) Would not two bonds of No. 6 B. W. G. iron wire give better results in track circuit operation than two of No. 8?

(*e*) Should not the cross-section of the ballast grade and the kind of ballast used be given more consideration in the installation of track circuits than at present?

(*f*) Would not two relays, one a four-ohm and the other approximately 16 ohms, the latter placed, in multiple with the track battery, at the incoming end of the section, be better than one relay?

(*g*) If when track relays are shunted, current is not entirely absent with a train on the track circuit, is there a point in such section where the shunt by the train is equally effective at both ends of the section?

All of these are questions affecting the behavior of the track circuit which a committee of the Railway Signal Association, aided perhaps by the signal companies, would do well to investigate.

THE EVOLUTION OF STATE RAILROAD COMMISSIONS.

Mid-summer of the present year finds all the state legislatures adjourned, most of them after extended sessions prolonged very largely by railroad questions. The railroad legislation mania—most of it anti-railroad—has been far and wide. It has reached the East with hardly less violence than the West and the South; and, in a large number of cases has been attended either with the creation of new state railroad commissions or the equipping of existing commissions with fresh powers. About 40 states now have railroad commissions, strong or weak. Sometimes heretofore they have been strong in powers while weak in practice; in other cases weak by statute but strong by their intelligent leadership of public opinion. Taken as a whole, the result of the last six months of state lawmaking and, even more, of the popular attitude, has been positive and decided evolution of state railroad commissions. For better or for worse, they will, in the immediate future, be more assertive bodies.

The obvious tendency of the season's lawmaking has been to make the advisory into the regulating commission—and the word "regulating" must here be used in a very strong sense. It has extended not only to regulation of rates but to regulation of other matters too numerous to cite. One need only go to the Public Service Commissions Law of New York state to see what it means; though this is one of the most extreme examples. In some of the states also, if we are not mistaken, where the powers of the commissions have previously been so extensive as to be almost farcical, they have been still further overloaded with functions. With existing problems of railroad regulation as the while growing more intricate it would seem as though railroad matters alone would give a state commission enough to do and more. But when to railroads is added warehousing, and to warehousing, the express business, and to the express business, the telephones and to the telephones, taxation and to all these in some cases general purview of corporations, it would seem as though legislators might have passed in the overloading process. The inevitable effect of this overburdening of a commission is to make it a jack of all trades and master of none. Yet in some states the revision of the commission laws makes one think of courts and legislatures rolled into one and vested by law with omniscience.

A bad feature of this radical evolution of the state commissions has been a kind of compulsory demagogism. That which is created, by the inexorable law of human nature, must reflect the spirit and policy of the creator. It is too much to expect that commissions, most of them made up of politicians, will set themselves against a tide of hostile popular and legislative sentiment, even though transitory. In the past, some commissions have been too subservient to the railroads. In most cases now and for some time to come, the railroads are likely to find such commissions hostile, not as an expression of real feeling, but as a matter of personal policy in order to hold their places. Sympathy in such cases with railroad corporations is not unqualified. In the past they have been content with the "political" commission as being one that could be "handled," if not otherwise, by the infirmity of its own ignorance. Would it not have been better if, in years gone by, the railroad influence had been more freely used for infusing intelligence in the railroad commissions even at the price of their greater independence? This moral default of the railroads heretofore, to a considerable degree spells demagogism now. Corporation foresight might have averted some of the present sad reflections of hindsight.

But in the radical evolution of railroad commissions we front a condition, not a theory, and the primary question is the extraction from that condition of the final equities. Here there is solid ground for hopefulness. Remembering that it is the *personnel* of a state railroad commission that counts, it requires no excess of optimism to discover in present radicalism an ultimate residuum of good. Nothing tries out incompetency like responsibility. It is the overdoing of a bad system or bad thing that brings its ultimate correction. The wider and more ramified the functions of a state commission that is inefficient or invertebrate, the surer is its exposure and the louder the call for brains and courage. Again, as the functions of the commissions grow more and more technical, the more conspicuous to both public and legislative vision becomes the need of the trained mind. A force working toward the same end is the advance into debatable ground of the state and interstate questions relating to public service, where the demand for intelligence and special knowledge on both sides is imperative. Finally there are the courts in their double office of nullifying bad commission rulings and exposers of commission weakness; while, as regards demagogical drift of the public and its law makers, it can hardly survive any really serious railroad calamity that touches the pocket nerve and the means of livelihood. It will not be surprising if next year's sessions of the state legislatures, as concerns the railroads, prove as tame as those of the past six months have been fierce.

Deeper searched and tried, that period beginning with the opening of the present year, though one of storm, will probably in the outcome be deemed a clarifying tempest in its development of the railroad commissions. They are now bodies in transition and it rests partly with them, partly with the public and partly with the railroads to determine whether the transition shall be upwards or downwards and whether the personality of the political officeholder shall or shall not give way to character and training. Without these last, railroad law may be piled on law and powers be amplified or restricted, but all in vain. Toward that higher ideal of state commissions better qualified than now, it looks as though events were trending under the urgency and gravity of the railroad problem. Two or three years hence—perhaps earlier—there will be sharper light on the subject after we begin to see clear water below the weltering foam of the railroad legislation of the last half year.

Train Accidents in June.[1]

Our record of train accidents occurring on the railroads of the United States in June includes 16 collisions and 27 derailments, 38 accidents in all. This record is not published in full, as was formerly done, except in the cases of the few accidents which are especially prominent—in the present instance two collisions and one derailment. The record of "ordinary" accidents—which term includes, for our present purpose, only those which result in fatal injury to a passenger or an employee or which are of special interest to operating officers—is given in the shape of a one-line item for each accident, showing date, location, class and number of deaths and injuries.

This record is based on accounts published in local daily newspapers, except in the cases of accidents of such magnitude that it seems proper to send a letter of inquiry to the railroad manager. The official accident record published quarterly by the Interstate Commerce Commission is regularly reprinted in the *Railroad Gazette*.

The most serious accident in the present list is the collision which occurred at Hartford, Conn., on the 23d, killing eight employees. The next most serious is the collision near Pittsford, N. Y. There are only three others in the list which caused the death of more than two persons each.

The Hartford collision, which happened about 7 p.m., appears to have been within or near the yard limits. The main line of the Highland division of the New Haven road from Hartford westward consists of two tracks, but it is operated as two separate single-track lines, one of the tracks being used exclusively by frequent short-distance passenger trains which formerly were propelled by electricity. It appears that one of these passenger trains backed through a cross-over track on to the other main track in entire disregard of the fact that a work-train had the right of way on that track; and it collided with the caboose of the work-train, wrecking the car and killing or injuring nearly all of the 40 men who were in it. The wreck took fire but the flames were quickly extinguished by the city firemen. Two of the injured men subsequently died, making the total number of fatalities 10.

The collision at Pittsford occurred about 11 p.m., and the persons killed were a station agent, one passenger, a brakeman, an unidentified man, and a boy who was riding on one of the locomotives. The trains were an eastbound passenger train and a westbound freight; both engines were wrecked and the smoking car of the passenger train demolished. The wreck took fire but the damage from the flames was not great. The freight train was wrongfully running on the time of the passenger train.

In the derailments on the Southern Railway the 5th and the Great Northern the 15th, passenger trains were thrown down embankments with much damage. In the Great Northern accident the whole train of nine cars took fire and was burned up, with the exception of a mail car. In the derailment on the Southern Pacific on the 2d, the passenger cars were overturned while running at full speed at 3 a.m. The derailment on the Baltimore & Ohio Southwestern on the 20th at 4 a.m. was due to the fall of a rock in a tunnel which occurred at the precise moment that the mail car of this train was passing the spot.

The persons recorded as killed and injured in connection with the derailment at Reddick, Ill., on the 4th were by-standers who were killed or injured by the explosion of a car of gasolene some little time after the cars had run off the track. The heated journal which caused the derailment set fire to the wreck and as one of the cars was loaded with gasolene, the explosion was inevitable. It broke windows and chimneys in houses throughout the village.

One accident, not prominent by reason of cost or fatality, was notable for its novelty. It was a derailment at Suspension Bridge, N. Y., on the 15th. Three freight cars broke from a Grand Trunk train of 11 cars in the middle of the steel arch bridge and plunged into the Niagara Rapids, 250 ft. below. In leaving the track the cars did considerable damage to the upper and lower decks of the bridge. When they struck the water they were not badly injured, but the current of the rapids carried them to the whirlpool, where they were broken into pieces. A brakeman had a narrow escape.

[1]Abbreviations used in Accident List:

rc.....Rear collision.
bc.....Butting collision.
xc.....Other collisions; as at crossings or in yards. Where only one train is mentioned, it is usually a case of a train running into a standing car or cars, or a collision due to a train breaking in two on a descending grade.
b.....Broken.
d.....Defective.
dr.....Defect of roadway.
eq.....Defect in car or engine.
n.....Negligence
unf.....Unforeseen obstruction.
unx.....Unexplained.
derail.....Open derailing switch (negligence of engineman or signalman).
ms.....Misplaced switch.
acc. obst..Accidental obstruction.
malice....Malicious obstruction of track or misplacement of switch.
boiler....Explosion of boiler of locomotive on road.
fire.....Cars burned while running.
Pass.....Passenger train.
Ft.....Freight train (includes empty, engines, work trains, etc.).
*Wreck wholly or partly destroyed by fire.
†One or more passengers killed.

Train Accidents in the United States—June, 1907.

Collisions.

Date.	Road.	Place.	Kind of Accident.	Kind of Train.	No. persons reported Kil'd.	Inj'd.
1.	Birmingham Southern.	Pratt City.	xc.	Ft. & Ft.	1	4
1.	Atch., Top. & S. Fe.	Sewell, O. T.	bc.	P. & Ft.	1	10
2.	Penn. Lines.	New Philta.	rc.	Ft. & Ft.	0	4
*4.	N. Y., N. H. & Hart.	Worcester.	xc.	Ft. & Ft.	0	3
6.	Southern Pacific	Lordsburg.	xc.	Ft. & Ft.	1	0
6.	Atch., Top. & S. Fe.	Paul's Valley.	bc.	Ft. & Ft.	0	2
7.	Wabash Pitts.	Hickory.	xc.	P. & Ft.	2	11
8.		Junction City.	xc.	Ft. & Ft.	2	0
12.	Southern Pacific	Santa Cruz.	bc.	Ft. & Ft.	2	17
14.	Southern Pacific	Deming.	bc.	P. & P.	0	1
17.	Southern	Sylva.	rc.	Ft. & P.	1	1
18.	Delaware & Hudson.	Bainbridge.	rc.	Ft. & Ft.	2	3
*23.	N. Y. C. & H. R.	Pittsford.	bc.	P. & Ft.	4	11
23.	Pennsylvania	Sharon, Pa.	xc.	P. & Ft.	0	8
23.	N. Y., N. H. & Hart.	Hartford.	xc.	P. & Ft.	8	35
27.	Pennsylvania	Cynwyd.	xc.	P. & Ft.	1	8

Derailments.

Date.	Road.	Place.	Kind of train.	Cause of derlmt.	No. persons reported Kil'd.	Inj'd.
†2.	Southern Pacific	Lozier, Tex.	Pass.	unx.	1	20
2.	Chic., R. I. & Pac.	Prairie Home.	Pass.	unx.	0	3
2.	Atch., Top. & S. Fe.	Ogilvie.	Ft.	unx.	1	0
3.	Chic., Burl. & Quincy.	Chicago.	Ft.	loose rail.	1	1
3.	Pennsylvania	Severance, N.Y.	Ft.	unx.	2	0
4.	Atlanta, B. & A.	Rebecca.	Pass.	unx.	1	4
*4.	Chic., Ind. & S.	Reddick.	Ft.	hot box.	3	10
5.	Southern.	Black Branch.	Pass.	unx.	0	16
6.	Gulf C. & S. F.	Browndell.	Ft.	brake-bm.	1	5
8.	Chic., R. I. & Pac.	Horton.	Ft.	unx.	2	2
8.	Hous., E. & W. T.	Goodrich.	Ft.	unx.	2	0
9.	Montana C.	Great Falls.	Ft.	b. rail.	1	0
14.	C., C., C. & St. L.	Graysville.	Ft.	unx.	1	0
14.	Pennsylvania	Pt. Lookout	Ft.	unx.	1	0
*15.	Great Northern	Palermo.	Pass.	b. rail.	0	17
15.	*Grand Trunk.*	Suspnsn Bdg.	Ft.	unx.	0	0
†17.	Atch., Top. & S. Fe.	Earl.	Pass.	unx.	3	18
18.	C., C. & St. L.	Columbus.	Pass.	unx.	0	6
19.	Denver & Rio G.	Florence.	Ft.	boiler.	3	0
20.	Balt. & O. S. W.	Mitchell.	Pass.	acc. obst.	0	17
20.	Phila. & Readg.	Perkiomen Jn.	Ft.	derail.	1	0
21.	Northern Pacific	Detroit.	Ft.	neg.	2	1
22.	Pitts. & Lake Erie.	Pittsburg.	Pass.	d. switch.	1	10
23.	Texas & Pacific.	El Paso.	Ft.	unx.	1	1
27.	Cripple Creek.	Cameron.	Ft.	unx.	1	1
*29.	Maine Central	Waterville.	Pass.	unx.	0	6
30.	St. Louis & S. F.	Springdale.	Pass.	d. track.	0	11

Of the electric car accidents reported in the newspapers in June, four—two collisions and two derailments—resulted fatally; the total deaths reported in the four accidents being six and the total injuries 50.

Robert J. Bailey, of the Monongahela River Consolidated Coal & Coke Co., which company owns 600 coal cars, has invited other private car owners to attend a meeting in Cleveland next Thursday with a view to presenting a united demand upon the railroads for greater compensation for the use of private cars in freight service. Formerly the rate paid for private cars was the same as that paid by the railroads to each other for the use of cars owned by the railroads, namely three-fourths of a cent a mile. Later the interchange rate between railroads was reduced to six-tenths of a cent, but the rate for private cars was left unchanged. Five years ago the railroads adopted the per diem system for their own cars, but continued the mileage rate for private cars, most or all of the private car owners finding that the per diem basis (20 cents a day at first and later 25 cents) was less profitable to them than the mileage rate. But now, with the per diem rate for railroad companies' cars raised to 50 cents, the boot is on the other foot; or at least it appears that it is so in some cases. Fifty cents a day is likely to average a good deal better than 7½ mills a mile, or even 1 cent a mile, and so, of course, the private car owners will now go in strong for reform. And how can the railroads refuse? Quite likely many of them will not want to refuse; but whatever the inclination of any road may be, the only reasonable and just stand to take is to approve a change to per diem. The per diem principle was adopted by the railroads as between themselves, not because it was more profitable—though to lenders it usually was profitable—but because it was rational and because by its use it is possible to do away with the opportunity for injustice and error that is inherent in the mileage system. If there is any difference between the railroads and the private car owners it should be one of rates and not one of methods. Fifty cents a day may or may not be a fair price—as between railroads the rate is supposed to be unimportant, as both sides are or should be lenders and both sides borrowers—but any mileage rate is unfair because it is not based on the actual service of the car.

CONTRIBUTIONS

A Criticism of the Salt Lake City Union Station.

Pittsburg, Pa., July 15, 1907.

To the Editor of the Railroad Gazette:

The *Railroad Gazette* of July 12 contains an article describing the new union station to be built by the Harriman Lines at Salt Lake City. Presumably the publication of such an article is an invitation to your readers to criticise the lay-out. If so, it seems permissible to remark that it is a conspicuous illustration of inef-

ficiency per unit of cost. The passenger station, which is to cost $450,000 seems intended to provide for a very large business. Seven through passenger tracks with island platforms and two local or terminal tracks are shown behind the station. This indicates a large contemplated passenger train movement. It is probable that the station is to be used by passenger trains in both directions, yet all baggage must be handled at the western ends of the platforms. This means that baggage to and from eastward trains—having the baggage car in front—must be conveyed almost the entire length of the various platforms, apparently at grade with great delay, expense of handling and inconvenience to passengers.

Just how the express and mail matter is to be handled between the rooms at the easterly end of the building and the trains is not clear. Apparently it is to be conveyed across the tracks at grade and then along the island platforms, like the baggage. It looks as if an additional tunnel or subway across the tracks near the east end of the station with lifts at the island platforms and a longitudinal subway to the basement should be added, even at the expense of cutting out some of the æsthetic features of the building, if necessary to reduce the cost. Another alternative would be to build a tunnel for baggage, express and mail opposite the center of the station with a longitudinal tunnel and lifts at both ends of the building. We think there would be no doubt of the adoption of one or the other of these alternatives east of the Mississippi river.

The arrangements for handling passengers between the station and trains are apparently quite as archaic as those for handling baggage, mail and express. The communication between the waiting room and the trains is apparently by a grade crossing of the tracks in front of the waiting room and by the island platforms. This practically restricts the station to handling one, or not more than two, trains at a time, unless the trains are quite short, not exceeding 440 ft. long. It is not clear why seven passenger tracks are needed at a station where but one train at a time can be handled. The inefficiency of such an arrangement may be seen daily at the Mount Royal station of the Baltimore & Ohio in Baltimore, at the Union Station of the Pennsylvania Railroad in Baltimore, and at the Pennsylvania station in Altoona, although at none of these points, if I recollect correctly, are there more than five tracks. A similar lay-out formerly existed at the Pennsylvania station at Harrisburg, but several years ago it was found necessary to change it by installation of overhead bridges from the waiting room to the island platforms, so that trains could be handled on all of the tracks simultaneously. The fact is that such a lay-out is at least 20 years behind the times.

I must confess to a feeling of some astonishment that the management of the Harriman Lines, whose reputation for efficiency is high, should have adopted such a lay-out, and that the *Railroad Gazette* should publish a description of it without an explanation of its necessity or a word of warning that it was intended to instruct the public as an example of how not to do it. S.

Proposed Southern Pacific Hospital at San Francisco.

The Southern Pacific is about to build a new railroad hospital in San Francisco to replace the one last year destroyed by fire. The site is the block north of the entrance to Golden Gate Park bounded by Fell, Hayes, Baker and Lyon streets. The new hospital will have 225 beds and will cost $600,000.

The building, which will be built largely of reinforced concrete, will be in the form of an H. There will be an east and a west wing with an administration building in the center connected with the wings by wide corridors. The main front of the building will be 220 ft. 8 in. on Fell street. Each wing will be 86½ ft. x 150 ft., with the administration building 72 ft. x 168 ft. There will be four stories. The frame will be reinforced concrete with the outside walls brick and the outside surface finished in white stucco. All partitions will be made of steel studs with metal lath and plaster and the floors of glazed ceramic tiles of different patterns. The only woodwork in the building will be the doors and windows. The different floors will be connected by easy inclines, thus avoiding the necessity of stairs, and there will be two elevators, one for general passenger service and the other to be used in connection with the ambulances and the operating room. A vacuum and cleaning plant is to be installed and all food rooms are to be cooled with a brine system of refrigeration. On each floor above the basement the corridors connecting the wings with the central part of the building have been widened so as to form sun rooms with large glass windows.

Proposed Southern Pacific Hospital at San Francisco.

On the lower or basement floor is the kitchen, with all necessary store and refrigerator rooms, dining-rooms, bath-rooms, drug-room and chemical laboratory, X-ray, hot and steam rooms, machinery room, and foreign wards with their dining-rooms in connection. In each wing on the first floor are to be two 12-bed wards with their service kitchen, bathrooms and rooms for nurses and internes, while the administration building on this floor has two large general waiting rooms for men and women, a library, offices for the chief surgeon and staff, with consultation, examination and dressing rooms. Each wing on the second floor is like the first floor, having two 12-bed wards, with service kitchens in connection, while the administration building on this floor has two 8-bed and three 2-bed wards, three single rooms with bath and nurses' rooms.

On the third floor there are two 8-bed and two 12-bed wards and 17 private rooms, with private room for visiting doctors, all equipped with service rooms, baths, nurses' rooms, etc. In the rear of the administration building, on this floor, are two large operating rooms connected with the sterilizing and anesthetic room, nurses' rooms and baths for doctors and nurses. The floors and wainscot of the operating, sterilizing and anesthetic room will be of ivory white unglazed vitrified tile, with wide plate glass windows, giving ample light.

In the rear of and directly opposite the center of this main building will be a four-story building 52 ft. x 116 ft. 9 in.,

and of the same construction, detail and finish. This to be used for the accommodation of the entire hospital staff. On the second and third floor of this annex will be four 6-bed wards, isolated by solid brick walls, to be used for contagious diseases.

The ideas and plans for the systematic operation of this large hospital plant are the work of Dr. F. K. Ainsworth, Chief Surgeon of the Southern Pacific. All details have been carried out according to his instructions. E. H. Harriman, President of the Southern Pacific, enlisted the services of Carrere & Hastings, architects, of New York City, in suggesting a design for the exterior. All plans for the work were prepared in the office of J. H. Wallace, Assistant Chief Engineer, and D. J. Patterson, Architect, of the Southern Pacific.

The Symmetrical Masonry Arch; Analysis According to the Elastic Theory.

BY MALVERD A. HOWE.

It has been established experimentally that the deformations of a masonry arch under a given loading correspond to those determined theoretically by means of formulas based upon the theory of elasticity. It may be concluded from this that the stresses within the arch ring vary according to the same theory. Only recently has the elastic theory been applied to masonry arches. A complete analysis is seldom made and quite often none is attempted, the dimensions of the arch ring being simply guessed or copied.

Much the same method was employed by the old builders of wooden bridges. They, to a certain extent, were excusable, as the theory of stresses was not commonly known in their time. But the designers of masonry arches in the present time have no such excuse as the elastic theory has been thoroughly worked out. It is true that the formulas and graphical methods have not, as yet, been made so short that anyone not familiar with the subject can in a few moments pass upon the correctness of a given design submitted for approval.

It requires time to check a design for an ordinary truss bridge, and there appears to be no good reason why the same amount of time should not be willingly spent in checking a design for a masonry arch. It is not necessary to determine the stresses for every possible loading upon an arch in order to be reasonably sure that the design is safe.

Assume that a design has been submitted and that its safety is questioned. The following method enables one to answer the question in a comparatively short time. Divide the span into 20 equal parts δx, and at the center of each division draw vertical lines cutting the axis of the arch ring. Beginning at the left, number the points so found on the axis 1, 2, 3, etc., up to the crown and number the symmetrical points upon the right of the crown 1^1, 2^1, 3^1, etc. Scale the co-ordinates of these points and call them x and y, the origin being taken at the left support. At each point scale along the axis to the right and to the left to a point half way to the adjacent points and call the sum of these distances $\delta \varsigma$. Or, if the arch axis is a curve of known radii the angle Φ from the crown to each point may be computed and then $\delta \varsigma' = \delta x$ secant Φ. Compute the moment of inertia I at each point and let $\Delta = \delta \varsigma \div I$ for each point. This will usually have a different value for each of 10 points on the left of the crown. The same values will, of course, obtain for the corresponding points upon the right of the crown.

If H_1 represents the horizontal thrust produced by vertical loading then

$$2\,H_1 = \frac{\Sigma\, m_x \Delta \left(y - \frac{\Sigma\, y\, \Delta}{\Sigma\, \Delta}\right)}{\Sigma\, y\, \Delta \left(y - \frac{\Sigma\, y\, \Delta}{\Sigma\, \Delta}\right)}$$

in which all of the factors are known quantities depending upon the dimensions of the arch ring, the shape of the axis, etc., and entirely independent of the loading, *with the exception of* m_x. The sign of summation indicates the sum of the factors for all points of the axis. In this case 20 in number. For example

$$\Sigma\, y\, \Delta = y_1 \Delta_1 + y_2 \Delta_2 + y_3 \Delta_3 \ldots\ldots\ldots\ldots\ldots\ldots y_{1'} \Delta_{1'}$$
$$\Sigma\, \Delta = \Delta_1 + \Delta_2 + \Delta_3 + \ldots\ldots\ldots\ldots\ldots\ldots\ldots \Delta_{1'}$$

etc., etc.

In Form A, columns 1 to 6 inclusive show the computations to be made. These are made but once as they are constant for the given arch ring. The factor m_x depends upon the loading. The loadings which should be considered are as follows:

(a) Load points, 1—1' inclusive.... } With a concentration
(b) " " 1—8' " } equivalent to uniform
(c) " " 9—1' " } moving load per ft. of
(d) " " 1—8' & 8—1' " } span multiplied by
(e) " " 8—9' " } Δx.
(f) Dead or fixed load alone.

Only (a), (b) and (f) need to be considered in computing H_1, as the values for the remaining loadings can be found by proper combination of the results obtained for (a), (b) and (f). These combinations are given in Form A.

The value of m_x at each point is simply the common bending moment produced by the given loading on a straight beam supported at the ends and having a span equal to that of the arch axis, *plus the common bending moment produced by an equal and symmetrical loading.*

In case of the dead load m_x is equal to *twice* the common moment as found from the ordinary equilibrium polygon. For a uniform load covering the entire span the same is true. In Form A the values of these moments divided by $\frac{1}{2}\ \delta x$ for each point are given for a unit load at each point. For any other load, multiply by the load. The values of $m_x \frac{2}{\delta x}$ are also given for unit loads at 1-8 inclusive in Form A. The sums of columns 10 and 12 must be multiplied by $\frac{1}{2}\ \delta x$ before substituting in the expression for 2 H_1 as indicated.

When the computations according to Form A are completed the values of H_1 for six different loadings are known and at an expense of but little time and labor. Any other loading such as a road roller can be considered in a like manner, remembering the significance of the factor m_x.

The next step is the determination of the moments at the left and right supports. Let them be represented by M_1 and M_2 respectively, then for all symmetrical loading such as a uniform load covering the entire span or the dead load in a majority of cases,

$$M_1 = H_1 \frac{\Sigma\, y\, \Delta}{\Sigma\, \Delta} - \frac{\Sigma\, m_x \Delta}{\Sigma\, \Delta} = M_2$$

in which m_x is the common moment at each point produced by the given loading on a beam supported at the ends.

All factors in the first term of the second member of this equation are known in computing the quantity $\Sigma\, m_x\, \Delta$. The values of m_x for each pair of symmetrical points may be combined and the sum multiplied by the common value of Δ for these two points. Table B gives the values of m_x so combined for a unit load at each point 1—1^1 inclusive. The computation of $\Sigma\, m_x\, \Delta \div \Sigma\, \Delta$ is a very short process. Having H_1 and M_1 for any given symmetrical loading and since $V_1 = V_2$ = one-half the loading, the equilibrium polygons can be readily constructed in their true relation to the arch axis. The ordinate between the arch axis and the equilibrium polygon at the support equals $M_1 \div H_1 = y_1$.

The equilibrium polygon may be located in another way. Above the spring line a distance $\Sigma\, y\, \Delta \div \Sigma\, \Delta$ and parallel to the chord of the arch axis draw a straight line A B. Construct the equilibrium polygon with a horizontal closing line, using the true H_1 as a pole distance. Above this line a distance $\Sigma\, m_x\, \Delta \div \Sigma\, \Delta$ draw a line A^1 B^1 parallel to the closing line. If now the two figures be superimposed so that these two lines A B + A^1 B^1 coincide

Form A.—To be Used in Computing H_1.

	1	2	3	4	5	6	7	8	9	10	11	12
			(1)x(2)		(3)x(4)	(2)x(4)		(6)x(7)		(6)x(9)		(6)x(11)
Point	y	Δ	$y\Delta$	$y - \frac{\Sigma y\Delta}{\Sigma\Delta}$	$y\Delta(y - \frac{\Sigma y\Delta}{\Sigma\Delta})$	$\Delta(y - \frac{\Sigma y\Delta}{\Sigma\Delta})$	Dead Load	$m_x\Delta(y - \frac{\Sigma y\Delta}{\Sigma\Delta})$	Unit load at 1-8 inclusive m_x	$m_x\Delta(y - \frac{\Sigma y\Delta}{\Sigma\Delta})$	Unit load at 1-1' inclusive m_x	$m_x\Delta(y - \frac{\Sigma y\Delta}{\Sigma\Delta})$
1							Insert TWICE the common moment for the G. L. on a beam supported at the ends		8		20	
2									22		56	
3									34		88	
4									44		116	
5									52		140	
6									58		160	
7									62		176	
8									64		188	
9									64		196	
10									64		200	
Sum												
		$\frac{1}{2}\Sigma y$	$\frac{1}{2}\Sigma\Delta$	$\frac{1}{2}\Sigma y\Delta$	$\frac{1}{2}\Sigma y(y - \frac{\Sigma y\Delta}{\Sigma\Delta})$			$\frac{1}{2}\Sigma m_x\Delta(y - \frac{\Sigma y\Delta}{\Sigma\Delta})$		$\frac{1}{2}\Sigma m_x\Delta(y - \frac{\Sigma y\Delta}{\Sigma\Delta})\frac{2}{\delta x}$		$\frac{1}{2}\Sigma m_x\Delta(y - \frac{\Sigma y\Delta}{\Sigma\Delta})\frac{2}{\delta x}$

$$2H_1 = \frac{\frac{1}{2}\Sigma m_x \Delta(y - \frac{\Sigma y\Delta}{\Sigma\Delta})}{\frac{1}{2}\Sigma y\Delta(y - \frac{\Sigma y\Delta}{\Sigma\Delta})} \qquad \frac{\delta x}{2} = \frac{1}{40}$$

H_1 for loads 1-8 and 8'-1' = $2H_1$ for loads 1-8
H_1 for loads 9-1' = H_1 for loads 1-1' minus H_1 for loads 1-8
H_1 for loads 9-9' = H_1 for loads 1-1' minus H_1 for loads 1-8 and 8'-1'

then the equilibrium polygon is in its correct position relative to the arch axis. For unsymmetrical loading

$$\left.\begin{matrix} M_1 \\ M_2 \end{matrix}\right\} = H_1 \left\{ \frac{\Sigma y \Delta}{\Sigma \Delta} - \left\{ \frac{\Sigma m_x \Delta}{\Sigma \Delta} + \frac{\Sigma m_x \Delta \left(x - \frac{l}{2} \right)}{\Sigma \Delta \left(n - \frac{\Sigma z^2 \Delta}{n \Sigma \Delta} \right) \frac{\delta x}{2}} \right\} \right.$$

The factors in the first and second terms of the second member have the same significance as for symmetrical loading. In the third term m_x is the simple moment for the given loading on a beam supported at the ends. As $\Delta \left(x - \frac{l}{2} \right)$ has two equal symmetrical values but *opposite in sign* for each pair of symmetrical points, the symmetrical values of m_x may be combined and the *difference* multiplied by the common value $\Delta \left(x - \frac{l}{2} \right)$. This is shown in Form B for loads 1-8 inclusive. In the denominator of the third term, n is 20 the number of the equal divisions into which the span was divided. $z = 2x \div \delta x$ and has the values 1, 3, 5, 7 .... 39. Since Δ is the same for a pair of symmetrical points, the symmetrical pairs of values of z^2 have been combined in Form B. Form B is quickly filled, and as a result the values of M_1 and M_2 for six different loadings are known.

Form B.—To be Used in Computing M_1 and M_2.

Point	1	2	3	4	5	6	7	8	9	10	11	12	13
				Dead Load		Unit Loads 1-1'		Unit Loads 1-8					
			(1)x(2)		(1)x(4)		(1)x(6)		(1)x(8)		(3)x(10)		(1)x(12)
	Δ	$x - \frac{l}{2}$	$\Delta(x - \frac{l}{2})$	m_x	$m_x \Delta$	m'_x	$m'_x \Delta$	m''_x	$m''_x \Delta$	m'''_x	$m'''_x(x - \frac{l}{2})\Delta$	z^2	$z^2 \Delta$
1				Moments produced by D.L. on beam supported at ends		20		8		4.8		1522	
2						56		22		12.4		1378	
3						88		34		18.0		1250	
4						116		44		21.6		1138	
5						140		52		23.2		1042	
6						160		58		22.8		962	
7						176		62		20.4		898	
8						188		64		16.0		850	
9						196		64		9.6		818	
10						200		64		3.2		802	
Sum					$\frac{1}{2}\Sigma m_x \Delta$		$\Sigma m'_x \Delta \frac{\delta x}{2}$		$\Sigma m''_x \Delta \frac{\delta x}{2}$		$\Sigma m'''_x \Delta (x - \frac{l}{2}) \frac{\delta x}{2}$		$\Sigma z^2 \Delta$

For symmetrical loading $M_1 = H_1 \frac{\Sigma y \Delta}{\Sigma \Delta} - \frac{\Sigma m_x \Delta}{\Sigma \Delta} = M_2$

For unsymmetrical loading $\left.\begin{matrix} M_1 \\ M_2 \end{matrix}\right\} = H \left\{ \frac{\Sigma y \Delta}{\Sigma \Delta} - \left\{ \frac{\Sigma m_x \Delta}{\Sigma \Delta} \pm \frac{\Sigma m_x \Delta (x - \frac{l}{2})}{\Sigma \Delta (n - \frac{\Sigma z^2 \Delta}{n \Sigma \Delta}) \frac{\delta x}{2}} \right\} \right.$

M_1 for loads 1-8 and 8'-1' = M_1 + M_2 for loads 1-8
M_1 for loads 9-1' = M_1 for loads 1-1' minus M_1 for loads 1-8
M_1 for loads 9-9' = M_1 for loads 1-1' minus M_1 for loads 1-8 and 8'-1'

For any loading the left reaction is found from the expression

$$V_1 = \frac{M_2 - M_1}{l} + R_1$$

where l is the length of the span and R_1 the common reaction for the given loading on a beam supported at the ends. Knowing H_1 M_1 and V_1 for any loading the true equilibrium polygon can be readily constructed.

The moving loads employed in Forms A and B produce maximum moments at the supports, the crown and in the vicinity of point 6' with a close approximation.

Thirty-three Passengers Killed in Michigan.

On the Pere Marquette Railroad near Salem, Mich., July 20, 33 passengers, nearly all of them employees of the railroad company, were killed in a butting collision between an eastbound passenger train and a westbound freight, and about 75 others were injured. These people were employees of the company, chiefly at Ionia, who were taking their annual excursion to Detroit, the special train being run for their accommodation. The passenger train met the freight in a cut on a sharp curve about one mile east of Salem. Two of the passenger cars were completely wrecked. The only explanation of the accident is that the conductor and engineman of the freight, who had received an order from the despatcher giving the times of the excursion train at the successive stations, misread the order. The engineman and fireman of both trains jumped off and, it appears, escaped without very serious injury.

A press despatch from Detroit says that Receiver Hannah, in charge of the operation of the road, has given orders that all the victims of the wreck be settled with the same as if they were passengers who had paid their passage.

The conductor of the freight train, it is said, has acknowledged that he read his orders wrong. He was arrested. Press despatches say that the engineman, fireman and one brakeman also read the orders wrong, reading that the time for Salem on the order was 9.25, when it was really 9.10. The engineman is at his home confined to his bed by injuries.

The Passing of the Pay Car.*

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Railroading isn't any fun any more. Sordid commercial folk in Wall street, with never an idea in their noggins but to invest money and make it pay dividends, have improved all the romance out of life on the rails.

They have reduced grades and straightened kinks and eliminated low joints and high centers and wooden culverts and crazy bridges until a ride over the division is about as thrilling as walking to church. Air-brakes have so thoroughly crowded out the good old Armstrong kind that a brakeman has no use for skill or judgment or muscle or even a vocabulary in stopping a train. The engineer does all that is necessary with a slight twist of the wrist.

As for making a coupling, a brakeman no longer mines in the cinders on the back of the tank until he digs up a rusty old link and a couple of pins and, taking these in one hand and his life in the other, sprints down the center of an unballasted track and over unprotected frogs and guard rails 6 inches ahead of a string of cars rolling back at the rate of 15 miles an hour. No; in these days of slavish adherence to M. C. B. standards he just stands around smoking cigarettes and lets the cars couple themselves. No more does he fracture the handle of the fireman's coal hammer and his own peace of mind in vain endeavors to pound a stub switch open after a grilling summer sun has expanded the rails until they are stuck as tight as if they were welded. A fellow in a dog house on a pole away off yonder, by manipulating a few dainty levers, throws the switches for him.

They have replaced the little old eight-wheel engines, with their ear-splitting, staccato bark, with compound steel mountains, with cylinders like hogsheads and nozzles so big that the exhaust is gentle as a lover's whispered nothings, for no better reason than a desire to keep down coal consumption. Trains, instead of being made up of a dozen or so of pill boxes, now consist of a string of warehouses on wheels so long that when the front end is arriving at its destination the hind end is just pulling out at the other end of the division.

No more do engineer and conductor, watches in hand, make nice calculations on the time they can steal to make a meeting point that has a siding long enough to avert the necessity of sawing past. Roads are double-tracked and four-tracked and block-signaled till all a man has to do is to trundle along from block to block until his run is ended and repeat the process until he is retired on a pension.

Ah, no! Railroading isn't what it used to be. But if those Wall street money grubbers had only left us the pay car all else could have been forgiven. Do you remember how, in the good old days, the decrepit jokes about what was to be done when the pay car came were taken out of the moth balls along about the 10th of the month and dusted off and put through their paces? How, toward the 15th, a feeling of sprightliness gradually stole over every one from the wipers in the roundhouse to the lucky dogs who had passenger runs? How this exuberance swelled in volume as anticipation became more keen, until toward the 18th everybody went about with a broad grin and nerves all a-tingle the way you feel when the orchestra is playing the creepy music to accompany the villain's midnight assault with intent to kill? How, still later, everybody drifted down to the depot about four times a day to ask the station agent if he had heard anything about the pay car, until he grew as crabbed as a setting hen? How, about the 22nd, the waiter girls at the Depot Hotel would give you a saucy wink and bring you a great, juicy, melting, extra special wedge of pie you didn't order, for dessert, along with the ice cream and nuts and raisins and fruit and pudding and shortcake you did order? Those girls knew how to work a fellow for tips about pay day, didn't they?

At last, one day as you were letting 'em down the hill into the junction, the operator pulled his train order signal on you. Your heart leaped into your throat because you knew—— Well, you just felt it in your bones. You went down the side of the car without knowing how you did it and sprinted for the switch to

*By C. F. Carter.

head 'em in on the passing track, and then flew to the station on winged feet, leaving the engineer to hold 'em with the driver brakes or let 'em run out at the lower end as he chose. And the grumpy old curmudgeon stopped 'em beautifully, without so much as saying "boo," when on any other occasion he would have unloosed a torrent of vituperation that would have set the ties on fire, and would have followed it up by heaving a monkey-wrench at you if you had been in range.

There behind the counter was the Old Man looking over the shoulder of the operator, who was spelling out the order without breaking oftener than every second word:

"Train No. 7, Conductor Flatwheel, Engineer Poundem, will meet Pay Car special, Conductor Linkenpin, Engineer Moriarty, at Emerson."

Such an air of nonchalance as Old Man Flatwheel did assume as he turned away to discuss with the hind man the advisability of making a switch of that through car of corn next the engine to get it behind the way cars so we wouldn't be bothered with it at Lyons in doing our work on those heavy grades, and affected to forget that he was getting orders until the operator called him over to sign them. He was so slow about his signature that before the despatcher's O.K. was received you looked out of the big bay window and saw the section gang that was working just beyond the Y throw down their shovels and run down the track like a herd of stampeded steers.

There, just coming around the curve, was a glittering vision of brass and varnish half hidden in a nimbus of smoke and dust. Two short blasts on a whistle greeted the gang, the vision hesitated for a minute, while the section men disappeared in the nimbus and reappeared as suddenly as if they had been shot out of a gun, and here came the vision gliding up to the platform with bell ringing and pop valve sputtering *sotto voce*, like a young lady trying to suppress a ticklish cough. It was the pay car. At this point you lost consciousness.

Some time later, while still as one in a dream, you realized that your numbed senses, beginning at the pilot, had taken in every detail of this romantic visitation of opulence. Never was there such an engine as the one which pulled the pay car. At each joint in her jacket was a band of brass 4 in. wide. Dome, sand box, steam chests and cylinders were encased in brass, polished until you could have seen to shave in it. Her front end and her dainty straight stack were rubbed with plumbago until they shone like a small boy's heel. All her bright work was smooth and spotless and glittering, while all the rest of her surface was striped and curlicued with all the colors the general shops could mix.

Moriarity, the lucky runner of this paragon, in a clean checked jumper left open at the neck to show a gorgeous red tie in which a diamond glittered, a hard boiled cady cocked jauntily over his left ear, was lolling out of the cab window in such a way that all the world might see that he wore kid gloves while on his engine. Moriarity was something of a swell and he didn't care who knew it. His only rival in sartorial effulgence was Pete Swanson, his Swede fireman, who was leaning out of his cab window with a stony glare fixed on vacancy, affecting to watch for signals. Of course he knew that all the signals which concerned him would be given with the bell cord; but his zealous attention to duty relieved him of the necessity of recognizing his humbler fellow mortals. No plebeian overclothes eclipsed Pete's glory. There was the square-cut black coat that no one but a railroad man ever wore —you know the kind—a vest of fancy red cloth, trousers with stripes that you could hear ten car-lengths away, square-toed shoes with soles half an inch think, and a stiff-bosomed shirt with red and white stripes. On this foundation reposed a black satin puff tie held together by a locomotive done in gold. On his head at a rakish angle was one of those soft hats of the peculiar block affected exclusively by railroad men a score of years ago. No, you didn't need to read the tag to discover that Pete was a railroad man.

Coupled to the engine was a wheeled palace built on graceful lines in freshly varnished yellow paint which rivaled the brass work on the engine in brilliance. The plate-glass windows were curtained with bright-hued brocade. Not a speck nor a flaw was to be seen. Even the yellow wheels bore only so much dust as had been gathered on the day's run. Through an open window came fragrant odors, while in the background a white jacket surmounted by a black face vibrated at intervals.

All this time Old Man Flatwheel was heading a little procession bound toward the rear platform of the pay car at a gait which he assumed but once a month. Flatwheel had conscientious scruples against undue exertion. He always had the caboose stopped at the station platform so that without dissipating his energies he could saunter in to gas with the agent until the hind man announced that the work was all done and that we were ready to go. Then he would get his orders or a clearance and tell the hind man to give 'em the sign and saunter back to the caboose before they got to rolling. But to have seen the animation with which he swung himself aboard the pay car would have created the impression that he was the only working railroad man on the division.

At his side stalked Panhandle Dan, the engineer, his face actually wreathed in smiles. Panhandle Dan had a chronic grouch from 12.01 a.m. January 1 to 11.59 p.m. December 31, except for three minutes once a month. On the way to the pay car he always perked up a bit and was even known to crack a joke with Old Man Flatwheel. After these two came the hind man talking incessantly with the fireman. Charles always was talking that way. He had an automatic tongue which never ran down. Half the time he didn't know he was talking. His was what the doctors would diagnose as a reflex conversation. Frank, the fireman, was the only sober one. He, poor fellow, was doing sums in mental arithmetic, trying to figure out how on earth $58.60 could be made to pay all necessary bills for a helpless father and mother, a wife and four kids, besides board bills for a man who was obliged to be away from home half the time.

Then there was the operator, in shirt sleeves and careworn air, hoping he could get back to his key before the despatcher lost his temper; the agent, placidly smiling; and the two coal heavers from the coal shed with an expression of almost human intelligence struggling up through numberless strata of grime and whiskers. After 30 days of humping over a scoop shovel in a choking smother of dust they were now about to be recompensed with 30 seconds of bliss in which they could fondle real money with their own hands. After that the storekeeper would do the fondling and feel bad because there wasn't more.

You had presence of mind enough to float into the pay car in the wake of the others. There were nine in the little party and you knew by experience that the average time required to pay nine men was 60 seconds; also that Moriarty would have 'em rolling before the last man had scooped his allotted coin into his trembling palm. But in the presence of death or the paymaster one may live an eternity in 60 seconds. How glad you were that you had not been rude and rushed in ahead of anybody, even the coal heavers! Now your hungry soul could have the uttermost second in which to revel in——

Great Mackerel! Just look at it! A metal coin rack crammed to the muzzle with three denominations of yellow boys, flanked with silver, and on the desk behind it a very large wooden tray on which were long columns of yellow coins. D'ye ever see anything so pretty in all your life? No wonder your eyes stuck out until you could have used 'em for hat pegs. And all the time an exquisitely musical "tinkle, tinkle, clink-clink" welled up from coin rack and counter in response to the calls of the assistant paymaster. Talk about Beethoven's symphonies!

If it were not for that strong wire screen you could have touched that fascinating tray. For the infinitesimal fraction of a second a wicked thought flitted through your brain. Then you almost fainted as your roving eye stared down the barrel of a monstrous revolver. It was only in a rack, but it was within easy reach of the paymaster's hand and most eloquent for all that. Half a dozen of its fellows lay in the handiest places, while as many Winchesters lying on tables and settees, came in strong on the chorus. Hurriedly your vagrant wits busied themselves with all the Sunday-school lessons you had ever learned. As your subconsciousness perceived that the head of the road's secret service department stood on the platform with his eyes intent on every man in the car at once, while Conductor Linkenpin stood on the ground outside very much alert, with his coat tail bulging suggestively, your bosom swelled with pride over the watchful care the company had exercised to bring its honest toilers their hard-earned money.

From the lithograph of Caroline Miskel Hoyt on the wall to the little hollows in the hard mahogany counter worn out by the attrition of the $128,000,000 in wages the paymaster had plunked down on that spot since this first pay car ever built had been commissioned, you kept on absorbing details until your name was called. A still greater rush of blood to your head caused you to gulp violently. Mechanically you lifted your hand to touch the pen as the others had done, and turned to go.

"Here! Come back and get your money."

When you came out of your trance you were standing in the middle of the track, your eyes wandering from some yellow objects in your hand to a nimbus of smoke and dust which was just tipping over the hill to the accompaniment of the diminuendo flutter of Moriarty's exhaust.

But now! Oh, well! After you have washed up on a certain day in each month you trudge drearily down to the station all alone, walk in, and lolling on the counter, affect to look indifferent and say: "Hello, John!" And the agent, after going over a column of figures three times, replies, "Hello, Bill," and gets up and goes to the safe and fumbles over some papers and hands you——

A check! No jokes, no infectious sprightliness, no uncertainty to put a wire edge on anticipation, no fleeting vision of brass and varnish and opulence wreathed in a halo of romance to leave a golden taste in your mouth for a day, nothing but a measly old check handed over a commonplace counter by a man who lives next door to you.

Why couldn't they have left us the pay car?

Increase in Weight of Locomotives.

At the recent annual meeting of the American Society for Testing Materials, H. V. Wilson of the Baldwin Locomotive Works, contributed to the discussion on rail a number of diagrams showing the increase in weight of locomotives of various types during the last 22 years beginning in 1885. Some of these diagrams are reproduced herewith, the weights being the averages of the output of the Baldwin Locomotive Works for each year. Fig. 1 shows the increases in total weight, weight on drivers and average weight per axle for eight-wheel locomotives. It will be seen that the maximum figures were reached in 1904, since which time there has been a decided falling off owing to the practical abandonment of this type of locomotive in favor of Atlantic, Pacific and Prairie locomotives for passenger service and those of heavy freight. The highest driving axle loads are 41,000 lbs.

Fig. 2 shows the same data for 10-wheel (4-5-0) locomotives. The average total weight has increased from 87,000 lbs. to 161,000 lbs., or 85 per cent., and the average weight on drivers has increased from 65,000 lbs. to 122,000 lbs., or 88 per cent. The average weight on each driving axle was 32,500 lbs. in 1885 and 40,000 lbs. in 1907.

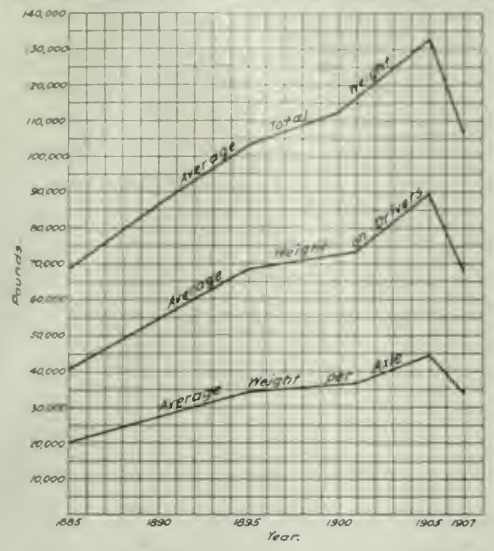


Fig. 1—Increase in Weight of 8-Wheel Locomotives.

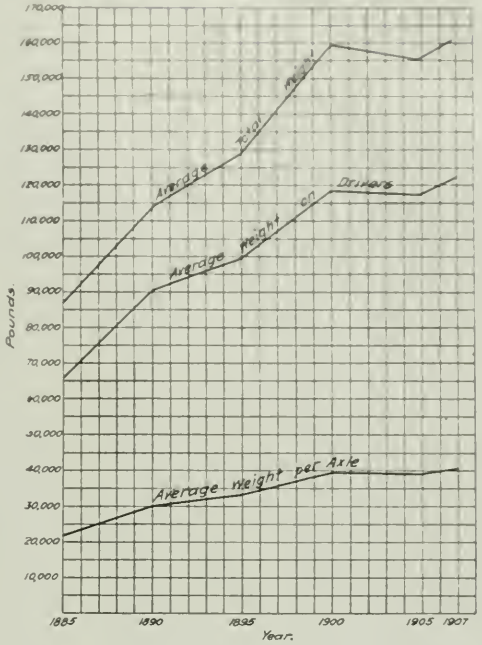


Fig. 2—Increase in Weight of 10-Wheel Locomotives.

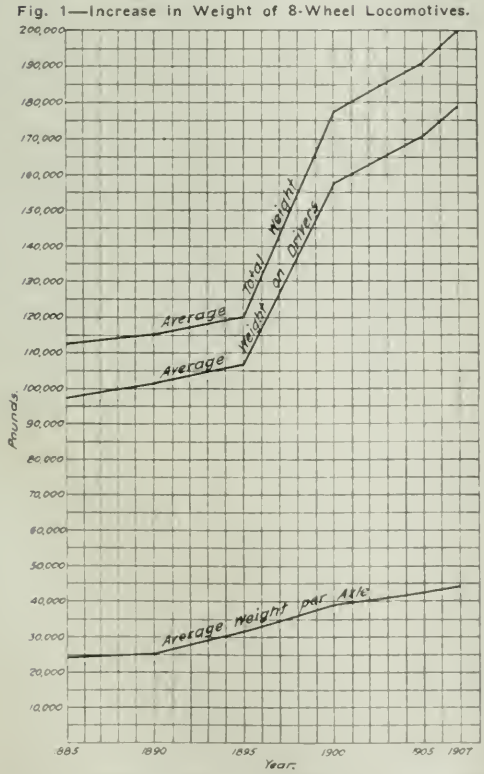


Fig. 3—Increase in Weight of Consolidation Locomotives.

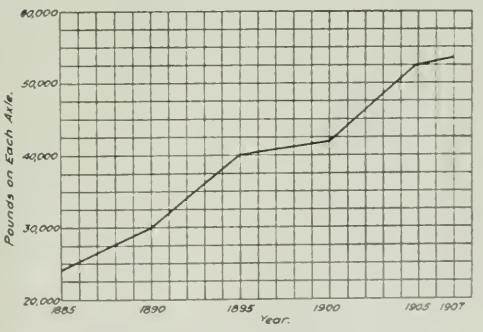


Fig. 4—Increase in Maximum Axle Loads.

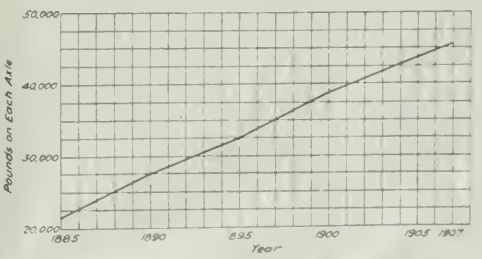


Fig. 5—Increase in Average Axle Loads.

Fig. 3 is for consolidation (2-8-0) locomotives. The average total weight increased from 112,000 lbs. to 200,000 lbs., or 79 per cent., and the average weight on drivers increased from 97,000 lbs. to 179,000 lbs., or 85 per cent. The driving axle weights rose from 24,250 lbs. in 1885 to 44,750 lbs. in 1907.

Fig. 4 shows the increased maximum axle loads, the highest in 1885 being 24,000 lbs. and the highest in 1907 being 53,500 lbs.

The increase is 123 per cent. Fig. 5 shows average axle weights for all types of locomotives, the increase in 22 years being from 21,500 lbs. to 45,500 lbs., or 112 per cent.

New York Telegraphers' Hours-of-Labor Law.

The Governor of New York has just signed a law, passed by the last legislature, to limit the working hours of railroad telegraph operators. The law is in substance as follows:

It shall be unlawful to require or permit any telegraph or telephone operator who spaces trains by the use of the telegraph or telephone under the "block system" * * * or whose duties pertain to the movement of trains by the use of the telegraph or telephone * * * to be on duty for more than eight hours in a day of 24 hours, except in cases of extraordinary emergency caused by accident, fire, flood or danger to life or property; and for each hour of labor so performed in any one day in excess of such eight hours, by any such employee, he shall be paid in addition at least one-eighth of his daily compensation. Penalty not less than $100 or more, one-half to go to the informer. The provisions of this act shall not apply to any part of a railroad where not more than eight regular passenger trains in 24 hours pass each way; provided, moreover, that where 20 freight trains pass each way generally in each 24 hours then the provisions of this act shall apply, notwithstanding that there may pass a less number of passenger trains than hereinbefore set forth, namely, eight. The act takes effect October 1, 1907.

Three Cent Fares in Cleveland; A Favorable View of Mayor Johnson's Projects.*

The fight for lower fares in Cleveland dates from 1898, when ordinances were introduced in the City Council to reduce fares on certain lines. These ordinances proceeded on the theory that the right to regulate fares and service had been reserved to the Council. In the elections which preceded these ordinances the political activity of the railroad companies had been notorious, and the use of money to influence the elections and to control councilmen was a matter of common gossip and scandal. The street railway companies met these ordinances with injunction suits. Thus began the first of a long line of litigation, which has extended over the intervening eight years, and which has been fought through every state and federal court. In the meantime grants were nearing expiration. Two considerable main line grants expired in 1905. This has been decided by the United States Supreme Court. Other grants, covering the very backbone of the system, will expire in from one to three years. On two occasions the railroad company nearly succeeded in getting a renewal grant. If it had made an offer even approaching the one it is now making, nothing could have stopped the passage of the renewal ordinance. But the City Council, realizing that there was little hope of being able to regulate fares under the old franchises, sought to secure a reduction and readjustment by inviting competition.

In 1901, Tom L. Johnson, millionaire, successful street railway promoter and operator, became Mayor, and thus brought to the service of the city a type of ability ordinarily to be found only in private corporations. He was elected after a campaign in which the street railway question was the chief issue. His efforts induced an outside capitalist to offer to build street railway lines and operate them on a 3-cent fare. The preliminary legislation was started and in 1902 grants were made to a competing company at 3-cent fare over territory not yet pre-empted by the old company. A new line of litigation and injunctions was begun and, because the railways themselves had hitherto made most of the street railway law, this new company was finally forced out of business.

At once new establishing ordinances were introduced, in which all of the quirks and technicalities were complied with to their last absurdity. And so dangerous to the "vested interests" did this attack become that the co-operation of the Attorney-General of the state was secured, and suit brought in the Supreme Court of the state to oust the city government and declare void its charter. The end to which the Cleveland roads, under the leadership of the late Senator Hanna, went in this litigation is almost without a parallel. The company, to maintain its advantage, succeeded in destroying not only the charter and city government of Cleveland, but brought down every city government in the state, so that not one charter was left whole. The destruction of the charters throughout the state made it necessary to hold a special session of the legislature in order to supply a new municipal code. On the night of May 4, 1903, this new code, under which all cities of Ohio are governed, went into effect, and the same night the fight was renewed. New establishing ordinances were again introduced.

Under these ordinances the Forest City Railway was awarded one grant on an outlying street for a 3-cent fare road. With this as a base to extend from, there has now been built and equipped, during intervals between injunctions, a 15-mile piece of road, from one extremity of the city to the center. It will be well to explain here that, under the laws of Ohio, it is almost impossible to establish a new line, but a comparatively much easier matter to extend from an established line. In the meantime construction has commenced on isolated stretches on the other side of the city. An extension over the two main lines of the old company, the franchises for which have expired, has been granted to the Forest City Railway. When all of these pieces are connected, there will be a line from one extreme end to another through the very heart of the city. As the old franchises expire, the new company will bid for franchises over these streets on the same terms hereinafter explained. Thirteen miles of the new road have for several weeks been in actual operation, and experts who have studied the matter claim that this fragment, by itself, can be operated for 3-cent fares at a profit.

The new road is being built and equipped for less than $50,000 per mile. The capitalization of the old company is $150,000 per mile. The construction is of the most modern and heaviest kind, and the equipment the best to be had. As a matter of fact, the structural value of the 236 miles of the old company is under $50,000 per mile, although capitalized for three times this amount. This figure was at one time agreed to by the old company. The capital invested in the new project is represented by the Forest City Railway, which is the owning company. The city is represented by the Municipal Traction Company, which is the holding company. The Forest City Railway is a corporation organized in Ohio, with a present authorized capital of $2,000,000, all common stock, 6 per cent., cumulative. It can issue no bonds. Under a trust agreement, $1,900,000 of the stock has been turned over to one of the leading trust companies of the city, the largest in the state. The other $100,000 of the stock had already been issued for actual money paid in. By a fiction of purchasing franchises from the original grantee for $200,000, the stock is fully paid up when sold at 90. Of it $750,000 was offered at popular subscription and oversubscribed by nearly an equal amount. The stock may be retired at 110. The money from the sale of stock at 90 can only be paid out by the trust company, on the order of the Municipal Traction Company for actual construction cost and expenses incident thereto, and for payment of 6 per cent. interest on instalments paid in to the first day of October, 1906, after which date dividends accrue. We have here a corporation without a dollar of debt, in which every stockholder, no matter at which time he becomes one, is on exactly the same footing, and one in which every dollar paid in goes into construction. There is no ground floor, no "rake-off" for promoters.

The franchises are all granted to The Forest City Railway. They are for 3-cent fare, cash or ticket, and universal transfers. The right to regulate charges and service is explicitly reserved to the Council. The grants are revocable at the will of the Council, limited only by a clause that the property cannot be impaired as a 6 per cent. investment. They contain a municipal ownership clause, under which the city may, whenever the laws of Ohio shall permit it, take over the property for its actual cost, less depreciation, plus 20 per cent. All of the property and rights, present or to be acquired, of the Forest City Railway are leased to the Municipal Traction Company for 50 years, with a privilege in the lessee to renew for another 50 years. The lease follows the general scheme under which the Elkins-Widener Syndicate controls the underlying properties in its system of street railways.

The Municipal Traction Company can be described as a purely paper corporation. It is organized under the laws of Ohio with an authorized capital of $10,000, 10 per cent. paid in. It is composed of five selected stockholders, each one a director, each owning one-fifth of the capital stock. Its personnel consists of five leading business and professional men, the President and General Manager being A. B. du Pont, one of the leading street railway experts in this country, and its Vice-President, Frederick C. Howe, a law partner of James R. Garfield. It will never pay any dividends. The directors and officers get reasonable salaries. By a carefully drawn contract, each stockholder and director has executed to all of the others an option on his stock, under which it will only be necessary to insert the name of the newly elected director into the certificate to transfer the stock. The stock certificates have been endorsed in blank and put in safe deposit and are accessible only to a majority of any surviving members. If a vacancy should occur, the same will be filled by the survivors. If the directorates shall all become vacant at the same time, a court of equity would take care of the emergency. The body is thus self-perpetuating.

The Municipal Traction Company owns no property except the lease to it of the Forest City Railway. It has or assumes no liabilities other than the current ones growing out of the operation of the road and the rental equal to 6 per cent. on the outstanding stock of the Forest City Railway and not to exceed $2,500 per year organization expense. Under the terms of the lease the lessee constructs and equips the road out of the proceeds from the lessor company's stock, and the title to the property is in the lessor. The

*Abstract of an article by Carl H. Nau, in the *Journal of Accountancy*.

lessee operates and maintains and keeps in original good repair the property of the lessor out of the earnings from operation. The lessor company cannot issue bonds or execute any mortgage or make any charge upon its lines or property without the written consent of the lessee. The lessee, of course, cannot in any way put any charge upon the property, the title to all of which is vested in the lessor. The lessee can, out of its surplus earnings, buy the property of the lessor at any time, in whole or in part, for a price 10 per cent. in excess of part on the stock, and the rental to be paid ceases on such portions so bought. Any portion of the property so paid for out of earnings, or any extensions to it built out of earnings, will not have to be paid for when the city exercises its option to purchase under the municipal ownership clause in the franchise. All of the books and records of both companies are open to the inspection of the City Council or any citizen and the utmost publicity has been provided for concerning all of their transactions.

The crux of the holding company plan is the question of trusting the five directors of the Municipal Traction Company to administer their trust faithfully and to elect equally faithful successors. As already shown, the stock of the Municipal Traction Company is so safeguarded that none of it can pass into the estate of a director in case of death, nor into the hands of a receiver in bankruptcy in case of financial trouble. All vacancies will be filled by the surviving members. The efficient checks upon the good faith and rectitude of the five men composing this holding company for the public are:

1. Their high character, the public pledges they have given and the obligations they have assumed.

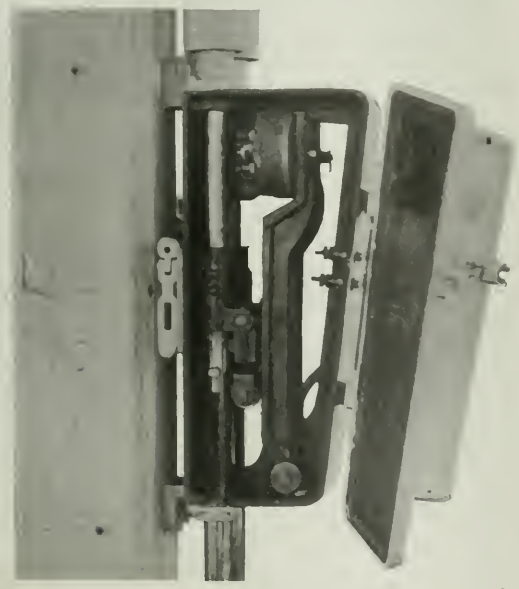


Fig. 1—Double Electro-Mechanical Slot.—Doors Open on Both Sides.

2. The utmost publicity. They and their every act are at all times open to public scrutiny.

3. The city's right, under the option reserved in the franchises, to appropriate the property at a small percentage over structural value.

4. The right to revoke the franchises at any time and grant them to another, who will compensate the stockholders of the owning company for their actual investment only.

Since this new project was financed and the holding company formed, the old company has made a new offer, which for the past six months it has been strenuously urging on the city by the expenditure of over $1,000 a day in advertising in the newspapers and by the attempted creation of favorable sentiment through discussions in churches, clubs and other organizations of the city.

This offer for a renewal franchise for 20 years is seven tickets for a quarter and universal transfers, including all of the other burdens now imposed, such as paving, sprinkling, licenses, etc. The present rate is 11 tickets for 50 cents. In its advertisements the company claims that this means a saving to its patrons of over $1,000,000 a year.

The fight for 3-cent fares in Cleveland has now, however, progressed so far that there seems to be a growing disposition to compromise on nothing less, and moreover to insist on no franchise being granted, at any rate of fare, that is not revocable and that does not reserve the future to the city. As the most valuable franchises expire in a comparatively short time the disposition seems to be to wait until they do expire, and then grant them to the Forest City Railway. In the meantime, a truce has been entered into whereby all construction by the new company and all adverse activities and litigation by the old company has been stopped, while a representative of the city and one of the company are fixing the value of the old company's property, with a view to leasing it to a holding company controlled by the city. The basis for the leasing value is to be physical value, plus unexpired franchise value plus one-ninth.

The Hall Electric Slot.

The Hall Signal Company's electro-mechanical slot for semaphore signals combines in a marked degree reliability, simplicity and accessibility. To reduce failures to a minimum such an apparatus should be easily understood, and easy to inspect and repair. A slot placed at or near the arm of a high signal is not, under the most favorable circumstances, easy of access. A small case, necessitating excessive compactness aggravates this condition. The placing of moving parts, such as levers and dogs, behind any other part, necessitating the removal of the latter to make repairs to the former, is a nuisance, and wires connected to moving magnets are liable to cause failure. This slot, shown in the accompanying illustration, is free, to a remarkable extent, from the evils mentioned. It is designed to be mounted near the base of the signal post, where it will be easily accessible to the maintainer. All movable parts can be plainly seen and easily inspected or removed without dismembering the entire mechanism. The case is roomy but not over large, and the magnet is fixed. The details and construction are shown in Fig. 2. In this drawing A represents the cast-iron case; B is the lower operating rod and C the upper operating rod carrying the dash pot Q, attached in the usual way. D is a powerful iron-clad magnet mounted on a stand which is rigidly fastened to the case; E is the armature secured loosely to the lever F by the threaded pin G. G is slightly smaller than the hole in F, through which it passes, and has a semi-spherical head, after the manner of a ball and socket joint. This is to allow E to make good contact with D despite any small lack of adjustment in F. Lever F is pivoted at O. H is a phosphor bronze spring used to restore lever F to its normal position, but exerts no appreciable pressure otherwise. I is a cast-iron sleeve riveted to the lower rod B, and carries the latch J pivoted to the lug K, which is part of the sleeve I; J carries a roller L to reduce friction when traveling against lever F. The lower end of C extends within B and carries a pin M working in slot N cut in B. This is to allow the signal to be pulled to danger, as M projects beyond the edge of B on both sides. Both rods are notched at P to allow the projection of latch J to engage with upper rod C.

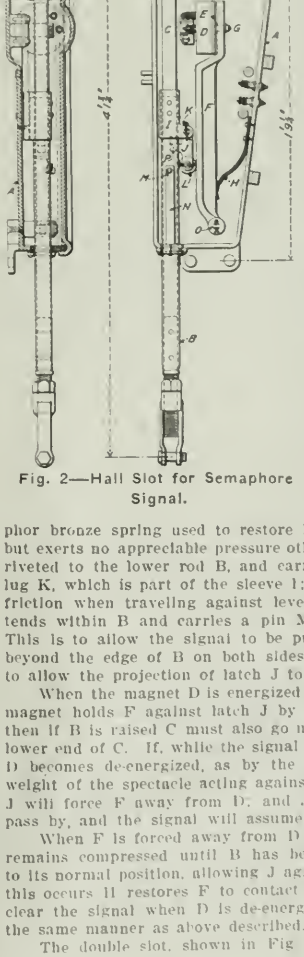


Fig. 2—Hall Slot for Semaphore Signal.

When the magnet D is energized the signal can be cleared. The magnet holds F against latch J by pressing against roller L, and then if B is raised C must also go up for latch J will engage with lower end of C. If, while the signal is in the clear position, magnet D becomes de-energized, as by the opening of a track relay, the weight of the spectacle acting against lever F, through C and latch J will force F away from D; and J, in tripping, will allow C to pass by, and the signal will assume the stop position.

When F is forced away from D it compresses spring H, which remains compressed until B has been restored by the signalman to its normal position, allowing J again to enter the notch P; when this occurs H restores F to contact with D. If it is attempted to clear the signal when D is de-energized, F will be forced back in the same manner as above described.

The double slot, shown in Fig. 1, is used where two arms of

a signal are slotted, and is much more compact and convenient than two single slots. This slot consists essentially of the mechanisms of two single slots mounted side by side in one case, and it operates exactly as above described. The principal dimensions of both slots are shown in Fig. 2. The single slot weighs approximately 85 lbs., and the double slot approximately 145 lbs. These slots will operate on 0.12 watts, and are highly efficient.

The Chemical Composition of Steel Rails.*

In the discussion on a paper which I presented to the institution nearly 40 years ago, manufacturers suggested matters of specification and composition in connection with rails should be left entirely to them; but the late Sir John Fowler, past-president, upheld the claims of his profession, and stated that "in his opinion it was not desirable in the interests of railroad proprietors or the public that engineers should abdicate their functions; but he would advise them to draw up specifications and to take pains to ascertain the process of manufacture. However, he thought it would be admitted that no rule could be laid down for the manufacture of rails which would be applicable to all localities."

In spite of the great amount of subsequent study, and of discussions on this subject, I still retain my opinion that a universal specification or composition for rails which would suit all cases cannot be satisfactorily arrived at. The varying conditions, such as ores available, process of manufacture, weight of rail, climatic and traffic conditions, differ in almost every case and all of them should be taken into account, in order to obtain the best results.

It will easily be realized how difficult a problem faced the Engineering Standards Committee when drawing up a general specification with fixed limits of chemical composition, to be applicable to the various processes of manufacture and other conditions.

All I can do in introducing this subject is briefly to mention the effect of each element according to my experience.

Beginning with phosphorus, I think engineers have suffered enough from fractures due to a high percentage of this element, especially in cold climates, to make it necessary to limit it as far as possible, in spite of the good wearing results of high-phosphorus rails. It is possible to work to a lower phosphorus limit with the basic than with the acid processes, especially with the basic open-hearth process; but starting with a pure ore, as in the acid processes, must always be attended by less risk of an accidentally high-phosphorus than the basic processes of purification.

Sulphur will probably present more trouble to the manufacturer than to the user, because if a high percentage is present the rails will be red-short. Sulphur is also liable to cause incipient flaws, which, although not apparent at the rolling, may develop under continuous wear into serious flaws, and in the interests of both the manufacturer and the railroad excessive sulphur should be avoided.

Manganese was stated by the late Sir William Siemens to have the effect of atoning for many evils in steel by healing it up and producing a smoothly rolled surface, which, after all, is of great importance, as many fractures commence with a small surface crack or flaw. At the same time, no more manganese should be allowed than is absolutely necessary for clean rolling, as I have found many cases of rail-fractures attributable chiefly to high manganese.

Silicon.—It has been found in the past that rails containing a high percentage of silicon, although giving excellent wearing results, have not been satisfactory, owing to their brittleness and irregularity of percentage. This has been due to the silicon being left in the steel from the pig-iron during the conversion, or added in the form of pig-iron. As a result of this experience, engineers now generally limit the maximum percentage of silicon to 0.1 per cent. or even less. I have for many years experimented with silicon in rails with a view to obtaining soundness and solidity without brittleness, and I gave some results of my experiments in a paper read before the Institution of Mechanical Engineers in Sheffield, in 1890.

I have found that for rail-steel the effect of silicon added is very different from the effect of silicon left in from the pig iron. When silicon is left in, the percentage varies considerably, depending on the heat of the charge, thus causing great irregularity, and as the iron has not been completely converted into steel the metal is of a brittle character. As a rule silicon, if left in, is an indication that the metal has been blown too hot, which is well known to lead to great irregularity in the finished steel. But when the silicon from the pig-iron has been eliminated as far as possible and a known quantity of silicon is added, in the form of high-percentage silico-spiegel or ferro-silicon, I obtain regularity in the percentage of silicon, and moreover, the silicon then toughens the steel instead of making it brittle, this being largely due to the more complete removal of gases and oxide from the steel. I thus obtain a harder, and at the same time, tougher rail, which as far as mechanical tests indicate should be able better to withstand both the wear and the crushing at the ends caused by the present day heavy axle loads. Very thorough tests on large quantities of these rails have been made at various works, but tests, although of great interest, could not be taken as final until they were confirmed by actual experience in the road. I have laid this question before many engineers who have witnessed the tests at the works, and who have now had the rails in the road for some time, and I think it would be of general interest if some of them would give their experience as far as it goes.

Carbon.—In general it is desired to obtain a rail as hard as is compatible with safety, and carbon is the most suitable hardener. In my practice I do not specify carbon limits, merely stating that it shall be as high as the safety or drop-test will allow. Although not absolutely a criterion, the drop-test is still the best safety-test we have.

Another point that has of late years attracted considerable attention is the modern high speed and temperature of rolling. Efforts have been made by various means to remedy the evil effects of this, such as using larger ingots, allowing the whole rail to cool before the last pass and other methods. I have preferred to obtain cold rolling of the rail-head only, by applying sprays of water to this portion of the partially rolled rail at the various passes of the rolls. This should at any rate improve the wearing surface, and has the advantage of neither delaying the manufacture, decreasing the output, nor appreciably increasing the cost. The rails of which tests are shown in a table (to be exhibited at the meeting) have all been treated in this way.

Considerable trouble has been experienced on electrified railways owing to the excessive side wear of the rails on curves. Apart from the question of better wearing steel for their rails in general, one of these railways has introduced the novelty of using a considerably harder steel for check-rails. This has shown surprisingly good results, about which I hope we shall hear more during the discussion.

Regarding special qualities of steel, such as manganese, nickel or chrome-steel rails, I have not, in the short time now at my disposal, touched upon these, because, owing to their high price they can generally be employed only for exceptional purposes.

* A paper read before the Engineering Conference of the Institution of Civil Engineers by Christer Peter Sandberg.

Local Freight Agents' Association.

The annual meeting of the American Association of Local Freight Agents' Associations was held at New Orleans June 18, 19 and 20, representatives being present from 60 cities. Membership in this association consists of Local Freight Agents' Associations located in cities of the United States and Canada having 50,000 inhabitants or over with three railroads, 100,000 inhabitants or over with two railroads or any city with five railroads, and the American association is formed of such associations situated in 86 of the largest cities of the United States and Canada. The topics discussed at this association are labeled with the name of the city which presents them at the meeting. We give below a condensed statement of the most important business done at New Orleans.

Stray freight was discussed in communications from three different cities, and it was voted the sense of the meeting that stray freight should be forwarded to the marked destination by the shortest route, billed free, the agent at destination to see that the roads interested receive their proper share of the revenue.

Toledo presented a paper written by C. H. Newton, formerly Local Freight Agent but now Freight Claim Agent of the Wabash, on the necessity of loading cars to their full capacity; and the meeting voted to have 10,000 copies of the paper printed. Kansas City proposed that waybills of freight received should remain permanently in the hands of the receiving agent and the matter will be taken up with the Accounting Officers' Association. Louisville proposed and the association agreed that freight houses ought to be closed from 12 noon to 1 p.m.

On the suggestion of St. Louis it was the unanimous opinion that one complete file of tariffs should be kept at each station, and only one; this to be the working file of the office, and to be accessible to the public.

Peoria.—The conference committee was instructed to try to secure the adoption of rules under which detachable parts of traction engines, agricultural implements and such like freight, when carried on open cars, should either be boxed or be fastened to the car by iron bands or bolts.

On the suggestion of Memphis a committee of five was appointed to draft a set of uniform blanks for use in local office business.

Cleveland.—In view of the great difficulty experienced in getting competent office help, every railroad should have an officer to be in immediate charge of agencies, keeping in close touch with their wants.

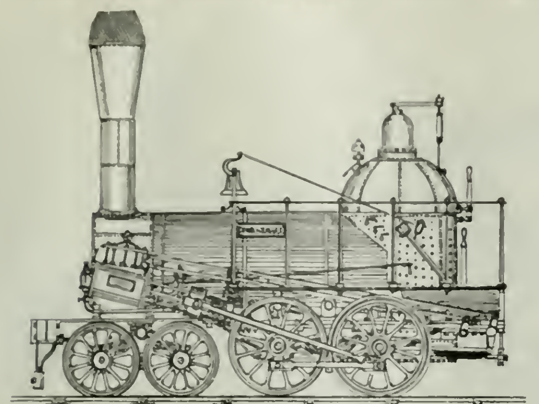
The President of the association for the ensuing year is W. W. Alexander, Louisville & Nashville, Cincinnati, Ohio; Secretary, G. W Dennison, Pennsylvania and Hocking Valley, Toledo, Ohio. The place and time for the next meeting will be decided by the executive committee.

Early Years of the Philadelphia & Reading.

BY C. H. [illegible]

The desire of the people of England to provide a speedy means of carrying coal from the mines to the more distant points of consumption or distribution formed the primary incentive to building railroads at the time of their origin in that country, and to the same motive can be attributed the construction of the Philadelphia & Reading Railroad, one of the [illegible] railroads, not of Pennsylvania alone, but of the whole United States.

Tiring of the slow and somewhat uncertain methods of bringing



Freight Engine "Gowan & Marx," 1839.

Built by Eastwick & Harris. Fuel, anthracite coal. Cylinders, 12½x18 in. Drivers, 42 in. Weight, 11 tons. Weight on drivers, 9 tons. Gurney draft box.

to market the products of the vast deposits of coal in the anthracite regions of Pennsylvania, the promoters of this road built it from Philadelphia to Port Carbon and Pottsville, passing, of course, through Norristown and Reading. Thus, although much of the line was located in fine agricultural districts and passed through manufacturing towns of considerable importance, even at that early day, the chief object in view was the heart of the anthracite coal regions of the state.

The first part of the road to be completed extended from Reading to Norristown, and the first train was run over it on July 16, 1838, when 11-ton engine, "Gowan & Marx," burning anthracite coal, drew a train between the points just named. This train, according to the company's report for the year 1838, consisted of 80 small four-wheel cars containing [illegible] of flour, [illegible] of bloom, [illegible] tons of coal, [illegible] and 6[illegible] persons. The [illegible] of the train, [illegible] of engine and tender, was [illegible] or a net weight of [illegible]. The [illegible] and arrangement of [illegible] exactly as [illegible] in the report. After the train had covered a distance of 1[illegible] miles from Reading the "water pipes" (by which the [illegible] who [illegible] the report probably meant the pipes [illegible] with the pump) gave out and caused a delay until engine "Delaware" (the [illegible] of that name) came up and pushed the outfit to Pottstown. Here the trouble appears to have been rectified and the "Gowan & Marx" drew her train the remainder of the distance to Norristown, assisted at a few points by second-class engine [illegible]. The weight of the "Delaware" is stated to have been "[illegible] tons, including water and fuel." Passenger traffic between Reading and Pottsville was established soon afterward, and also between these points and Harrisburg by way of the Schuylkill Valley and the state road of Pennsylvania. The freight traffic, however, was small, but was not expected to be otherwise until the entire line would be ready for operation from Port Carbon to Philadelphia. This important event took place on January 13, 1842, and hauling of anthracite coal by rail then began in earnest. The cost of the road is placed at $5,000,000, with an additional $521,000 for the extensions to Pottsville, and from the Philadelphia terminus to the Delaware river. As an indication of the business done after the final opening, the report for 1842 shows that the company at that time owned 12 eight-wheel passenger cars, 2 four-wheel passenger cars, 1,130 four-wheel coal cars, 176 four-wheel freight cars, 3 eight-wheel freight cars and 5 four-wheel baggage cars. It is most probable that the capacity of these four-wheel freight and coal cars was little, if any, over three tons. Contracts had also been entered at this time for 14 locomotives and 450 four-wheel coal cars.

From this beginning of 96.9 miles of road, the company from time to time absorbed the following lines: Atlantic City Railroad; Catasauqua & Fogelsville; Cape May, Delaware Bay & Sewells Point; Chester & Delaware River; Dauphin & Susquehanna; Gettysburg & Harrisburg; Lebanon Valley; Middletown & Hummelstown; Mine Hill & Schuylkill Haven; North Pennsylvania; Perkiomen; Philadelphia & Chester Valley; Philadelphia & Frankford; Philadelphia, Newtown & New York; Port Reading; Philadelphia, Germantown & Norristown; Reading & Columbia; Rupert & Bloomsburg; St. Clair, Tamaqua & Hazelton, and Wilmington & Northern. It also added a line of sea-going steamships, sailing from its Port Richmond wharves and carrying anthracite coal to many seaports.

In the few years which intervened between the phenomenal success of the "Rocket" at Rainhill and the date of the opening of the Philadelphia & Reading Railroad, the steam locomotive had so thoroughly established the claims of its supporters as the only satisfactory means of drawing railway trains (excepting, of course, the use of stationary engines on inclines of unusually heavy grades) that no allusion appears in any of the printed matter consulted in

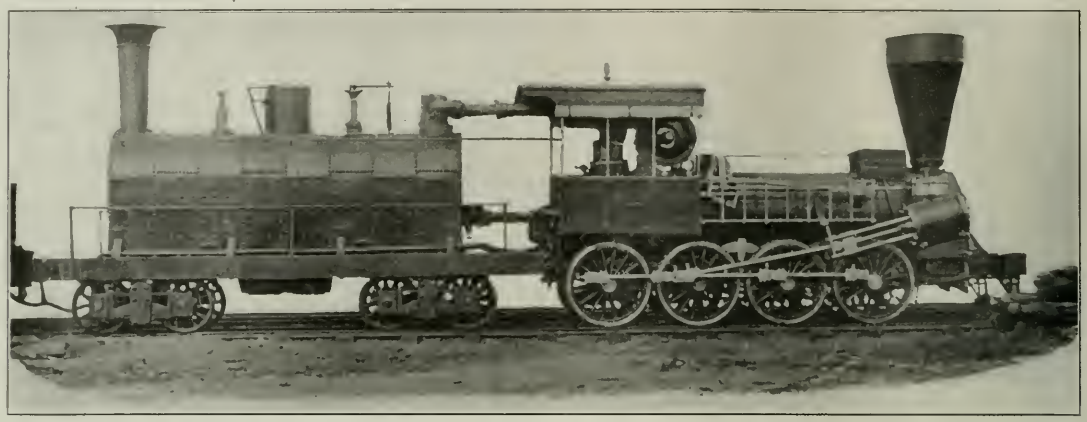
The "Delaware"; Philadelphia & Reading.

connection with this article to indicate that any other method had been considered.

It is probable that the "Gowan & Marx" and the Winans' "crabs" were the only engines of the early equipment which used anthracite coal as their fuel, and that on account of the abundance of wood then available at low prices, together with the limited grate area of the other engines, the use of anthracite in them was not attempted to any extent. Naturally, however, the officers of the company realized the importance of using in all their locomotives a fuel with which the interests of the company were so closely allied. The "Gowan & Marx" already referred to had a firebox 60 in. long, and the large grate surface in comparison to that of their other engines

standard on the line, and with some modifications has not only continued to be so ever since, but has also been extensively adopted on other roads using anthracite coal in their engines, and in a few instances has been applied to a number of engines on roads where soft coke coal is used.

As we have already referred to the fact that the Reading Railroad was built and opened but a few years after the "Rocket's" achievements in Europe, and the impetus given to locomotive construction in this country by the final successful operation of M. W. Baldwin's "Old Ironsides" on the Philadelphia, Germantown & Norristown Railroad, therefore it is but a natural sequence that we should find a great variety of types of locomotives on the road in the

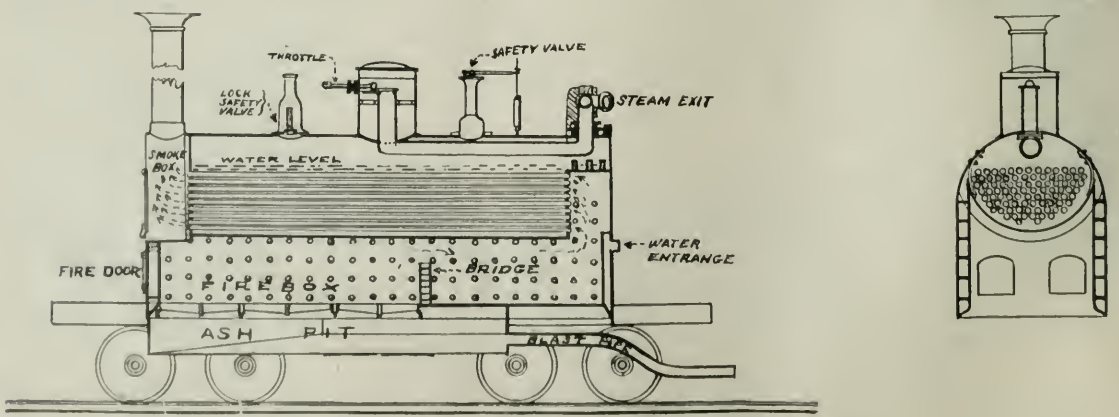


Engine "Novelty", Built in 1847 at Reading, Pa., from Designs of G. W. Nicholls, Engineer and Master Mechanic.

undoubtedly produced results which impressed both officials and locomotive builders with the necessity of large grate era in engines using anthracite coal. Even with this engine the desired degree of efficiency in the use of fuel does not seem to have been obtained; in fact, the solution of the problem appeared rather remote until 1846, when Ross Winans placed his engine "Baltimore" on the road. The firebox of this engine had a grate area of 17 sq. ft. It also had a variable exhaust which proved satisfactory, and the favorable results obtained from this engine doubtless induced the designing and building of the "Novelty" in the following year, with a grate surface of about 44 sq. ft. In 1850 Ross Winans delivered the "camel" engine "Patapsco" to the road, with a firebox of 19½ sq. ft. grate area, and in 1852 James Millholland brought out his "Pawnee," with a grate surface of 24½ sq. ft., following it with the passenger engine "Hiawatha," which also had a grate surface of 24½ sq. ft. These last three engines were practically the standard engines of the road during the next ten years, or until about 1862, when freight engines of the "gunboat" type and passenger engines with similar boilers were built. Both of these types were larger than their predecessors, and both had a greater grate area. During the ensuing fifteen years but little change was made in the locomotive practice of the company. Then, in 1877, the first Wootten boiler was applied to an engine numbered 408. This engine was exhibited at the Paris Exposition the following year. The Wootten boiler at once became the

earlier years of its existence, especially when we consider that American builders soon cut away from the somewhat similar designs of the various English builders, and each man became "a law unto himself" in his efforts to improve the design and efficiency of the steam locomotive. The English engines in use were all practically of the "Planet" type, which will be recognized by those who have seen the famous "John Bull," now in the National Museum at Washington, D. C. Among the earlier engines were four Winan's "crabs," of which the men running them in 1840 say: "They are pulling like elephants."

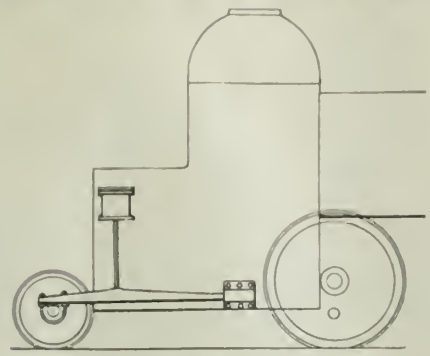
As tabulated data of the engines does not appear in the company's reports until 1846, it is possible that some very interesting machines have passed out of existence and "left no trace behind." These reports show that in 1845 the company owned equipment consisting of 47 locomotives, 2,456 four-wheel coal cars, 265 four-wheel freight cars and 19 passenger and baggage cars. The names of the firms which built the locomotives are: Braithwaite & Co. (England); M. W. Baldwin; Norris Brothers; Eastwick & Harrison, Locks, Canal & Navigation Co.; Lowell Machine Co.; Dotterer & Co., and Ross Winans. By the close of 1847 the locomotive equipment had increased to 72, and the annual report for 1857, ten year later, gives a total of 141. In the report for 1872 we find the names Boston Locomotive Works (Hinckley & Drury); Hayward, Bartlett & Co.; John Brandt; Taunton Locomotive Works; Davenport, Bridges &



Side and End Views, Engine "Novelty", 1847; Philadelphia & Reading.

Kirk, Danforth, Cooke & Co. and Lehigh Railroad Co. added to the list of builders for the road.

Until 1872 all the engines were known by names, but in that year numbers were substituted, although the annual report of that



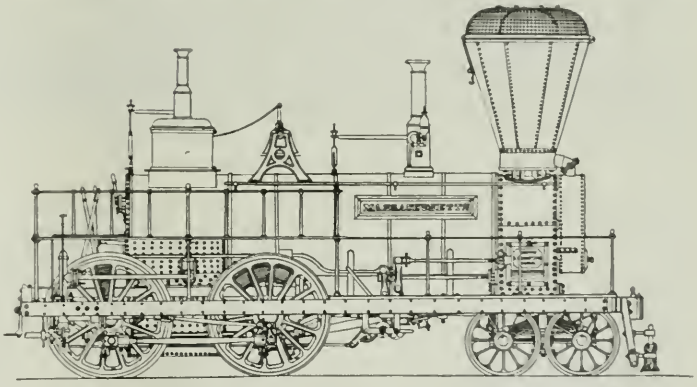
Trailing Wheels and Connections Added to Winan's Locomotives of 1847.

date gives both names and numbers in the tabulated statements of the locomotives, which had then reached a total of 377. All subsequent reports use numbers only. That of 1879, which practically marks the advent of the more modern types of engines on the road, places the total number at 495, and contains the name of one more builder, Smith & Jackson, in addition to those of 1857.

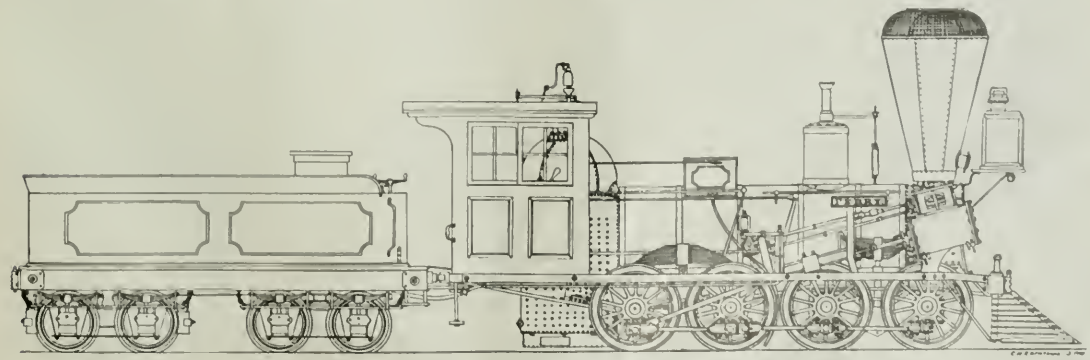
Referring to some of the more prominent types of engines used at various times on the road, the "Gowan & Marx" first attracts our attention. This machine was built by Eastwick & Harrison, of Philadelphia, Pa., and its prominent features, in addition to the large grate surface already alluded to, are the position of the wheels, which were placed in such a manner as to allow the drivers to carry 9 of the 11 tons of its maximum weight, and its reversing valve-seat, which was placed upon the regular seat, carried the slide-valve on its back, and contained ports which regulated the admission and exhaust for forward or backward motion as it was moved backward or forward. On first examination of a drawing of the "Gowan & Marx" one would suppose it to be one of the "old-timers," with full-stroke and cut-off valve-rods, but the preceding description of the reversing-plate will make it clear that the lower rod controls this plate, while the upper one is that which actuates the ordinary slide-valve. The cylinders were $12\frac{1}{2}$ by 18 in., and the four driving-wheels were 42 in. diameter. The forward end was carried on a four-wheel truck. A peculiar form of nozzle, or exhaust-box, was used; the invention of Eastwick & Harrison. This consisted of a sort of drum which the exhaust steam entered on the under side and emerged through a large number of small tubes on the top. This arrangement was supposed to have a more continuous and uniform effect on the fire than the common form of nozzle, and was used on a number of engines built by the same firm for other roads.

Of the English engines on the road at that time the "Spitfire" was afterward sold to the Delaware, Lackawanna & Western, and became the No. 1 of that road. It, like its sister engines, was from the shops of Braithwaite & Co., and was of the "Planet" type. A six-wheel connected engine without truck wheels, named "Richmond," was built and placed in service by Norris Brothers in 1844, but exploded its boiler not long afterward. It was afterward rebuilt by the railroad company and the name changed to "Philadelphia."

The Ross Winans engine "Baltimore" of 1846 required some changes in the way of looping off a part of the cylinder flanges at the sides, and a slight readjustment of some other parts to enable it to clear all objects along the line before it was permitted to go into service. A man who was at that time, or nearly afterward, connected with the motive power department of the road informed me some years ago that "thereby hangs a tale." As has been mentioned, the attempts to use anthracite coal had been of an adverse nature until this engine of Winans came and appeared to make a "howling success" of it. Thereupon, my informant stated, it was quietly decided that this engine must be "downed," if at all possible. After close scrutiny it was found that the cylinder on one side had "slightly scraped" against something on the line, and the engine was declared unsuited for service and was run into the roundhouse at Schuylkill Haven as a companion to two Winans' "crabs" which had been retired from service. The "man from Baltimore," however, was not to be put out of the race in such a manner, and soon appeared on the scene and cut off sufficient of the flanges to furnish the necessary clearance. The "trouble hunters" next "discovered" that the engine had too much "overhang" at the rear. Again was the objection met, this time by the addition of a pair of small trailing wheels placed behind the firebox, and attached to it by springs extending from the journal boxes to pads on the sides, while steam cylinders, one on each side of the engine, were also attached to the sides of the firebox above the springs. These cylinders were open at their lower ends and took steam at their upper ends through pipes without cocks or valves. The ends of their piston rods rested in seats on the backs of the springs, and all worked fairly well unless the engine left the rail. Then the pistons usually blew out and a goodly proportion of the steam in the boiler followed, causing trouble and strong language on the part of the engine crews. After the "Baltimore" was finally considered up to the company's requirements through the addition and subtraction mentioned, Ross Winans

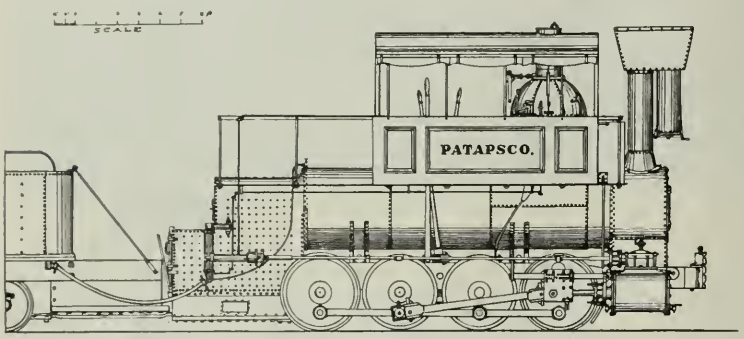


The "Massachusetts." Built by Hinkley & Drury in 1849
Cylinders, 15x18 *in.*. *Drivers*, 54 *in.* *Weight*, 20 *tons.*



The "Perry". Built in 1849 by M. W. Baldwin. Owned First by the Pennsylvania, Then by the Reading.
Weight, 50,975 *lbs.* *Cylinders*, 17x22 *in.* *Drivers*, 44 *in.*

quickly followed it with three more of the same type, completing the number specified in the order, of which the "Baltimore" was the first. The three were named "Ohio," "Chesapeake" and "Maryland," but through some inadvertance the "Chesapeake" bore the name of an engine already in service, and the Winans' engine was then renamed "Delaware." It appears rather strange that although the "Baltimore" was the first of the type, and the one which first proved their ability to burn anthracite coal successfully in continuance service, that the "Delaware" should usually be the machine referred to in this connection both in descriptive matter and in illustrations. These engines had cylinders 18 by 22 in. and 46-in. drivers; also the drop-book valve gear with a half-stroke cut-off driven by a cam, all of design followed on the "camel" engines of the same builder. At a later period J. Milholland rebuilt the "Maryland" and added another dome and changed the cab of the "Ohio" to the same position as those on the "camels." He also placed a cylindrical water heater in the smoke-box. This heater contained a number of small tubes, through which the exhaust passed and heated the feed-water in so doing. The arrangement heated water well enough, but affected the exhaust to some extent, yet the use of the device was continued for several years, until one day the old "crab" "Delaware," which had stood out of service for many years, was dismantled and the boiler taken to the shop to be put in order for pumping service. When the tube cover was removed, lo! there was found the same



Ross Winans' Short Firebox "Camel" "Patapsco", 1850.

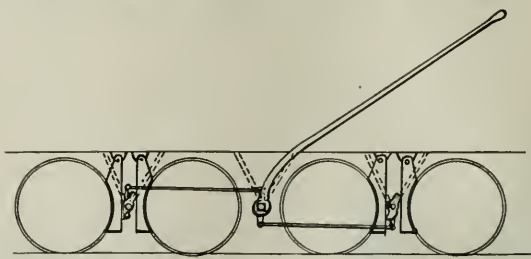
arrangement of a heater, and, worse still, covered by letters patent in the name of Ross Winans. Then the Milholland heaters were hustled out on short notice.

The success of the Winans' engines referred to, preferably suggested to G. W. Nicholls, the engineer and superintendent of the company, the designing and construction of the "Novelty," which was certainly no misnomer. This engine came out on June 21, 1847, and in the annual report for that year Mr. Nicholls writes in the following sanguine manner: "The locomotive 'Novelty' alluded to in my last report, as then building on a new principle for the purpose of burning anthracite coal has been completed and in operation since June of the present year. Her performance has been very satisfactory, fully equaling my expectations and showing no injury from the use of coal as her exclusive fuel after five months' trial and a duty of 9,357 miles run with coal trains. With such results and from her great economy in fuel, I feel confident that the main difficulties in using anthracite coal in locomotives have been overcome, and with further improvements which experience has suggested, now in progress, this road will shortly be able to use as its exclusive fuel the coal of its own region."

It is to be regretted that such high hopes failed of their realization, but in the report for 1848 the "Novelty" appears in the tabulated record of engine performances as "in shop undergoing repairs," and in the report for the next year, 1849, the entry opposite its name reads: "Boiler used for stationary engine," and its name does not appear thereafter; nor can I find any reference to it in any reports of Mr. Nicholls after that already quoted. As the "Novelty" has been so often described in various publications, it will suffice to mention that it consisted of three units, first, the usual running-gear, frames, etc., of an ordinary eight-coupled locomotive having a drum, or cylinder, substituted for the boiler; second, a boiler mounted on a separate frame which rested on two four-wheel trucks, and third, an ordinary tender.

The drum was used as a receptacle for the exhaust steam and feed-water, and was supposed to serve the double purpose of a condenser and heater. It was surmounted at its forward end by a French & Baird smokestack, probably more for appearance sake than for any other reason, as nothing passed out of it except the surplus exhaust steam from the drum.

The boiler was practically of the return flue type and had a grate surface of over 12 sq. ft. Its steam connection to the cylinders was by means of a pipe passing above the head of the engineman and fitted with swiveling metallic joints. The check-valve was on the end next to the foot-plate, and was connected to the lower part of the drum by pipes also fitted with joints similar to those of the steam connections. On account of the constant danger of these connections breaking, especially if the engine should leave the track,

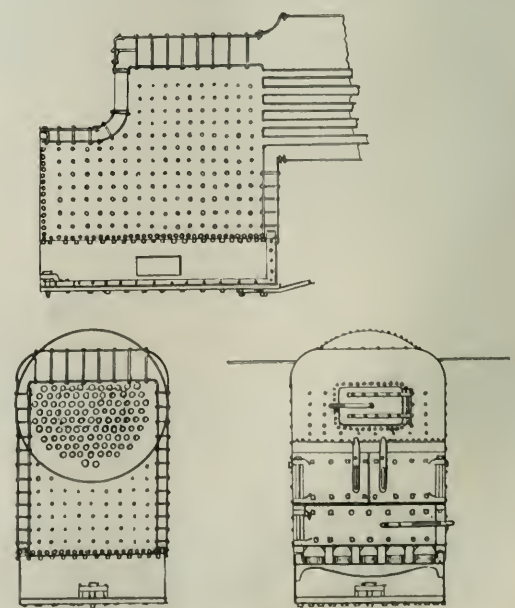


Eight-Wheel Tender Brake, 1850-1860; Philadelphia & Reading.

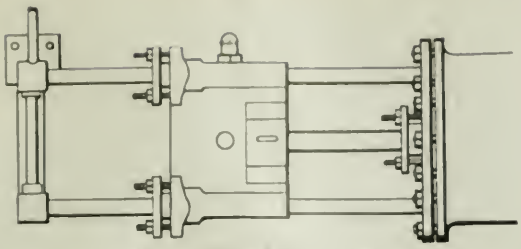
as it was very liable to do in those days of comparatively imperfect construction of roadbeds, an old employee of the Reading once said that he thought it was a very brave man indeed who would risk either running it or riding on it. Its principal dimensions were: Cylinders, 18 by 20 in.; drivers, 46 in. diameter; weight of engine proper, 43,000 lbs.

As the "Novelty" was a digression from the path of improvement which the locomotive was following, and may fitly be designated a freak, we can return to the beaten way and notice that in 1846 M. W. Baldwin built 17 eight-wheel connected engines for the company, all of which had his flexible truck on the first two pairs of drivers. Except that the capacity of the boilers was somewhat deficient, the engines were good in all other respects and continued in service for many years. Fifteen of these engines had 15 in. x 20 in. cylinders and 46 in. drivers, and two had 17½ in. x 18 in. cylinders and 42 in. drivers. Their average weight was 48,000 lbs. They were the first engines built by M. W. Baldwin with a roof over the footplates, and the first built by anyone with sandboxes.

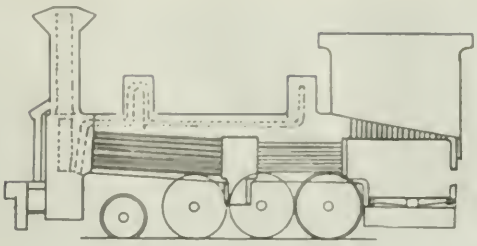
Probably but a short time previous to the building of the first of these engines, a 4-4-0 passenger engine named "Champlain" had been placed on the road by the same builder, and had his first independent half-stroke cut-off which he placed on all subsequent engines built at his shops until 1853. Both Baldwin and Norris had



Firebox of the "Patapsco."



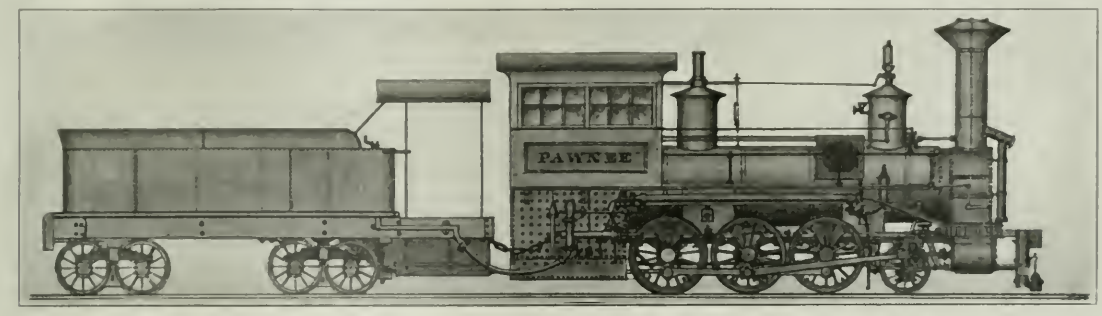
Milholland's Guide, 1851-1874.



Section, Engine "Pawnee".

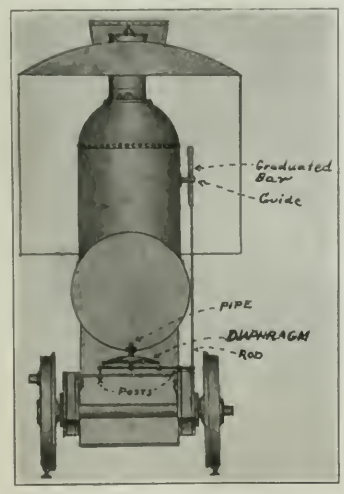
also furnished some 0-6-0 freight engines beside the Richmond already mentioned.

Simultaneously with the building of the four Winans engines just described, the Norris firm built the "Chesapeake," and placed it in service in April, 1847. It was the first 4-6-0 engine, or 10-wheeler, and was built under the patent granted to Septimus Norris. I have seen a number of engines built in 1862-3 with a cast iron plate on the base of the dome-casing bearing the words, "Septimus Norris Ten-wheel Patent," and a date somewhere in the late forties, but if the description generally given of the "Chesapeake" is correct, it must have required considerable ingenuity to extend the protection of this patent over these later engines, as they had the Bissell truck of that day, while we are informed that the "Chesapeake" used no center-plates but simply a large pin which passed through a part of the truck prepared to receive it; the idea of the truck being merely to guide the engine, the weight being all thrown upon the drivers, the front pair of which was very close to the cylinders. The "Chesapeake" had a Bury dome, 46 in. drivers, 14½ in. x 22 in. cylinders, and weighed 20 tons, and in addition to using a sort of composite parallel-rod rather favored by Norris, had that one which coupled the second and third pairs of drivers carried on the pins as close to the face of the wheels as possible, while that uniting the first and second pairs was placed sufficiently far out on the pins to enable the connecting rod to grasp the main pin between the two parallel rods. This arrangement was adhered to by the Norris people for at least 15 years after the building of the "Chesapeake," although the composite form of rod does not appear on their engines after 1851.



The "Pawnee". Built in 1852 for the Philadelphia & Reading.

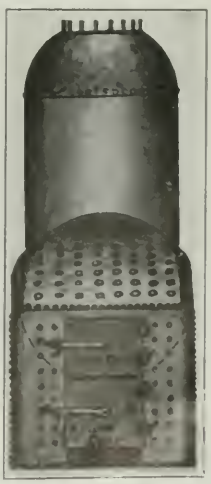
Cylinders, 18x22 in. *Drivers*, 46 in. *Pony wheels*, 30 in. *Steam pressure*, 110 lbs. *Firebox*, 42x84 in. = 24½ sq. ft. grate area.



Early Steam Gage on a Winans "Camel", Probably between 1852 and 1855.

In 1850, two 0-8-0 engines built by Baldwin for the Pennsylvania Railroad were sold by that company to the Reading, as it was feared they were too heavy for the bridges on the road of the original owner, although some other reason must have been the true one, as the selling company retained an exactly similar engine built at the same time. These engines had 17 in. x 22 in. cylinders, 44 in. drivers, and weighed 50,975 lbs. They had Bury (haystack) domes, deep horse-shoe fireboxes, a small additional dome on the waist of the boiler, and all the driving wheels between the firebox and front of smokebox. One of the same design was built at the same time by M. W. Baldwin for the Reading. All had a peculiar arrangement of the Baldwin hook motion, having both rockers carried in one set of boxes, one rocker being hollow and thus serving as the journal for the other.

The "Massachusetts" was a 4-4-0 engine built for the company in July, 1849, at the "Boston Locomotive Works" of Hinckley & Drury. It had inside cylinders 15 in. x 18 in., 54 in. drivers, and weighed 20½ tons. It had a peculiar form of drop-hook valve-gear with an independent half-stroke cut-off, all so arranged that the reversing of the engine and the control of the cut-off were effected from the same lever. This gear was also used on one Wiimarth engine which came under the writer's notice during the later years of its existence. The "Massachusetts" not only had inside frames, but also composite outside frames, these latter consisting of two broad plates of iron with wood centers, all being riveted firmly together. Another peculiarity is a sort of extension front into which the cinders passed from the smoke-stack through a pipe attached to the usual "dust hole." This same arrangement is shown on a drawing in my possession of an engine built in 1851 for a New England railroad by the Amoskeag, N. H., company.



Furnace End of "Camel" as Remodeled by James Milholland in 1863.

The "Patapsco" was a "short firebox" "camel" built for the Reading by Ross Winans in October, 1850, and with one or two more of similar design which followed it, gave such good results with anthracite coal and in other respects, that it was followed in succeeding years by other "camels" of the "long firebox" type until by 1859 the number of these engines on the road had reached 42.

This number was afterward diminished by the scrapping of one or two and the entire remodeling of others, until it dropped to 31 by 1864, but in 1868 was increased to 38 by the purchase in that year of the Dauphin & Susquehanna Railroad and its equipment. The "Patapsco" had 18 in. x 22 in. cylinders, and weighed 24$^{6}/_{10}$ tons. The long firebox "camels" had 19 in. x 22 in. cylinders; firing chutes on the sloping roof of the fireboxes; grate surfaces of about 23½ sq. ft. each., and ranged in weight from 50,200 to 55,000 lbs. With the exception of the fireboxes, of the first three, the general features of all were alike. In 1863-4 James Millholland substituted link motion for the hooks; two round guide-bars placed one above the other, for the single square bars used by Winans, and crossheads with glands on the outer ends where the guide-bars passed through. These glands are variouly stated to have been packed with Babbitt metal, rubber, hemp, lead and leather. As I believe my informants to be reliable, it is just possible that all of these materials may have been used singly at different times or on different engines. This type of guide and crosshead had been used on other engines of the company after 1851, and was the standard for many years. A few are still in use, I believe, or at least were very recently, on a number of the older engines yet in service.

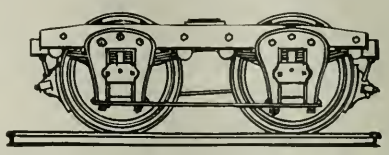
Probably the first pressure gage ever used on a locomotive in America was on engine "Minnesota," one of the first three "camels" referred to. The "Minnesota" had been built for a railroad in the New England states, and was meant to use anthracite coal, but the employees of the line were unfamiliar with the use of this fuel, and as the performances of the engine were therefore unsatisfactory, it was sold to the Reading, coming on the road soon after the "Patapsco," and also was the smallest "camel" owned by that company, its cylinders measuring 16½ in. x 22 in.; drivers 42 in., and its weight being but 22½ tons.

The steam gage referred to consisted of a diaphragm attached to a cross brace between the frames directly under the dome and attached to the boiler on its upper side by a pipe which extended up through the sheet about 5 or 6 in., in order to prevent the entrance of mud or other sediment. Its under side, which was of flexible metal, was attached to a compound lever extending horizontally across the frames. This lever was connected by short posts to the frames, and at its outer end was attached to a vertical rod which extended upwards into the cab and through a guide on the side of the dome. The upper part of this rod was flattened and contained a graduated scale from 0 to 120 lbs., which was an ample limit as the maximum pressure carried on the engine was but 100 lbs. One edge of the guide formed the point from which the pressure was indicated.

When the long-furnace camels came on the road the furnace-ends were of Winans' standard type without any water space, but of course covered by two large firing doors on their upper half, and on the lower part with a large single door to afford access to the grates and for cleaning the fire. In their later years, Millholland altered some of these, if not all, by adding a water space at each side of these ends, which then left an opening of about 18 in. in width, extending from the top to the bottom, for access to the grates.

About 1869 some one thought that he had discovered an inherent and dangerous weakness in the boilers of these engines, and 17 were put out of service within a short time. The "scare" soon assumed such proportions that a sweeping order was issued to take all the rest off the road as rapidly as possible. As a result, by the end of 1870 only four remained, and these vanished into the obscurity of the scrap heap before 1871 had ruled the calendar for very many moons. Their memory, however, was perpetuated in the adoption of many of their features in subsequent engines. While this was noticeable to an extent on some other lines, it was especially so on the Reading; probably because the success of these engines in using anthracite coal made them favorites and thus impressed the other features upon the officials.

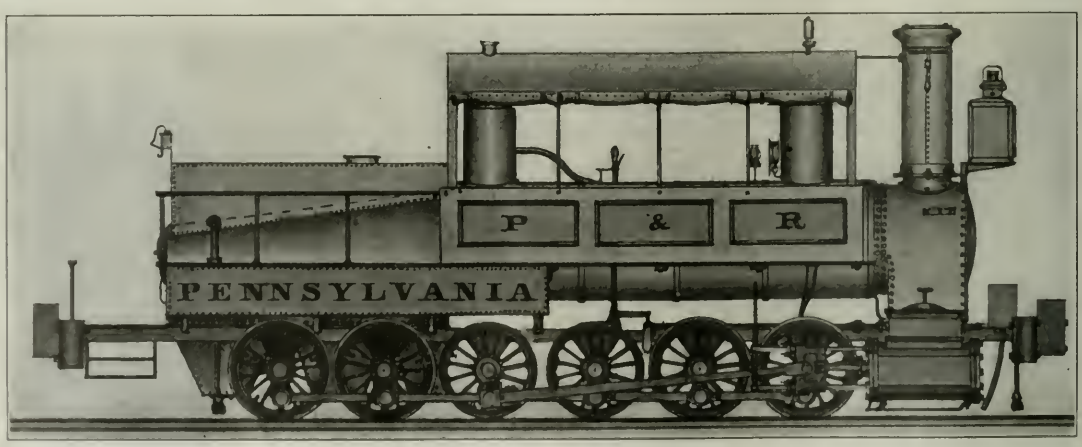
In some one of the years not far from the advent of the "camels," Lewis Kirk, who had been master mechanic of the company from 1844 to 1848, and during that time had rebuilt many of the small 0-6-0 freight engines on heavier lines, became a partner in the firm of Davenport, Bridges & Kirk at Cambridgeport, Mass., and as he was supposed to know the requirements of the Reading, an order for a 4-4-0 engine was given that firm. This engine when it came was named "Cambridge," and had 15 in. x 22 in. cylinders, 54 in. drivers, and was a close imitation of the Hinckley engines with one exception. Its weight was 24 tons, and 15 of these were on the truck. A standing joke among the employees thereafter was that



Tender Truck, 1860-1874.

they had to put the heaviest engineman and fireman in service on the footplate to "keep her down"!

The "Pawnee" was built in 1852 by Jas. Milholland at the company's shops in Reading, and shows many earmarks of the "camel," among which are the solid end rods and sloping top firebox placed behind the frames. Its pump, however, was original in having a heater between it and the point of admission to the boiler. It also had two combustion chambers, one at the firebox end of the boiler barrel and the other about midway between the smokebox and the firebox. The flues connecting the latter with the smokebox were smaller in diameter than those leading from it to the back chamber. The "Pawnee" had three pairs of 46 in. driving wheels and one pair of 30 in. leading wheels, all set in pedestals rigidly attached to the engine frame, and all placed between the cylinders and the firebox, an arrangement which for some unaccountable reason seemed to meet the approval of some locomotive builders and railroad officials of that period, and was followed in two Norris engines and in the Smith & Perkins engines built for the Pennsylvania soon after. M. W. Baldwin also caught the "fever" slightly and built

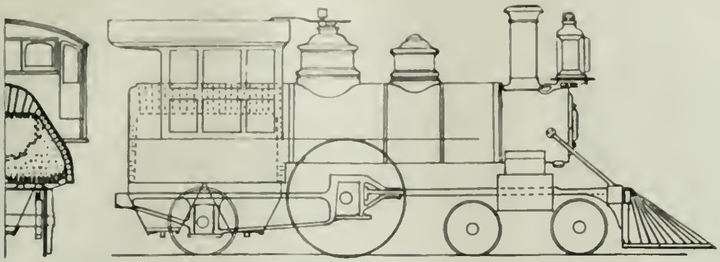


Engine "Pennsylvania," 1857; Philadelphia & Reading.

12 for the Pennsylvania with three pairs of drivers and one pair of leading wheels in rigid pedestals on the engine frame, but with the drivers spread widely apart, the rear pair being behind the firebox. Returning to the "Pawnee," the engine of that name was the second of the class built at Reading, but as the "pony" wheels were new to the men, I have been informed that some of them thought the names Pony and Pawnee were synonymous and styled all of the class "Pawnees" as they were built, and the officials, unwittingly perhaps, adopted the same nomenclature. They were probably the first engines with the Milholland guides and crossheads already described. Galvanized sheet-iron was just becoming popular at the time of their advent, and at least one had a boiler

jacket of this material used without the addition of any paint or varnish. These jackets soon rusted away and were replaced with the orthodox Russia iron. The "Pawnee" engines continued to be the standard for freight service for about 10 years, although a few of the later ones were built with main rods attached to the second pair of drivers. All had the Gooch suspended links.

In 1857 Milholland built a 12-wheel connected locomotive, without truck wheels, to be used as a pushing engine on heavy coal trains between Falls of Schuylkill and Port Richmond wharves at Philadelphia. It was named "Pennsylvania," and had a boiler somewhat like that of the "Pawnee," a cab like the Winans "camels," even to the canvas curtains instead of glazed sash, one water tank on top of the firebox, and two more placed one on each side of the boiler at the rear. No coal was carried and the firing was done at either end of the run, which was not long but strenuous. The cylinders were 20 in. x 26 in., and the drivers 43 in. in diameter, and grate surface $31\frac{1}{2}$ sq. ft. The total weight of the machine was 50 tons. It is said to have performed very satisfactorily, though in later years two pairs of the drivers were removed and replaced by a four-wheel truck. In this shape it was still reported in service, bearing the number of 1149. While this engine was practically of saddle-tank type, the first saddle-tank engine as we now understand them, came on the road in 1860.



No. 507, Built by Baldwin Locomotive Works in 1880.

Cylinders, 18x24 in. Drivers, 78 in. Firebox, 94x96 in. = 56 sq. ft. grate area. Auxiliary cylinders under waist of boiler enabled weight on drivers to be varied from 35,000 lbs. to 45,000 lbs.

Engine No. 14.

Built in 1866 at the locomotive works of Norris Bros., Lancaster, Pa., to working drawings of the Philadelphia & Reading's "Gunboat" type for another company which wished to experiment with this kind of locomotive.

In 1862, the "Gunboat" type of freight engine used for so many years until supplanted by the larger engines after the advent of the Wootten firebox, were first built. While retaining a few of the features of the "Pawnee," they were larger and better in every way. The drivers, six in number, were 48 in. in diameter, and the cylinders 19 in. x 22 in. The weight was about 66,000 lbs. The four wheels of the truck were 28 in. in diameter. The pumps were driven by return cranks from the rear parallel-rod pins, and were of a double-action type. The frames were of composite type. Each consisted of two bars of iron about 6 in. wide set vertically about 3 or 4 in. apart, and united by thimbled distance pieces. The pedestals were separate and fastened between the bars of the frames. A number of 0-8-0 engines similar in all other respects to the "Gunboats" were also built about the same time, and many passenger engines with practically the same type of boiler. Quite a number of the "Gunboats" and passenger engines are yet running, and I have seen at least one of the 0-8-0 type within three or four years in the yard at Tamaqua.

In the latter part of 1877 the first Wootten firebox was built and put into service, and later was taken to the Paris Exhibition of 1878, where it attracted considerable attention. The barrel of the boiler of this engine, 408, was almost like that of a "Gunboat," and the cab was perched high on the sloping top of the "Wootten." After the close of the exhibition the engine was taken to the Northern Railway of France and put into service, but not until the cab had been removed to a position forward of the firebox, and thus made the engine the forerunner of the host of Wootten engines of today with their cabs but a short distance behind the smoke-stacks and called by many "Camelbacks."

The advent of this type of firebox marked a decided change in the locomotive equipment of the company. All new engines except a few 2-8-0 built at the Baldwin works within the early years of the last decade, received Wootten fireboxes and the corresponding arrangement of cabs and other parts, and a number of old engines were rebuilt on these lines. The exceptions mentioned were intended to use soft coal, an innovation in the company's practice which occasioned no little comment in railroad circles at the time. The sloping tops of the first Wootten fireboxes was superseded in later engines by perfectly straight tops. Although consuming anthracite coal, and especially coal of inferior grade admirably, the type has never met with ardent supporters on railroads outside of the anthracite coal district, chiefly, perhaps, on account of its necessitating the separation of the engineman and fireman during much of the time the engine is running, and thus increasing the danger of accident through the engineman missing signals on account of sudden illness or death while at his post.

In 1880 the growing demand for increased speed on passenger train schedules induced the Reading Company to design and build engine No. 507 from which great results were expected, but which, like the "Novelty," failed to meet such expectations. This engine was a 4-2-2 with 18 in. x 24 in. cylinders and 78 in. drivers. It had a Wootten firebox and a steam cylinder was placed under the boiler in front of the firebox and so connected to the equalizing beams as to enable the weight on the drivers to be increased or diminished as might be required. It was built by the Baldwin Locomotive Works, and was No. 5,000 of their manufacture. After a brief service on the Reading it was sold to the Eames Vacuum Brake Co., and was taken, after a few changes to adapt it to the lines, to England to show the working of the Eames brake to the railroad officers and employees of that country. It was followed in 1895 by another 4-2-2, which gave much better results. Yet only one more of the type was built, and both were followed by many

4-4-2 and some 2-4-2, from all of which good results in speed on heavy trains were obtained.

In recent years the company has had numerous engines built for suburban trains which appear to be well adapted to the service. They are of double-ender, tank type, 2-6-4, with 20 in. x 24 in. cylinders, 61⅝ in. drivers, and weigh 201,700 lbs.

The tenders used during the existence of the company have differed little from those of other roads. When eight-wheel types first came into use the first two pairs of wheels were arranged in a swinging truck and the last two pairs were carried in pedestals attached rigidly to the frame. Brakes were used only on the first two pairs of wheels, as it was feared that if applied to all there would be a tendency to derailment when drawn. They consisted of wooden shoes or blocks, suspended between the wheels from the frame, and actuated by short arms on a shaft which extended crosswise between the blocks, and had a long operating lever attached to the end on the right hand side. When brakes were afterward applied to all wheels, this lever was removed to an additional transverse shaft which was placed midway between the trucks and connected by short arms and rods to the shafts on the trucks. The simple type of truck used on the Winans "camels" was a favorite in the early days with the company, and was used on the "Pawnee" class and other engines. After that, a wooden frame somewhat like that of a passenger car truck was used for many years. Although some of these were very recently in use, the diamond-bar and, later, various forms of stamped-steel trucks have taken their place. A number of the small 0-4-0 saddle-tank shifting engines use a small four-wheel tender without water space to carry a moderate supply of coal.

The car equipment of the company has been referred to, and it may be added that at one time it ran its own parlor cars, but later changed them to ordinary day coaches and fell back upon the Pullman Co. for a supply of "elegance."

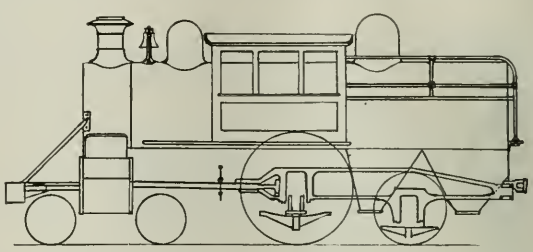
When the Philadelphia, Germantown & Norristown Railroad came into possession of the Reading it brought with it a lot of passenger coaches which were provided with gratings of about $^{5}/_{16}$ in. round iron bars placed about 3 in. apart, vertically, over the windows. This grating was probably meant to prevent injury to passengers from putting their arms or heads out of the windows; nevertheless it gave the whole outfit the appearance of Black Marias carrying their loads of prisoners to the penitentiary.

Another odd feature obtained by this purchase was the railroad station at the end of the Chestnut Hill branch. Here the engines were turned at the end of each trip, and as the turntable was too short to hold both engine and tender at the same time, they were always uncoupled and turned separately.

The passenger stations in Philadelphia previous to the building of the present terminal were at Broad and Vine streets for the first station in the city after the opening of the road, and removed later to Thirteenth and Callowhill streets; that of the Philadelphia, Germantown & Norristown Railroad, which became a part of the Reading system, at Ninth and Green streets; and the New York division station at Third and Berks streets—three widely separated points.

The Reading is peculiar in many respects. It, more than any other railroad, dominates the mining, hauling and shipping of the unique fuel to which it owes its origin. It has at present a mileage of 2,122, and a trackage of 4,686, the greater part of which is situated in a comparatively small portion of the eastern part of Pennsylvania. Much of this traverses what would rank among the grandest mountain scenery of the state, were it not that this same fuel which plays so important a part in the existence of the road, has changed the whole region to a region of desolation, covering it with leaden-hued culm banks and polluted streams. Even the cities and smaller towns are dingy and forbidding, the whole uniting to form a veritable black country differing in many ways from the outside world.

The road has also drawn largely for its employees on a community where "Pennsylvania Dutch," a strange patois formed of about equal parts of English, Dutch and German, is extensively used by the farmers and other descendants of the earlier settlers, and therefore by many of the employees of the railroad. Within four years I have heard an entire crew of a local freight train on the road conducting all their conversation in this tongue, as I watched them drilling cars for 20 minutes at a town within 25 miles of Philadelphia. Even the orders given to them verbally by the rather intelligent young station master were couched in the same, to me, unintelligible jargon.



P. & R. No. 385. High-Speed Passenger, Vauclain Compound, Built in 1895 by the Baldwin Locomotive Works.

Cylinders: High-pressure, 13x26 in.; low-pressure, 22x26 in. Drivers, 84½ in. Firebox, 114x96 in. = 76 sq. ft. grate area. Weight, 115,000 lbs.; on drivers, 48,000 lbs.; on truck, 39,000 lbs.; on trailer, 28,000 lbs.

The company also possesses a record of interest in the fact that a former president, Franklin B. Gowen, was able to cope with, and end forever, the fearful career of the "Molly Maguires," an organization which in the early seventies attained such a hold upon the anthracite region that operators and miners of any reputation at all conducted the plants at the risk of their lives, and too often formed the subjects of mysterious disappearances, or brutal assaults and murders committed with most extraordinary boldness; and when even people from other places, and having no connection with the coal companies, were openly insulted on the highways and streets.

Type of Suburban Tank Locomotive Now in Use on the Philadelphia & Reading.

This article must not close without reference to the valuable aid so cheerfully accorded the writer while collecting the data contained therein during past years, by L. B. Paxson, former Superintendent of Motive Power of the Reading; E. J. Rausch, who was with the locomotive department of that company during many years at the time most of the earlier engines referred to were in service; H. F. Colvin, who is also very familiar with the early equipment of that road; the Baldwin Locomotive Works; J. Snowden Bell, and an old volume prepared by E. Reuter, who was a draftsman in the service of the Reading, and from whose excellent work the drawings of the "Delaware" and "Massachusetts" have been reproduced.

GENERAL NEWS SECTION

NOTES.

The Baltimore & Ohio is to establish a police force throughout its lines, to be organized like that of the Pennsylvania lines west of Pittsburg.

On the lines of the Southern Pacific, near the Great Salt Lake, Utah, water from the lake is now regularly used to destroy weeds in the roadbed.

The railroads running east from the Missouri river have decided to apply the new and higher freight tariffs to the grain, estimated at 6,000,000 bushels, which was in elevators at Missouri river points on July 1, when the advance in the tariffs took effect. The owners of the grain had expected that it would be carried forward at the old rates.

It was announced this week in New York that the Southern Pacific had once more brought the Colorado river under complete control, and that the property in the Imperial valley and thereabouts, which was damaged or endangered by the break in the river, had been turned over again to the control of the California Development Company.

The Union Pacific and the Oregon Short Line, having received the approval of the Interstate Commerce Commission, announce, for the period between July 19 and September 1, a reduction of 25 cents a ton on coal shipped to points in Washington, Idaho and Nevada, this action being taken to stimulate the movement of coal at this season with a view to preventing a congestion in the winter.

It is announced in Madison, Wis., that Chairman John Barnes, of the State Railroad Commission, has resigned his office. The reason for this, according to the press dispatches, is the fact that the Legislature has passed a law limiting passenger fares to 2 cents a mile, in disregard of the fact that the Commission has published a decision that 2½ cents is a fair rate to be charged by the roads of the state.

The Pennsylvania Railroad publishes the following comparison of prices paid last year (1906) with those paid the current year, all of them being increases: Steel angles 31 per cent., bronze journal bearings 25 per cent., copper 22 per cent., freight car wheels 21 per cent., and malleable iron castings 20 per cent. Brass and tin have each increased 16 per cent., car axles and cross ties 12 per cent., rail braces 8 per cent., white pine lumber 8 per cent., and air-brake hose 7 per cent.

On Wednesday last the New York, New Haven & Hartford began the use of electric motors on a few of its passenger trains between New Rochelle and the Grand Central Station, New York. New Rochelle is about four miles from the junction with the New York Central and 16 miles from New York. Five regular westbound trains begin their trips at this point and these are the first to be propelled by electricity. It is expected to use the electric power farther east within a week or two.

The State Railroad Commission of Missouri has issued a voluminous report on the condition of tracks of the Missouri Pacific in that state and has ordered a reduction in the maximum rates of speed on certain sections of the road as follows: Thirty miles an hour between Jefferson City and Kansas City; 12 miles an hour on the Colorado line between Kansas City and the Kansas state line; 25 miles an hour between Kansas City and Cole Junction, and 25 miles an hour between Pleasant Hill and Joplin.

Chicago newspapers say that railroads west of that city recently declined to comply with a request to expedite shipments of agricultural machinery from the International Harvester Company, which had been delayed on the road and which were urgently needed for use in gathering the crops in Nebraska, Kansas and other Western states. The legal advisers of the roads decided that to thus favor particular shipments would be an illegal discrimination; and they declared, furthermore, that any such favor, if granted, would be subject to special odium because it would be a favor done for a "trust."

The Public Service Commission of the second district of the State of New York announces that about September 1 it will begin the investigation of car service and demurrage charges. It is the intention to give public hearings, and all shippers, consignees and railroads are asked to present in concise and orderly form any facts they may have bearing on the grievances of shippers and consignees and the best ways of curing them. Persons having grievances are reminded that vague or general statements will be of no assistance to the Commission. The railroads will be required to furnish all necessary detailed reports concerning the way in which demurrage rules now work.

The New York State Public Service Commission, second district, has appointed Frank Barry Chief of the Division of Traffic at a salary of $4,000 and Walter E. Griggs of Jamestown Chief of the Division of Tariffs at a salary of $3,000. The Commission for the first district has appointed Abel E. Blackmar Chief Counsel at the statutory salary of $10,000 a year. The same board has appointed William J. Norton, First Assistant Secretary, and J. O. Hammett Second Assistant Secretary. Mr. Norton is a mechanical engineer and Mr. Hammett has been an Albany newspaper correspondent.

The railroads leading west from Chicago expect to issue complete tariffs of reduced passenger rates this week. Through rates to points beyond the Missouri river will, in most or all cases, be made up on the basis of 2 cents a mile to the Missouri river, with the addition of the existing rate west of that river. The new rate to Kansas City is $9.20, as compared with $12.50. This difference of $3.30 is the difference between the old and the new rates to Denver and other points in the far West. Since the tariffs have been practically finished the State of Wisconsin has ordered a reduction of local fares in that state to 2 cents a mile, so that for points in the Northwest the rate clerks will have to do their work all over again. An officer of the Chicago, Milwaukee & St. Paul, denying the report that 2 cents a mile would be the rate from Chicago through to points in North and South Dakota, says that his company will make no reductions not forced upon it by the law. Rates to points in North and South Dakota are figured at 2 cents to the border of those states and 2½ cents beyond. In North Dakota the rate of 2½ cents is now prescribed by law and in South Dakota the State Railroad Commission has power to prescribe that rate.

An Advance in Rates and Reasons for It.

The Great Northern and the Northern Pacific announce that on October 1 the rates on lumber and shingles from the Pacific coast will be advanced—to St. Paul 25 per cent. (from 40 cents to 50 cents), to Chicago 20 per cent., and to Missouri river points 10 per cent., and in the announcement they say:

"The conditions that influenced the reduction in rates on lumber from the Pacific coast to the East in 1893 on completion of the Great Northern Railway no longer exist.

"(1) At that time the cut of white pine in Minnesota and Wisconsin was at its height and Pacific coast lumber could not have paid higher freight rates in competition with lumber from these nearer sources of supply. Since then the forests of Minnesota and Wisconsin have been rapidly depleted, and the consequent enhancement in value of the white pine has materially limited its competition with the Pacific coast lumber.

"(2) In 1893 the preponderance of traffic on the transcontinental roads was westbound, and without the lumber it would have been necessary to return many cars empty. To-day this condition is absolutely reversed. Cars have to be sent west empty for lumber.

"(3) The cost of operation and maintenance of the railroads has materially increased, occasioned principally by demands of the public for better service (both freight and passenger), higher wages to employees and the additional cost of supplies. In three years fir ties have increased in price 86 per cent.; fir car sills, 67 per cent.; fir car siding, 24 per cent., and fir timber, 81 per cent.

"In view of the foregoing and considering the large reductions in their gross revenue recently forced upon them by legislative action in various states, it is obvious that the present abnormally low rates are no longer warranted."

New Record Around the World.

In an interesting letter to the London *Times* Lieut.-Colonel Burnley-Campbell has been describing how to beat the record of his prototype in Jules Verne's "Round the World in Eighty Days" by circling the globe from Liverpool westward to Dover in not much more than half that time. Traveling by the Canadian Pacific route, he left Liverpool at 7.20 p.m. on May 3 and reached Vancouver at 5 a.m. on May 14 and Yokohama at 5 a.m. on May 26. Departing thence at 7 p.m. next evening he traveled across the island by rail to Tsaruga, and sailing from that port, a few hours later landed at Vladivostok at 2.15 p.m. on May 30. Then he caught the trans-Siberian train at 7 p.m. for Moscow, where he arrived at 2.38 p.m. on June 10, and finishing the journey via Warsaw, Berlin, Cologne and Ostend, landed at Dover at 2.50 p.m. on June 13. The

time consumed on the journey was thus 40 days, 19½ hours. Of course, in strictness he did not quite complete the circle, but seven hours more would have sufficed him to do so, since he could have reached London soon after 5 p.m., in time to catch the 5.55 from Euston due at Liverpool at 9.30. On the whole he had very good luck with his connections, and the only place where there was any serious waste of time was at Yokohama, where he had to stay 38 hours; but to have avoided this would not have done him any good, since there was no earlier train that he could have caught out of Vladivostok. His most anxious moment must have been in the Japan sea, when his steamer ran ashore in a fog, but in spite of this delay he had the sufficient margin of 3¾ hours at the last-named port, though if his steamer had remained aground four hours longer than she did, the result, in the absence of a train on the Siberian railroad, would have been an increase of four days in his time. The journey is a striking example of what the Siberian railroad has done in increasing rapidity of communication, for so recently as the beginning of this century, before that line was constructed, the feat would have been quite impossible.

Atchison Merits.*

Merit marks placed to the credit of various employees in the month of June:

J. W. Wright, section foreman, 10, on account of best attention being given to switch lights.

William Walck, sealer, and Charles Coleman, flagman, 10 each, for discovering parties stealing merchandise from a car.

A. H. Hill, engineer, and W. D. McCeery, fireman, 15 each, for discovering fire in car at Argentine and taking it across the main line, thus saving other cars from burning.

C. A. McKneeley, brakeman, 10, for prompt action in reporting telephone wire across track and too low to clear a man on a car, thus possibly preventing a personal injury.

W. O. Russell, agent, Duke, Texas, 15, for diving into water tank through 14 ft. of water, repairing valve and putting water tank into service without making it necessary to empty it.

W. M. Riggs, engineer, and C. D. Hill, conductor, 10 each, for extraordinary efforts put forth to keep engine alive and get freight into terminal. In this case engine on local freight had burst a flue, but by liberal use of bran and sawdust the engine was taken to terminal with but slight reduction in tonnage.

T. P. Guilfoyle, conductor, 10, for lifting four tickets on train No. 8, June 11, in the hands of wrong party. Mr. Guilfoyle is probably the most skilful conductor on the system in detecting scalped tickets.

H. G. Hadler, operator, Woodward, Kan., 10, for moving Pecos Valley trains when wires were down. Mr. Hadler started a train sheet at Woodward and handled trains for the Pecos Valley Lines until their wires were working.

New Barge Canal Engineer.

Governor Hughes of New York has appointed, subject to confirmation by the Senate, Mortimer G. Barnes, of New York city, a member of the Board of Advisory Engineers for the Barge Canal, succeeding Elmer L. Corthell, resigned. Mr. Barnes is a graduate of the University of Michigan, and has worked on the construction of many waterways, including the Birmingham Canal, the Sault Ste. Marie Canal, the Illinois & Mississippi Canal and the Panama Canal. He is at present connected with the work on the new Catskill reservoir.

The Art of Handling Men.

President Winter, of the Brooklyn Rapid Transit Company, says there are three principles. Before men will work for you they must understand: first, that you are going to be boss; second, that you know your job and theirs; third, that you are square. He is an experienced railroader, a westerner, and now has 14,000 men under him, operating more than 250 miles of street railway. One of the penalties of a high corporation position, he says, is that you lose the close contact with men - for ten years he hasn't been as close as he wanted to be.

Introduce a new head or sub-head into any working force, from a half-dozen bindery girls to a railroad division, and that force instinctively braces itself for a trial of strength with the newcomer. Then follows a shock, and one or the other wins. There can be no compromise. "When I was in the railroad business," says one corporation executive, "I kept an eye out for trouble and adjusted it." Being an acute "trouble man" is a large factor in management. Many an executive is treating symptoms, never finding the seat of the disease.

Being square with employees is important and difficult. It is easy enough to deal out justice to men under your eye. But how can it be managed over a system of 11,000 miles of railroad, or in a department store where the distance between the proprietor and some of his people is so great that one of them may starve to death without his knowing it until the newspapers begin to castigate him? Such a case happened in New York a few years ago, and to-day every employee of that merchant is required to keep at home a postal-card, addressed to the store, upon which a report of sickness must be mailed.

How are petty bosses to be controlled? President Vreeland, of the New York surface-car lines, says that wonders may be worked through firmness and intelligent sympathy with men by an executive who knows the kind of lives they lead, the anxieties that they carry about, the ambitions they have for themselves and their families. But to find petty bosses with this sympathy is a crucial matter. For lack of them many a system breaks of its own weight. * * *

In a Boston store where a board of arbitration sits on the appeal of every discharged employee, two-thirds of those who appeal are reinstated because it is found that subordinates have been unjust or worked out a grudge.

The Brooklyn Rapid Transit Company investigates even the appeal of the man whose application for employment has been denied. President Winter took up such an appeal from his desk the other day to illustrate this point, and found that it was the application of a Hebrew who charged that he had been excluded on racial lines. The real cause lay in his physical disability. But his appeal was not denied until that had been made certain. An employee with a grievance can sometimes take his case right up to the president, and even past the president to the board of directors. But good judgment must be exerted, or subordinates would be weakened in authority.

One railroad officer says he can't do much with men until he knows them, and can't know much about a man until he has seen his wife and family. This spirit seems to be growing among executives, and accounts for the social features that sprout out of welfare work, such as dinners, dances and lectures. One industrial president in the Middle West carries a photographer with him when he goes on a foreign vacation, has stereopticon slides made when he comes home, and lectures to his employees on "The Homes of the Pharoahs" or "Europe as I Found It." Probably nobody would care to pay to get into one of his lectures. But that isn't the point.

President Ralph Peters, of the Long Island Railroad, holds a reception in his office the first week in the year, and any worker on the road who can arrange his schedule is welcome to come in and shake the "Old Man's" hand.—*James H. Collins in Saturday Evening Post.*

British Comment on Hot Water Boiler Testing.

American boiler practice does not accord in many ways with British ideas, and we have several times called attention to what appear to us to be very antiquated views. Any boilermaker who here advocated that hydraulic tests should be made with hot water, on the ground that it is not so likely to injure the boiler, would be pretty generally suspected of turning out poor work, and if he urged that such a test enabled leakages or fractures to be more easily discovered, the majority of persons familiar with the subject would think he was trifling with their intelligence. Yet both these suggestions were made in a report presented by T. W. Rowe, of the Canadian Pacific Railway, at a recent convention of the International Railway Master Boilermakers, Cleveland, Ohio. The writer of the report remarks he has had little experience with cold-water testing worth relating, and is strongly in favor of hot-water in preference to cold-water testing, as being the nearest to the working conditions yet provided; and "as the material with which we construct a boiler becomes stronger up to about 600 deg. temperature, the hot-water test is not so likely to develop an injury to the boiler, and leaks or fractures are less likely to pass undiscovered." Leakages from a hot boiler are much more likely to evaporate without leaving a trace than when the water is at normal temperature. At least, this is the view which engineers here universally accept, and how the writer of the report can arrive at a distinctly opposite conclusion is beyond our comprehension.—*The Mechanical Engineer.*

Overwork in England.

Responding to an order of the House of Commons, the British Board of Trade has issued a statement showing all instances during the past eight years in which the inspectors in reporting on railroad accidents in the United Kingdom have spoken of excessive working hours. The list would appear insignificant when compared with a similar list in regard to train accidents in the United States, there being only 34 items in all. When comparing it with cases like Terra Cotta and others which have appeared in the United States Government Accident Bulletins it becomes of still less apparent consequence,

*Extracts from a long list, in the Santa Fe Employees' Magazine.

as most of the cases refer to men who had been on duty only 12 or 13 hours. Eighteen railroads appear in the list, but of the 34 items there are nine which occurred on a single road. One other road has five items. In a hasty glance through the report we find only two or three cases which would have been forbidden by a 16-hour law such as has been passed recently in this country by Congress and by a number of state legislatures. Only eight of the items, however, refer to train accidents, all of the rest being cases of men injured by other causes.

The Logic of the Situation.

"So you are in favor of government ownership?"

"Emphatically," answered the disinterested citizen.

"I suppose you have studied the subject thoroughly?"

"No, I can't say I have. But I fancy it is something the railroads wouldn't like." *Washington Star.*

Heavy Bail.

Following a slight collision on the Third Avenue Elevated Railroad at 106th street, New York city, on July 16, the conductor and motorman of the train at fault were arrested and held in $10,000 bail each, pending hearings before the court on charges of assault, or manslaughter, about 20 persons having been injured by broken glass, two of them seriously. There was a crowd of boisterous men on the leading car of the second train and, according to the reports, the presence of these men, some of whom cut off the view of the motorman, was the occasion of the negligence by which this train was allowed to run into the one ahead of it.

On Monday of this week Mr. Eustis, of the state Public Service Commission, having made an investigation, laid before the Commission a report on this collision holding that it was due to the riotous action of the passengers, for which the motorman was not to blame.

A Great Shrinkage at Pittsburg.

Atlantic City is not the Mecca of Pittsburgers this year. Instead of there being 30,000 at the resort at this time of the year, as has always been the case before, the number of Pittsburgers there at the present time will not reach 1,000. And all because the Pennsylvania, along with other railroads, has shut off free passes. In years past the Pennsylvania people required from three to four sections of the special trains that they ran for their Atlantic City excursions. This year one excursion was arranged, and the usual special train was provided. But it was not needed. Just two persons showed up with tickets. Not only is the man who rode on a pass remaining at home, but many of those who formerly paid their fares are doing likewise. This is accounted for by the fact that the man who paid his fare usually accompanied a man who rode on a pass. Because he had a pass, this man would be willing to help pay the traveling expenses of the man who didn't have a pass.—*Philadelphia Press.*

INTERSTATE COMMERCE COMMISSION RULINGS.

Grain Rates from Kansas Producing Points Adjusted.

In an opinion by Commissioner Prouty decision has been announced in the case of Farmers, Merchants and Shippers' Club, of Kansas v. Atchison, Topeka & Santa Fe and Gulf, Colorado & Santa Fe, and in the case of the same complainant against the Chicago, Rock Island & Pacific and others. These cases involved rates on grain from various points of production in Kansas. The district of origin is the same in both instances and the destinations are identical. The two cases were heard together and were disposed of in one report.

The complaint put in issue the reasonableness of defendants' rates on grain from Wichita and other shipping points in Kansas to Kansas City, Mo., and Galveston, Tex., for export and to various destinations in Texas for domestic consumption. The Commission found that the rates to Galveston for export and to the various destinations in Texas for domestic consumption are unreasonable of themselves and ordered reductions of from 3 to 5 cents per 100 lbs. to be made. It appeared that the rates from these shipping points must be the same to Kansas City, Mo., and to Kansas City, Kan., and that after the complaint was filed, the legislature of Kansas reduced by 15 per cent. the rates to the latter point, whereupon defendants, after accepting said reductions, reduced correspondingly the rates to Kansas City, Mo. For these reasons the Commission took no action concerning the latter rates. The destination points in Texas are divided into groups numbered 1, 2, 3 and 4, at the hearing, representatives of the city of Lancaster contended that that city should be transferred from group 2 to group 1, and the Commission upheld this contention. Other defendants against the shipping points in favor of Kansas City, Mo., were merged, but the Commission refused to modify the orders of the complaint.

Rates to New Mexico Points Reduced.

In an opinion by Commissioner Prouty the case of the Roswell Commercial Club and others v. the Atchison, Topeka & Santa Fe and others is decided. The complaint put in issue the reasonableness of rates between various points in the western states and Roswell, Artesia, Hagerman and Carlsbad, New Mex. The Commission held that the present class rates from Kansas City and St. Louis, Mo., Galveston, Tex., and Denver, Colo., to these points in New Mexico are unjust and unreasonable and reductions were ordered. Certain commodity rates to the same points in New Mexico were held to be excessive. The commodity rates on grain and grain products from points in Kansas and Oklahoma were ordered reduced from 47 cents on flour and 45 cents on wheat to 42 cents on flour and 40 cents on wheat per 100 lbs. The commodity rate on lumber from points in Texas and Louisiana was ordered reduced from 45 cents to 32 cents per 100 lbs., and that on salt in sacks from Hutchinson, Kan., was ordered reduced from 35 cents to 30 cents per 100 lbs. The commodity rates on apples, alfalfa and alfalfa meal from said points in New Mexico to Fort Worth, Tex., were held to be unreasonable and were ordered reduced from 50 cents on apples and 34 cents on alfalfa and alfalfa meal to 45 cents on apples and 30 cents on alfalfa and alfalfa meal per 100 lbs.

Parcels Express for Suburban Patrons.

In an opinion by Commissioner Prouty the case of J. E. Walker v. Baltimore & Ohio and United States Express Co. has been decided. These two companies operate, for the convenience of suburbanites, a parcels express from Philadelphia, Pa., to certain points on the B. & O. This is done by affixing stamps, which are sold at the railroad stations. The charges for these stamps are: For a package under 10 lbs., 5 cents; for a package from 10 to 25 lbs., 10 cents; for a package from 25 to 50 lbs., 15 cents. A person desiring to use this service puts the proper stamp on the package and delivers the package to an agent of the express company at the 24th and Chestnut street station of the Baltimore & Ohio in Philadelphia. The express agent cancels the stamp, bills the package to destination and turns it over to employees of the railroad company, who carry it in baggage cars. For its services the express company receives from the railroad the entire receipts from the sale of these stamps. The services of the railroad company in handling the packages are without compensation.

Previous to 1890 the Baltimore & Ohio carried without charge in its baggage cars parcels from Philadelphia to outlying stations in the vicinity. Its purpose in so doing was to increase the convenience of suburban life and stimulate suburban travel. As the amount of this business increased, much confusion and dissatisfaction resulted; whereupon the present system was adopted. The purpose of the railroad in handling packages without compensation is similarly to stimulate suburban travel. In general such packages are sent either by or for the benefit of patrons of the railroad. Packages of eatables are carried in the baggage cars of the company free up to a certain weight and at a small compensation when over that weight, provided the package is for a commuter or is carried on the train with a passenger.

The complaint in this case was brought by a person who desired to send packages from Philadelphia to Hockessin, Del., but who was, previous to August 28, 1906, refused the privilege on the ground that he was not a regular patron of the road, in spite of the fact that this privilege was in most cases open to the public generally. Since August 28, 1906, the day on which the Rate Law went in effect, the privilege has been extended to complainant and the public, but defendants insist that it is their right, if they wish, to restrict the privilege to the patrons of the road, for whose benefit it is intended. The Commission holds that on the facts previous to August 28, 1906, the complaint was well founded. To select the complainant and apply to him a particular rule not applied to the public generally was clearly an unjust discrimination. No opinion is expressed on the lawfulness of the Baltimore & Ohio's practice in transporting packages of a certain kind free only when they belong to commuters or to a passenger on the train; nor is any opinion given on the right of the defendants to restrict the privileges of the parcels express service to patrons of the road, although the defendants asked the opinion of the Commission on that point. The Commission rules, however, that it is the duty of the United States Express Co. to establish for the benefit of the public an adequate service over this same territory at a reasonable compensation. Whether the charge for the stamps affords such compensation is not now considered.

TRADE CATALOGUES.

Traction Couplers and Draft Rigging.—The Edwin C. Washburn traction devices, made by the Washburn Steel Castings & Coupler Co., Minneapolis, Minn., are described and illustrated in a 111-page catalogue just issued which is claimed to be the first catalogue devoted entirely to a complete line of couplers for traction service. The couplers are divided into three types: (1) The M. C. B., able to work on curves as sharp as 45 deg.; (2) type K, called a rigid coupling joint, and (3) type M, a simple link and pin arrangement. One hundred and fifty cars recently built by the St. Louis Car Co. for the Pacific Electric Co., of Los Angeles, Cal., are equipped with the first type mentioned. The other types are described and illustrated in detail, also traction draft riggings. The second half of the book shows a number of standard Washburn M. C. B. couplers that are considered as being peculiarly adapted to the requirements of traction service as used on steam roads; and also a design of cast-steel bolster or transom.

The Rotary Snow Plow.—In time of peace prepare for war. It is probably on this principle that a pamphlet illustrating and setting forth the merits of a rotary snow plow is issued in July by the American Locomotive Company. The value of the pamphlet lies not so much in anything new that it contains as in its reminder to those who may have forgotten that this type of plow can be driven through the deepest drifts at a speed impossible to rival by any other means of snow removal. The pamphlet contains a sketchy account of some of the performances of the rotary and their cost, a description of the machine and complete instructions about its use. It is interesting to note that the Walschaert valve gear is used. To those who are confronted with the problem of keeping a railroad open through deep snow this pamphlet should prove more than interesting.

Car Trucks, Bolsters, Underframes, Etc.—The 1907 catalogue of the Bettendorf Axle Co., Davenport, Iowa, describes the trucks, bolsters, tank cars, underframes, etc., made by this company. The Bettendorf truck with cast-steel side frame and journal boxes in one piece is well-known and has been described in the *Railroad Gazette*. The different standard and special designs are shown as well as their application to locomotive tenders and different kinds of cars. Different capacity body and truck bolsters made from standard shapes of open-hearth steel are shown. Underframes and tank cars fill the second half of the book, designs of underframes and principal parts and a number of designs of tank cars built for various users being illustrated.

Wyoming & North-Western Railway.—The Chicago & North-Western has prepared a folder on its new route to the Yellowstone National Park through Wyoming—the Wyoming & North-Western Railway. The folder tells of the resources and attractions of this "big-game" country and is illustrated with colored half-tones. There are relief maps of the part of Wyoming traversed by the new route and of Yellowstone Park. The opportunities for fishing, hunting and camping are set forth at length.

Pneumatic Tools.—A new 47-page catalogue has been issued by The Dayton Pneumatic Tool Co., Dayton, Ohio. The first half is devoted to hammers, the various styles being illustrated and described. A table gives the sizes and other essential facts about the different hammers and their work. Sand rammers, drills, hoists, holders-on, air hose, electrical drills, etc., are included in the latter half of the book, also "Climax" air compressors, which are accompanied by tables giving essential information about the different sizes.

Vises.—Catalogue No. 7 of the Emmert Manufacturing Co., Waynesboro, Pa., describes fully the company's wood workers' and pattern makers', and machinists' and tool makers' universal vises, as well as the "Tiger" parallel vise for machinists and iron workers. The illustrations show the universal vises set at different angles so as to hold the work in the most convenient positions. The catalogue gives dimensions, weights and prices of different sizes of each style of vise, as well as a price list of parts.

Track Drills.—The latest improvements in track drills manufactured by Cook's Standard Tool Co., Kalamazoo, Mich., are shown in a 12-page pamphlet just issued. The standard track drill of this company is illustrated in its various details and applications. The standard grinder and drill, and standard tool grinder are included, also lists of repair parts and prices of twist drill bits.

MANUFACTURING AND BUSINESS.

The Pullman Company has ordered applied to all its private cars Bliss axle light equipments, made by the Bliss Electric Car Lighting Company, Milwaukee, Wis.

The Central Inspection Bureau, 17 State street, New York, is inspecting 56 cars for export to South America and also a number of cars for Porto Rico, which are now being built by J. G. Brill Company, Philadelphia, Pa.

Otto Dieckman, Jr., representative at St. Louis of the Atlas Engine Works, Indianapolis, Ind., has been appointed Manager of the company's direct sales office at St. Louis. His office will be, as heretofore, in the Chemical building.

The Rostand Mfg. Co., Milford, Conn., maker of the McCarthy rack for passenger coaches, is now putting on the market a rack for parlor cars, the design of which follows closely the basic principles of the McCarthy patents with suitable additional ornamentation.

D. W. Ross, who recently resigned as Chief Purchasing Officer of the Isthmian Canal Commission, has been appointed Managing Director of the Magnus Metal Company, 111 Broadway, New York. W. H. Croft has been appointed Manager of the sales department and W. S. Bostwick General Manager.

L. W. Jones resigned on July 8 as President and Director of the Pittsburg Filter Manufacturing Company, Pittsburg, Pa. Mr. Jones had been with the company since 1903. He intends to open an office soon in Pittsburg as a consulting engineer, taking up municipal and industrial filtration plants, water softening and sewage disposal plants.

The entire issue of $13,000,000 5 per cent. 10-year convertible bonds of the General Electric Company, Schenectady, N. Y., has been subscribed to. The first payment of 50 per cent. was made on July 20 and the payment for the remainder falls due in six months. Since many of the subscribers have already paid in full, the company has, so far, realized from the new issue between $7,000,000 and $8,000,000, which is available for construction and other purposes.

The Cincinnati Planer Co., Cincinnati, Ohio, has increased its capital stock from $200,000 to $400,000. The proceeds will be used to cover the cost of the company's new plant now being built at Oakley, Ohio, a suburb of Cincinnati. This plant will be equipped with new machinery throughout and will be used exclusively for making large planers from 6 ft. to 12 ft. square. The present plant will continue to be used for the smaller sizes. Work on the new plant is now well under way and will be finished some time in September.

Gilbert Rosenbusch, C.E., of London, England, is in New York for a few weeks with address at 17 Battery Place. He is an American engineer, graduate of Stevens Institute, with ten years' residence in London, where he is an associate member of the British Institute of Civil Engineers. He has just completed his work as engineer in charge of construction of the lifts in the London underground electric railways and now proposes to introduce American mechanical and electrical specialties in Europe. He is well equipped in character, knowledge and acquaintance.

Iron and Steel.

Bids are in for about 7,000 tons of fabricated steel for freight sheds on piers 54 and 56, New York.

The New York, New Haven & Hartford is in the market for bridge steel for a lift bridge at Providence, R. I., which will require about 1,500 tons.

There are inquiries for about 7,000 tons of rails for electric lines in the Cleveland district, and sales are reported of from 1,000 to 2,000 tons of light sections.

It is thought that the Pennsylvania will re-let the contract for about 20,000 tons of fabricated steel, which was originally ordered from Milliken Bros. It is understood that the American Bridge Company has made the lowest bid, but the matter may still be adjusted between the Milliken receivers and the railroad.

The National Transcontinental Railway Commisson (Canada) has given contracts for rails and fastenings for the Grand Trunk Pacific aggregating about $1,850,000. The Algoma Steel Works, of Sault Ste. Marie, has a contract for 23,000 tons for the Abitibi section, half of which is to be delivered by November 1, 1908, and the other half in 1909. The Dominion Iron & Steel Company, of Sydney, N. S., has an order for 43,000 tons, half to be delivered before November, 1907, and the other half by July, 1908. Deliveries to be made at Edmundston, N. B., at Quebec, and at Levis, Que.

The United States Steel Products Export Company, of New York (United States Steel Corporation) has orders for 10,000 tons of 80 to 100-lb. rails to be used on extensions of the Victorian State Railways, Australia. The rails are to be rolled at the Homestead

mills of the Carnegie Steel Company. According to the terms of the contract delivery is to be begun within 90 days. Orders have also been given to the same company for 12,000 tons for the Imperial Government Railways of Japan, 6,000 tons for the Cananea, Yaqui River & Pacific, Mexico, and for about 1,000 tons of heavy girder rails for the Municipal Electric Traction lines of Christchurch, New Zealand.

OBITUARY NOTICES.

Augustus R. Macdonough, formerly Secretary of the Erie, died on July 21 at his home in New York City. Mr. Macdonough was 86 years old. He was born at Middletown, Conn., and graduated from Yale in 1839. He studied law and practiced for a short time in St. Louis and then came to New York. He was Secretary of the Erie for 25 years, resigning about six years ago.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Central of Georgia.—James A. Blair has resigned from the Board of Directors.

Chihuahua & Pacific.—Philip Baber has been appointed Auditor, with office at Chihuahua, Mex.

Illinois Central.—A. G. Hackstaff, Vice-President, has been elected a Director, succeeding John C. Welling, deceased.

Maine Central.—Arthur P. Foss has been appointed Auditor of Disbursements, with office at Portland, Me.

Mobile, Jackson & Kansas City.—Ambrose Monell, Thomas Morrison and John McLeod have resigned from the Board of Directors. R. D. Scandrett, of Pittsburg, has been elected a Director.

New York, New Haven & Hartford.—John F. Stevens has been appointed Vice-President in charge of operation, with office at New Haven, Conn., effective August 1.

Pennsylvania.—George T. Smith, General Agent at New York, has been elected Chairman of the Lighterage Committee of the Trunk Line Association, succeeding W. B. Pollock, resigned.

St. Louis, Brownsville & Mexico.—John D. Finnegan, Treasurer, has been elected also Assistant Secretary, with office at Kingsville, Tex.

Operating Officers.

Boca & Loyalton.—H. H. Griffiths, Superintendent of the Western Pacific, has been appointed General Manager of the Boca & Loyalton, succeeding W. S. Lewis, resigned.

Canadian Northern.—M. H. Macleod, Chief Engineer, has been appointed General Manager, with office at Winnipeg, Man., succeeding E. A. James, resigned.

Corvallis & Eastern.—George F. Nevins, Assistant General Manager, has been appointed General Superintendent, and his former position has been abolished. The office of General Manager, formerly held by G. W. Talbot, who recently resigned to go to another company, has also been abolished.

Mobile, Jackson & Kansas City.—W. F. Owen has been appointed General Manager and Assistant to the President.

Oregon Railroad & Navigation Company.—W. M. Gleason has been appointed Assistant Superintendent at Starbuck, Wash., succeeding L. F. Pennington, assigned to other duties.

Western Pacific.—George A. Brown has been appointed Superintendent, with office at Stockton, Cal., succeeding H. H. Griffiths, transferred. See Boca & Loyalton.

Engineering and Rolling Stock Officers.

Baltimore & Ohio.—E. Conniff, general foreman at Holloway, Ohio, has been appointed Master Mechanic at Benwood, W. Va., succeeding F. C. Scott, resigned.

Buffalo, Rochester & Pittsburg.—E. J. Govern, Assistant Engineer of Bridges, has resigned.

Illinois Central.—L. A. Downs, who was recently appointed Assistant Chief Engineer of Maintenance of Way, was born in 1872 at Greencastle, Ind. He graduated from Purdue University in 1894, and began railroad work on the Vandalia. He then went to the Illinois Central, where he has been ever since, serving first as Assistant Engineer and then as roadmaster on, successively, the Amboy, the Louisville, the Louisiana, the Springfield and the Chicago divisions.

New York Central & Hudson River.—W. O. Thompson, Division Superintendent of Motive Power at Oswego, N. Y., has been appointed Master Car Builder at East Buffalo, N. Y., succeeding James Macbeth, deceased.

Traffic Officers.

Chicago & Alton.—Jared M. Adee has been appointed General Agent at Pittsburg, Pa., succeeding T. C. Frew, resigned.

Colorado Southern, New Orleans & Pacific.—C. C. Cary has been appointed General Agent at Opelousas, La.

Las Vegas & Tonopah.—George F. Knight has been appointed General Agent at Goldfield, Nev.

Louisville & Nashville.—See Missouri Pacific.

Missouri Pacific.—Charles L. Stone, General Passenger Agent of the Louisville & Nashville, has been appointed to the new office of Passenger Traffic Manager of the Missouri Pacific, with office at St. Louis, Mo.

Western Maryland.—Thomas G. Smiley, Assistant General Freight Agent, has been appointed General Freight Agent, with office at Baltimore, Md., succeeding W. T. Hunter, transferred. W. A. Cox, General Agent at Baltimore, Md., succeeds Mr. Smiley.

Buffalo, Rochester & Pittsburg.—Robert Ward Davis, who was recently appointed Freight Traffic Manager, was born at Union Square, N. Y., in 1857. After a common school education he began railroad work in 1872 on the Syracuse Northern, now part of the New York Central & Hudson River. He was station agent at Union Square from 1876 until 1880, when he went to the Rome, Watertown & Ogdensburg as train despatcher. He was later made ticket agent at Watertown and then Traveling Auditor. He was appointed train despatcher in 1882 and two years later was made traveling freight agent. After a few months he was made also chief clerk in the general freight office, holding both positions until 1892. He then went to the Rochester & Pittsburg as General Freight Agent and held the same office on its successor, the Buffalo, Rochester & Pittsburg, until his recent promotion.

R. W. Davis.

LOCOMOTIVE BUILDING.

The Public Belt Railroad (New Orleans) is asking bids on locomotives.

The Michigan Central is said to be contemplating the purchase of 30 locomotives.

The San Antonio & Aransas Pass, it is understood, is about to order some locomotives.

The Great Northern has ordered two locomotives from the American Locomotive Company.

The Northern Pacific has ordered five switching locomotives from the American Locomotive Company for the Portland & Seattle.

The Tunisian Government has been authorized to buy from abroad 38 narrow-gage locomotives. For information apply to Bureau of Manufactures, Washington, D. C., referring to Foreign Trade Opportunity No. 1220.

The Pennsylvania Lines West, as reported in the *Railroad Gazette* of July 12, have ordered five class E-2b (Atlantic) locomotives from the Altoona-Juniata shops. The 45 freight locomotives mentioned have not been ordered.

CAR BUILDING.

The Duluth & Iron Range is about to order 800 ore cars.

The Grand Trunk is asking prices on 5,000 freight cars.

The Canadian Pacific is asking prices on 1,000 box cars.

The Oklahoma Central is to order new equipment within 60 days.

The Public Belt Railroad (New Orleans) is asking bids on cars.

The Western Maryland is said to be in the market for 1,000 freight cars.

The Illinois Tunnel Company, Chicago, is asking prices on 500 small dump cars.

The Chicago, Burlington & Quincy is said to have ordered 1,300 additional steel cars.

The Kansas City Southern, it is said, is considering the purchase of some freight equipment.

The Oklahoma Central is said to be in the market for 500 coal cars of 80,000 lbs. capacity.

The Lake Superior & Ishpeming is considering the purchase of 150 ore cars of 100,000 lbs. capacity.

The San Antonio & Aransas Pass is understood to be about to order some passenger and freight cars.

The Toledo & Ohio Central has ordered one combination mail and express car from the Pullman Company.

The Detroit & Toledo Shore Line, it is said, has ordered 400 coal cars from the American Car & Foundry Company.

The Western Maryland denies being in the market for 1,000 freight cars, as reported in our advance sheet of July 17.

The Washington, Idaho & Montana, it is understood, has ordered 50 flat cars from the American Car & Foundry Company.

The Southwest Missouri (Electric) has, it is said, ordered three single and three double truck cars from the Jewett Car Company.

The Duluth & Iron Range is in the market for four passenger coaches, two combination and two combination baggage and mail cars.

The Tampa Northern, it is said, has ordered 75 flat and 75 box cars of 60,000 lbs. capacity from the Baltimore Steel Car & Foundry Company.

The Central Railroad of New Jersey has ordered 1,000 hopper bottom coal cars of 100,000 lbs. capacity from the Cambria Steel Company. These cars will measure 30 ft. long and 9 ft. 5⅝ in. wide, inside measurements, and 31 ft. 6 in. long, 10 ft. wide and 10 ft. 4 in. high, over all. The bodies and underframes will be of steel. The special equipment includes:

Brake-beams	Diamond adjustable
Brake-shoes	Am. Brake-Shoe & Fdry Co., steel back
Brakes	Westinghouse
Brasses	Magnus metal
Couplers	R. E. Janney
Door fastenings	Simonton hopper door rigging
Draft rigging	Miner
Journal boxes	Symington
Springs	Simplex Railway Supply Co.
Trucks	Andrews cast-steel side frame, Barber lateral device

RAILROAD STRUCTURES.

Beaver, Pa.—The Pittsburg & Lake Erie bridge over the Ohio river is to be replaced with a new structure. The plans call for a bridge over the river starting 200 ft. east of the old structure on the Beaver side, with a shore pier on the West Virginia bank of the river 500 ft. above the old bridge. The channel span is to be 767 ft. long, and for 531 ft. of this span it will be 90 ft. above low water. The War Department has been asked to grant the necessary permission to put up the structure.

Brookhaven, Miss.—The Illinois Central, it is said, will put up a brick passenger station, 32 ft. x 196 ft., to cost about $25,000. Contract reported let to George P. Swift & Co., of Chicago. The work to be finished within 90 days.

Buffalo, N. Y.—Contractor John Johnson, of Buffalo, is said to have been the lowest bidder for the stone and concrete work on the elimination of grade crossings for the New York Central & Hudson River at East Buffalo. The bids were in two sections. The first for the work at Bailey avenue and Broadway crossings, on which the bids were: Stone masonry, $149,261, monolithic concrete, $139,373, and reinforced concrete $135,026. The second section was for crossings on the line between Kensington avenue and Amherst street. They were: Stone masonry, $129,822; monolithic concrete, $122,262, and reinforced concrete, $112,785. The city is to pay part of the cost, aggregating about $200,000, and the Grade Crossing Commission has voted to ask the Common Council to authorize an issue of bonds for that amount.

Butler, Pa.—The Baltimore & Ohio, it is said, is planning to put up a new freight house also a passenger station here, and increase its yard facilities.

Glendon, Pa.—Bids will soon be asked for building a steel and concrete bridge over the Lehigh river, to replace the old covered bridge. The cost is to be borne by the county of Northampton, the Lehigh Coal & Navigation Company and the Lehigh Valley Railroad. The borough of Glendon is to do the grading on the approaches.

Vancouver, B. C.—Contracts are reported let by the Canadian Pacific for putting up a pier 670 ft. long and 166 ft. wide to cost about $300,000. A number of similar piers are to be built at the C. P. terminals here.

Washington, Pa.—J. W. Sheldon, of Fayette county, one of the promoters of an electric line from Masontown to Waynesburg, is negotiating with the Greene county and Fayette county commissioners to build a bridge over the Monongahela river at a cost of about $150,000. The electric line is to pay one-third of the cost.

West Albany, N. Y.—Bids were recently asked for by G. W. Kittredge, Chief Engineer of the New York Central, Grand Central Station, New York city, for putting up a steel, concrete and brick boiler shop 125 ft. x 430 ft. and 40 ft. high. Separate contracts are to be let for the structural steel to be used in the construction.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

Alexandria, Zimmerman & Northwestern.—Incorporated in Louisiana, with $230,000 capital, to build a line from Alexandria, La., northwest to Zimmerman, 35 miles. J. A. Bentley, President; E. W. Zimmerman, Vice-President; A. F. Sharpe, Secretary, and P. Lisso, Treasurer.

American Midland.—Local reports say that this company has been incorporated in Oklahoma with a capital of $20,000,000 and office at Guthrie. The company proposes to build a north and south line from Langdon, N. Dak., south through the Dakotas, Nebraska, Kansas, Oklahoma, Indian Territory and Texas to Galveston, 2,100 miles; also a branch from Winnsboro, Tex., east to Shreveport, La., and one from Coalgate, Ind. T., east to Poteau. The Incorporators include: Henry Oppenheimer, C. F. Senkowsky, F. Jerome, H. Meyer and L. Linden, of New City; B. F. Hagler, Jr., U. C. Guss and C. R. Havinghorst, of Guthrie.

Arkansas Anthracite.—This company, incorporated in 1904 with a capital of $1,500,000, to build a line from Fort Smith, Ark., east to Clarksville, in Johnson county, about 65 miles, has been granted an extension of 18 months to begin the work. The directors include: R. M. Remmel, C. McKee, G. Heim and others. The Arkansas Anthracite Coal Company is also interested in the project. (See Arkansas Anthracite & Western, May 4, 1906, p. 136.)

Atlanta & Carolina Construction Company (Electric).—Incorporated in Georgia with $5,000,000 capital, to build an electric line from Atlanta east to Augusta, 160 miles. Surveys made from Atlanta to Conyers and from Athens to Augusta, leaving about 50 miles to be surveyed. J. W. English, President, Atlanta; Mathew Mason, Vice-President, and M. T. Edgerton, Secretary.

Atlantic Northern & Southern.—Contracts are reported let to the Engineering Construction & Securities Company, of Chicago, Ill., for building this proposed line from Manning, Iowa, south to Villisca, about 75 miles. Surveys made and rights of way obtained from Kimballton south to Atlantic. (May 24, p. 726.)

Beaumont, Sour Lake & Western.—See Colorado Southern, New Orleans & Pacific.

Charleston, Westfield, Marshall & Terre Haute Interurban.—Incorporated in Illinois, with office at Marshall, to build an electric line from Charleston, Coles county, east via Westfield, to the Illinois-Indiana state line, 35 miles. The incorporators include: James Dawson, S. Hurst, N. Bennett, M. L. Briscoe, W. B. Scholfield, T. M. Berkley, E. T. Pinnell and W. R. Patten.

Charlotte Harbor & Northern.—This company announces that its line from Arcadia, Fla., south via Hull, Fort Ogden and Liverpool to Boca Grande, 53 miles, is completed and is to be opened for traffic August 1. From Arcadia to Liverpool, 17 miles, the line has been in operation for freight only for some time past. (March 15, p. 381.)

Chesterfield & Lancaster.—This road is said to be in operation to a point 20 miles west of Ruby, S. C., and the company plans to extend it northwest towards Charlotte, N. C., or to Concord.

Chicago & North-Western.—It is reported that contracts will soon be let for grading an extension of the line from Bellefourche,

S. Dak., north about 10[illegible] miles to the northern border of South Dakota.

CHICAGO, BURLINGTON & QUINCY.—Work, it is said, is to be started at once on an extension of the line from Guernsey, Wyo., northwest to a connection with the Chicago & North-Western at Orin Junction, about 40 miles.

CHICAGO, ROCK ISLAND & GULF.—Track is reported laid for about 3½ miles on the extension this company is building from Irving, Tex., which is on the Fort Worth-Dallas line of the Rock Island, north to Carrollton, on the St. Louis & San Francisco, 11 miles.

CINCINNATI (OHIO) BELT LINES.—Surveys are to be made for a proposed belt line around Cincinnati. John E. Bleekman represents the interests which will finance the project. If the survey is satisfactory steps will be taken at once to begin the work. (See Cincinnati Intersecting, March 29, p. 467.)

COLORADO SOUTHERN, NEW ORLEANS & PACIFIC.—The Beaumont, Sour Lake & Western extension from Sour Lake, Tex., west to Houston, 64 miles, is reported finished, and the old line from Beaumont to Sour Lake, 22 miles, has been reconstructed to form part of the through line from New Orleans, La., west to Houston, 360 miles. Work is under way on the section from Baton Rouge to De Quincy, 137½ miles. The tracks of the Kansas City Southern are to be used from De Quincy to Beaumont, 47 miles, and the tracks of the Yazoo & Mississippi Valley from Baton Rouge to New Orleans, 89 miles. It is expected to have the whole line in operation early in September. (March 15, p. 382.)

COLUMBUS, MEMPHIS & PENSACOLA.—This company proposes to build a line from Aberdeen, Miss., on the Illinois Central, the Mobile & Ohio and the St. Louis & San Francisco, south to Columbus, on the Mobile & Ohio and the Southern, about 25 miles. H. E. Reynolds, President; C. Y. Reynolds, Vice-President; B. L. Reynolds, General Manager, Aberdeen, and C. B. Hopkins, Secretary and Treasurer, Columbus.

DEFIANCE, PAULDING & FORT WAYNE (ELECTRIC).—Reports state that this company is to be incorporated in Ohio to build an interurban line from Defiance, Ohio, southwest to Fort Wayne, Ind., with a branch from the main line a few miles south of Defiance south to Paulding. It is intended to eventually extend the line from Defiance northeast via Toledo to Detroit, Mich. H. F. Schnelker and W. S. Rogers, of New Haven, Ind., and Fort Wayne are interested.

DOLGEVILLE & SALISBURY.—This company is building an ore line from the mines of the Salisbury Iron Company at Salisbury, N. Y., southeast to a connection with the Little Falls & Dolgeville at Dolgeville, N. Y., about five miles. W. H. Switzer, President and General Manager; E. L. Wells, Vice-President, and F. R. Switzer, Secretary and Treasurer, all of Utica. The directors include E. Fairchild, of Salisbury; A. M. Mills, of Little Falls, and C. Sullivan, of Dolgeville.

ELYRIA SOUTHERN (ELECTRIC).—Incorporated in Ohio with $100,000 capital and office at Cleveland. The company proposes to build an electric line from Elyria, Ohio, south through Lorain, Medina, Wayne, Ashland, Richland and Knox counties, about 60 miles. The incorporators include W. E. Elliot, F. W. Carpenter and F. L. Sargent.

FLORIDA CENTRAL.—Incorporated in Georgia to build a line from Thomasville, Ga., south to the Georgia-Florida state line, about 13 miles. J. L. Phillips, of Thomasville, and associates are incorporators.

GAINESVILLE, TEXAS & SOUTHWESTERN.—Incorporated in Texas, with office at Gainesville, to build a line from Gainesville, Tex., southwest to Mineral Wells, about 80 miles. The incorporators include: E. C. Bell, of Toledo, Ohio; E. M. Wickey, of East Chicago, Ind.; W. W. Newberry, of Chicago, Ill.; J. M. Lindsay and John King, of Gainesville.

IDAHO NORTHERN.—Contract reported let by this company for building 35 miles of its proposed line from Kingston, Idaho, which is on the Oregon Railroad & Navigation Company's line, northeast to Murray, about 22 miles, thence south to Wallace, on the O. R. & N. and the Northern Pacific, 20 miles. B. F. O'Neill, President of the State Bank of Commerce at Wallace, is President. E. P. Spaulding, of Spokane, Wash., is also interested.

ILLINOIS & NORTHWESTERN (ELECTRIC).—Incorporated in Illinois with $10,000 capital and office at Chicago. The company intends to build an electric line from Lyons, in Cook county, south to Bloom, about 15 miles; also a number of branches. The incorporators include: A. B. Konsberg, E. J. Cady, C. P. Chamberlain, H. S. Martin and W. E. Phillips.

KENTUCKY NORTH & SOUTH.—Surveys are nearing completion and plans made to soon start work on this proposed line. The route is from Fullerton, Ky., on the Ohio river opposite Portsmouth south to Bristol, Tenn., about 200 miles, where connection is to be made with the Southern Railway. (June 21, p. 917.)

LOUISIANA & PACIFIC.—See Shreveport, Alexandria & Southwestern.

MADISON COUNTY (LOUISIANA) BELT.—Incorporated in [illegible] with $35,000 capital and office at Highland. The company proposes to build an electric line from Scranton, in Mississippi county, southeast via New Douglas, Dean, south through Grantfork to Highland, and thence southwest via St. Jacobs and Troy to Collinsville in Madison county, about 45 miles. W. P. Watt, J. Gebrig, J. Wild, J. L. Rhein and J. Pardu are incorporators.

METTOWEE VALLEY.—Incorporated in Vermont to absorb the Manchester, Dorset & Granville Railroad. The M., D. & G. was organized to build from Manchester, Vt., northwest via Dorset to Granville, N. Y., 25 miles, and the road finished to Dorset, eight miles. It is now proposed to extend the road from South Dorset to Granville. C. L. Leach, President.

MEXICAN INTERNATIONAL.—This road, it is reported, is to be extended from Tepehuanea west via the Topia mining district to Culiacan, 225 miles, where connection is to be made with the Western Railway of Mexico, operating a line from Culiacan west to Altata on the Pacific coast, 38 miles, recently reported bought by the Mexican government. The latter road is to be rebuilt and extensive improvements made at the port of Altata, which is midway between the ports of Topolobampo and Mazatlan.

Surveys reported made for a branch from Durango south to Guadalajara, 400 miles. (March 15, p. 396.)

MEXICAN ROADS.—The state of Chihuahua, Mex., has granted a concession to Jose Batello to build a line from Parral to San Jose Delsito, 60 miles.

A concession has been granted to Pablo Olivas, of Prieto, by the state of Chihuahua, Mex., to build a line from Allende northeast to Jiminez, about 75 miles.

MIDLAND VALLEY.—The branch building from Jenks, Ind. T., to Glen Pool, 6½ miles, is nearing completion, and trains will be run soon. It is reported that this is to form part of an extension from Jenks, Ind. T., southwest to Shawnee, about 100 miles.

MISSOURI, KANSAS & TEXAS.—Local reports state that work is under way on a second track from Parsons, Kan., south to Muskogee, Ind. T., on the Cherokee division. This division, which is 117 miles long, is to be shortened to about 100 miles. It is estimated that the work will take three years to finish, and cost about $2,000,000.

MOBILE, JACKSON & KANSAS CITY.—President L. S. Berg, of this company, is reported as saying that the road is to be extended from its present northern terminus at Middleton, Tenn., north about 100 miles to a point on the Ohio river.

NASHVILLE, CHATTANOOGA & ST. LOUIS.—Contract reported let to Toney & Lawler, of Chattanooga, Tenn., for grading a five-mile branch from Tracy City, Tenn., to coal mines at Pryor Ridge.

NEVADA & CALIFORNIA.—See Southern Pacific.

NEW YORK, AUBURN & LANSING.—Application has been made by this company to the New York Public Service Commission for permission to make a new mortgage for $2,000,000, half of which is to cover the cost of double-tracking the 37 miles of road from Auburn to Ithaca and installing a third-rail electric service. (March 15, p. 387.)

OAXACA & EJUTLA.—This company, operating a line from Oaxaca, in the state of Oaxaca, Mex., south 43 miles to Ejutla, is reported planning to build an extension south to the Pacific coast, about 60 miles.

OVERTON COUNTY.—This company, operating 19 miles of railroad from Algood, Tenn., northeast to Livingston, is planning to build an extension northeast to a connection with the Cincinnati, New Orleans & Texas Pacific at Burnside, Ky., 75 miles.

PARAGOULD & MEMPHIS.—This company, which proposes to build an extension from Cardwell, Mo., north to Poplar Bluff, 50 miles, and one from Cardwell west to Paragould, Ark., 17 miles, has located the line for the last named. Extensions are also projected from Manila, Ark., southwest to Marked Tree, 30 miles; also from Manila southeast to Osceola, 16 miles. (March 15, p. 389.)

PENNSYLVANIA.—This company, it is said, is planning to build a branch from the Indiana branch at Twolicks, Pa., east to a connection with the Cherrytree & Dixonville at Clymer, about 15 miles.

PEOPLES RAILWAY CONSTRUCTION COMPANY.—Organized in Texas to build a line from Tyler, Tex., northwest to Canton, about 40 miles. B. B. Caill, President; J. Durst, of Tyler, Vice-President; T. Butler and S. Brack, of Tyler, and D. F. Clark, of Canton, are interested.

PEORIA & ST. LOUIS.—It is reported that a company under this name is being formed in Illinois to build a line from Dixon, Ill., northeast to Belvidere, about 50 miles. The names of the promoters are not given.

Perla Northern.—This company, operating a logging road from Perla, Ark., northwest to Whittington, 18 miles, is said to be building an extension northwest, also an extension from Perla southeast to a connection with the Wyandotte & Southeastern.

Sacramento Valley & Eastern.—An officer writes that this company is building a line with its own forces from Pitt, in Shasta county, Cal., three miles east of Kennett, along the north bank of Pitt river to the mouth of Squaw creek, thence via Copper City to Delamar, 16 miles. About five miles has been graded. The work is heavy, being mostly through rock. Maximum grades 4 per cent. and maximum curves 20 per cent. There are to be two bridges; one over Sacramento river and the other over McCloud river. Some of the work may be let if bids from contractors prove satisfactory. D. W. Riordan, President, New York, and F. J. Dearborn, Chief Engineer, Wintbrop, Cal.

St. Francis.—Incorporated in Arkansas to build a line from Parkin, Ark., on the St. Louis, Iron Mountain & Southern, south about 20 miles to Round Pond, on the Chicago, Rock Island & Pacific. E. E. Taenzer, W. D. Darnall and others, of Memphis, Tenn., are incorporators.

St. Louis & San Francisco.—This company, it is said, has recently appropriated funds for double-tracking work on its road between St. Louis, Mo., and Springfield. Surveys are reported made for building a cut-off from Crocker, Mo., east to Rolla, so as to shorten the line between these two towns from 36 miles to 30 miles.

Shreveport, Alexandria & Southwestern System.—The Louisiana & Pacific extension from Fulton, La., is in operation south to Banks, 16 miles from Fulton, and it is said work is under way from Banks south to Lake Charles, eight miles. Plans are reported being made to build an extension from the northern end at De Ridder to Cravens, 10 miles. (June 14, p. 879.)

Southern Pacific.—An officer writes that preliminary surveys are being made for an extension of the Nevada & California from its southern terminus at Keeler, Cal., south to Mojave, about 120 miles.

Tennessee & Georgia Interurban.—Incorporated in Georgia with $500,000 capital to build an electric line from Rossville, Ga., southeast via Ringgold to Catoosa Springs, about 25 miles. J. R. Jones, J. C. Brayn and J. W. Clark, of Catoosa county, and W. H. Payne, of Chattanooga, Tenn., incorporators.

The Suffolk Syndicate Co.—This company, which has mortgaged its property for $200,000, is believed to intend using the proceeds to build an electric railroad from Patchogue, N. Y., westward through the villages and towns along the south shore of Long Island. John W. Wells, of New York city, is President.

Union Pacific.—Contracts, it is said, will soon be let for laying a new second track from Hanna, Wyo., west to Rawlins, 40 miles, to cost about $1,000,000. The work also includes the elimination of curves and the building of a number of cut-offs to shorten the line. Similar work is also to be carried out from Wamsutta, Wyo., west to Robinson, 20 miles, and from Rock Springs to Green River, 16 miles, at a cost of about $1,000,000. Surveys are reported made and work is to be started at once on a cut-off from Robinson, Wyo., west to Point of Rocks, 27 miles. The line is to be seven miles shorter than the existing road.

Western Railway of Mexico.—See Mexican International.

RAILROAD CORPORATION NEWS.

American Light & Traction Company.—A quarterly dividend of 1½ per cent. on the outstanding $6,738,700 common stock has been declared payable August 1. The annual rate was 5 per cent. during the fiscal year ended June 30, 1907. In the first half of 1906, 2 per cent. was paid; 1905, 3½ per cent., and in 1904, 1½ per cent. The company owns or controls gas, lighting, power and traction companies in Wisconsin, Minnesota, Michigan, Texas, New Jersey, New York, Colorado and Canada.

Baltimore & Ohio.—See Chicago Terminal Transfer.

Buffalo, Rochester & Pittsburg.—This company has applied to the New York Public Service Commission for permission to issue $1,300,000 additional equipment trust notes.

Chicago, Burlington & Quincy.—See Chicago Terminal Transfer.

Chicago Terminal Transfer.—The Baltimore & Ohio is said to have offered $30 a share for the preferred stock held by minority stockholders. There is outstanding $17,000,000 4 per cent. noncumulative preferred stock, of which the Burlington is believed to own over 70 per cent.

Chicago Union Traction.—This company has sold about $4,000,000 first-mortgage 5 per cent 25-year bonds to the First National Bank of Chicago. It is said that probably $6,000,000 more will be sold at once. The proceeds are for rehabilitation. (July 19, p. 84.)

Detroit & Charlevoix.—See Michigan Central.

Florida East Coast.—This company, which operates 484 miles of road from Jacksonville, Fla., south, has sold to Harvey Fisk & Sons, New York, $3,000,000 three-year 6 per cent. notes; they are secured by bonds of the railroad company and also, it is said, by the endorsement of H. M. Flagler, President of the company, who owns the road. It is supposed that the notes were sold to raise money to pay for the extension from Homestead along the Florida keys to Key West, about 125 miles, on which work has been under way for the past two years.

Kansas City Southern.—Earnings and expenses for the month of June, 1907, and for the year ended June 30, 1907, were as follows:

Month of June, 1907.			
Gross earnings	$870,428	Inc.	$208,448
Operating expenses	508,606	"	25,900
Net earnings	$361,822	Inc.	$182,548
Taxes	15,583	Dec.	437
Net earnings, taxes deducted	$346,239	Inc.	$182,985
Year Ending June 30, 1907.			
Gross earnings	$9,284,884	Inc.	$1,531,993
Operating expenses	5,486,539	Dec.	157,991
Net earnings	$3,798,345	Inc.	$1,689,984
Taxes	190,925	"	16,884
Net earnings, taxes deducted	$3,607,420	Inc.	$1,673,100

Michigan Central.—According to press dispatches, this company has bought the Detroit & Charlevoix, which runs from South Arm, Mich., to Frederick, on the Michigan Central, 44 miles, with an eight-mile branch. The Detroit & Charlevoix is a logging road and has $520,300 stock outstanding.

Milwaukee Electric Railway & Light.—This company has increased its authorized common stock from $15,000,000 to $20,000,000. A subsidiary, the Milwaukee Light, Heat & Traction Company, has increased its authorized common stock from $1,000,000 to $30,000,000. The parent company owns 103 miles of road and controls all the gas and electric lighting companies in Milwaukee.

Mobile, Jackson & Kansas City.—L. S. Berg and associates have bought half of the controlling interest heretofore held by Alexander McDonald, W. D. Stratton and E. K. Stallo. (July 19, p. 84.)

New York, Auburn & Lansing.—This company has applied to the New York Public Service Commission for permission to make a mortgage for $2,000,000, of which $1,000,000 is to refund outstanding bonds and the rest is for double-tracking and electrifying the company's road from Auburn, N. Y., to Ithaca, 37 miles.

Santa Fe Central.—It is understood that finances of this company are to be reorganized and the road consolidated with a coal and iron company and several real estate companies. The road runs from Santa Fe, N. Mex., south to Torrance, 117 miles, and had a 47-mile branch from Moriarity Junction to Albuquerque under construction at the beginning of the present year. It was reported over a year ago that C. W. Tallmadge, of Chicago, had bought the road. It has outstanding $2,500,000 stock and $2,000,000 first-mortgage 5 per cent. bonds of 1941.

Southern Pacific.—The estimated income account for the year ended June 30, 1907, is as follows:

Gross earnings	$124,861,440	Inc.	$19,215,326
Operating expenses	82,578,907	"	11,992,257
Net income	$42,285,533	Inc.	$7,253,069
Other income	3,665,365	"	211,220
Total income	$45,950,898	Inc.	$7,464,289
Fixed charges and rentals	19,423,833	"	2,497,937
Available for dividends	$26,527,065	Inc.	$4,966,352
Dividends, preferred stock, 7 per cent.	2,769,879		.....
Available for common	$23,757,186	Inc.	$4,966,352
Dividends, common stock, 5 per cent.	9,892,463	"	4,946,217
Surplus	$13,864,723	Inc.	$20,135

Union Pacific.—The estimated income account for the year ended June 30, 1907, is as follows:

Gross earnings	$75,781,115	Inc.	$8,499,573
Operating expenses	42,222,464	"	5,258,691
Net earnings	$33,558,651	Inc.	$3,240,882
Other income	11,028,252	"	3,260,761
Total income	$44,586,903	Inc.	$6,501,643
Fixed charges and rentals	8,652,622	Dec.	230,791
Available for dividends	$35,934,281	Inc.	$6,732,437
Dividends, preferred stock, 4 per cent.	3,982,006	Dec.	25
Available for common stock	$31,952,275	Inc.	$6,732,462
Dividends, common stock, 10 per cent.	19,548,790	"	3,998,398
Surplus	$12,403,485	Inc.	$2,734,064

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS.

THE BRITISH AND EASTERN CONTINENTS edition of the Railroad Gazette is published each Friday at Queen Anne's Chambers, Westminster, London. It contains selected reading pages from the Railroad Gazette, together with additional British and foreign matter, and is issued under the name Railway Gazette.

CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.

ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

OFFICERS.—In accordance with the law of the state of New York, the following announcement is made of the office of publication, at 83 Fulton St., New York, N. Y., and the names of the officers and editors of The Railroad Gazette.

CONTENTS

VOL. XLIII., No. 5. FRIDAY, AUGUST 2, 1907.

THE NOTABLE OPERATION OF THE KANSAS CITY SOUTHERN.

The Kansas City Southern, in saving for net earnings more than its entire increase in gross during the fiscal year just ended, has made a record which is probably unique among the more important roads during recent years. It was to be expected that, other things being equal, the company would this year be able to decrease its operating ratio because last year's maintenance expenses included large amounts spent for rehabilitation. The road was left in bad shape at the end of 1905. But this chance to improve its showing was more than offset by the higher costs of material and work which, during the past fiscal year, have greatly increased the operating ratio on most roads. The results under consideration are, therefore, to be credited to the management of the road and not to general conditions.

How these results were obtained is worth studying in some detail. The methods followed are perhaps not uncommon, but their success is uncommon. In June, 1906, estimates of the amounts to be spent on maintenance and conducting transportation, based on experience in 1906, were made. Then, throughout the year, close track was kept by watching detailed monthly reports and whenever any item was larger than the standard that had been set, inquiries were made until the waste was stopped or a satisfactory explanation found. The probable cost of maintenance could be figured closely, after several weeks of careful inspection had furnished data for estimating how much rolling stock, track material and supplies would be needed for renewals. The chief element of uncertainty was the cost of labor, usually amounting to about 30 per cent. of maintenance expenses. In 1906 maintenance cost 29 per cent. of gross earnings. The estimates did not call for reduction of this percentage, but a system was put in force looking toward getting better results from the same amount of money. The maintenance of way engineers were allowed the usual margin of 10 per cent. over the estimated cost of the work to be done and were then told that what they saved could be spent on some improvement they particularly wanted but which had not been approved. This form of "bonus system," which has worked out well in the East, was new to the Kansas City Southern engineers, but results were noticeable as soon as the men got used to it. Conducting transportation cost, in 1906, 38 per cent. of gross earnings. The management saw no reason why this should not be reduced to about 30 per cent.; as a matter of fact it was brought down to 33 per cent. The big saving was made by increasing the average train load and the car mileage. The road has no low grade operating division, gradients of about 1 per cent. being scattered over the whole line and opposing about equally both the north- and southbound traffic. The reduction of these grades has been figured on, but nothing has been done yet because of the financial situation. The train load was increased not by using heavier locomotives but by getting a larger backhaul. The great bulk of the traffic had been northbound, consisting mostly of lumber from Louisiana, Texas and the southern part of Arkansas for shipment to Kansas City. The traffic department has directed especial energy toward getting a backhaul south, and it has succeeded in getting enough more manufactures and grain, particularly the former, to greatly increase the southbound train load, although this is not yet as large as the northbound. The average car movement was about 20 miles a day a year ago; this increased to 34 miles in October, 1906, but has since fallen off to about 29 miles. The responsibility for the small car movement in previous years rests on the transportation officers, who failed to make the shippers handle the cars faster. When the requisite activity was infused into this department, the resulting quicker movement of freight attracted southbound traffic and had a gratifying effect on gross earnings. The monthly statements of earnings which have been made public throughout the year show that after the first few months the improvement was steady and rapid. The yearly results are surprisingly close to the original estimates. Gross earnings for the 12 months ended June 30, 1907, were $9,290,000, an increase of $1,530,000, or 20 per cent.; operating expenses, $5,490,000, a de-

crease of $160,000, or 3 per cent., leaving net earnings of $3,800,000, an increase of $1,690,000, or 80 per cent.

THE COLLISION AT SALEM, MICHIGAN

The terrible butting collision near Salem, Mich., July 20, in which 33 persons were killed, reported in the *Railroad Gazette* of July 26, was due to a mistake in reading the schedule of the special train. This schedule was in the shape of a written train order, a slightly reduced fac-simile of which will be found on another page. The schedule was delivered to the freight at Plymouth. The error in reading "Salem.....9:25" instead of "Salem.....9:10" was due evidently to the failure of the person reading to follow the line of dots connecting the word with the figures. It would appear that in the first writing of the order, the time at Brighton (8:39) was omitted, and that it was inserted afterward, and the dots then put in to guide the reader.

As both conductor and engineman are required by rule to know the correct reading of an order, it will be seen that the cause of this collision was careless reading by two or more men of an imperfect order. The order is imperfect, not only because the time for Plymouth is on a level with the word Salem, but also because the dots making up the lines are insufficient. The dots should be larger and there should be more of them. Indeed, a strict construction of the rules for writing orders would require that in a case like this the order should be torn up and then be resent by the despatcher to enable the operator to make a new and correct copy. But, as everyone knows, it would require unobtainable vigilance by the superintendent to enforce such a high degree of care. A cautious conductor would have taken special care with an order of this kind. Any conductor of experience would see that it was not a satisfactory order. A document involving the safety of lives and property when presented in this shape challenges its reader to extreme caution. A conductor determined to avoid any chance of mistake would not be satisfied to read the Salem line alone by itself. He would read the whole order with sufficient care to grasp the entire schedule of the extra train. In doing this he would by force of habit see that "9:25" at Salem indicated abnormally low speed. This would lead him to re-examine the other items in the schedule.

The order was received by the night operator, a young man 22 years old, about 2:27 a.m. and was delivered by the day operator about 8:40 a.m. The day operator says that he remembers the conductor's reading it aloud to him correctly. If this is so, the conductor's fault evidently must be classed as mechanical reading. He read it, but did not give thorough attention either with his eyes or with his ears. Once the wrong impression is made, it is easy to make the same error in reading to the engineman or the fireman or the rear brakeman. If we may judge by what has been brought out in similar cases before. The freight was to stop at some point between Plymouth and Salem and unload two carloads of cinders. The day operator says that he reminded the conductor that he had not time to do that work and still reach Salem in time to clear the extra. If this is so it is one more evidence that the conductor was not giving sufficiently careful attention to the order.

The newspapers have made much of the alleged fact that the train despatcher had been early informed that the freight had left Plymouth without sufficient time to reach Salem, and yet that he did nothing to prevent the collision. If this is so, and if some means existed by which the despatcher could have communicated to one train or the other, the fact may have some bearing on the alertness of the despatcher; but it has no value as a lesson. The prevention of collisions is not to be accomplished by educating despatchers to perform lightning calculations and to do unheard of feats in emergencies. It is a fine thing to have despatchers who can do such things, and we all praise them when we hear of such strokes of genius, but to talk of prescribing in advance that such procedures shall be carried out or that any despatcher shall be held accountable for not using every possible opportunity to do something, is idle.

The causes of this collision have been given in detail; not because it is proposed to discuss the faults in the details and the means of correcting them, but simply as an interesting exhibit of how the time-honored American train despatching system breaks down. The only way to cure these faults is to abolish the system and use in its place the block system. We must accept as an incurable defect in American railroad operation the continued employment of men who will occasionally make such mistakes as were made in this case. In setting forth what an ideal freight conductor would have done in this case we have implied a standard of proficiency which must be regarded as unattainable. That is to say, no superintendent of a large road can assure himself that he can attain it in all of his men all of the time. Our train-despatching system is, indeed, time-honored, but it is not worthy of confidence. The non-automatic block system is suitable for roads of the lightest traffic and cannot reasonably be objected to because of its cost. It is not free from chances of error, but it is simplicity itself compared with the despatching system, and simplicity tends to enhance safety.

If we may judge by the action of a number of other roads during the past ten years, the road on which this collision occurred will now proceed to install the block system on a considerable part of its lines. In our list of notable disasters we can at a glance pick out 40 collisions which have occurred within the past 20 years, killing an average of 20 persons each, or 800 in all, all due to causes of the same general nature as those which figured in this case; and a psychologist, desiring to estimate the influence of collisions on railroad directors' minds, could, if he had the inside facts of these 40 cases, make out an instructive exhibit of cause and effect—collisions as causes and orders for block signals as effects; with possibly as a side light an estimate of the number of lives sacrificed to establish each hundred miles of block signals. The failure of the Federal Government and of most of the state governments to establish competent inspectorships or any suitable and authoritative means of giving to the public correct statements of facts and rational lessons therefrom is an invitation to anybody and everybody to propose remedies for railroad disasters. This particular disaster will, no doubt, bring out at least a dozen amateur cures for everything, from boiler explosions to sleepy brakemen.

Is this country so big, and is our collision problem so scattered, that American railroad officers will never concentrate their energies on its effective settlement?

TAKING RAILROAD PROPERTY WITHOUT DUE PROCESS OF LAW.

"The Constitution of the United States declares that no individual shall be deprived of his property without just compensation, or without due process of law. . . . If a law were passed by a legislature contrary to the Constitution, taking from a man his home or interfering with his lawful enjoyment of it, there is no one, thus deprived, who would not ask, through the courts, the protection of the Constitution for his lawful rights. Every good man would applaud his action and would uphold his hand. If, however, legislation is enacted contrary to the Constitution taking from a railroad company its property or interfering with its lawful enjoyment of it and an effort is made by those charged with the responsibility for the property, to obtain for it in the courts constitutional protection, there are those who declare that this is a defiance of the popular will . . . an arrogant refusal to accept the popular verdict. Instead of a firm and determined insistance on Constitutional protection, the railroad manager is confronted with denunciation, with obstruction, with threats of reprisals and with efforts at intimidation."—*President Finley, of the Southern Railway, to the Board of Trade of Nashville, Tenn., July* 17, 1907.

"If this kind of obstruction should prevail and citizens are thus to be denied the rights guaranteed them by the Constitution of the United States, then those provisions of the Constitution [providing that no person shall be deprived of property without due process of law] would become a dead letter, as there would be no means of enforcing them."—*Justice Pritchard, July* 29, 1907.

The first of these quotations, from President Finley's speech at Nashville a little more than two weeks ago, is peculiarly apt in describing, prophetically, the latest developments in the dispute over the new passenger-rate law in North Carolina, of which we spoke last week. Then the situation was that two agents of the Southern Railway, arrested and sentenced to the chain gang for selling tickets at a rate of more than 2½ cents a mile, the rate established by the last North Carolina legislature, had been released on writs of habeas corpus issued by the United States Circuit Judge. In his opinion accompanying this action, Justice Pritchard took occasion to condemn the heavy penalties prescribed by the state statute and the methods of the state authorities in instituting criminal prosecutions against the railroad's agents. In spite of his sensible words, the state authorities, headed by the Governor, besides arresting Mr. Finley himself, who had come to the scene of action to help straighten out the tangle, threatened to call a special session of the legislature to annul the charter of the old North Carolina Railroad, which runs from Goldsboro to Charlotte, 224 miles, and is one of the constituent parts of the Southern Railway lines. A compromise plan suggested by one of the assistant attorney generals of the United States sent by the Department of Justice to North Carolina on this special mission, was rejected by the Governor, who insisted that no compromise would be entertained

until the railroads agreed to immediately adopt the new rate. On July 27 a compromise was reached between the Governor on the one hand and the Southern Railway and Atlantic Coast Line on the other containing the following agreements:

(1.) The railroads to put the 2 cent rate in effect not later than August 1, 1907.

(2.) The State to appeal from the decision of Judge Pritchard discharging parties in Asheville on writs of habeas corpus.

(3.) The Southern Railway to appeal to the Supreme Court of North Carolina in the Wake County case and if the case is there decided against it, to take the case by writ of error to the Supreme Court of the United States.

(4.) Both sides to cooperate to have both of these cases advanced, argued together and speedily determined.

(5.) The State at its option to dismiss the Atlantic Coast Line in one case.

(6.) All indictments and prosecutions now pending to be dismissed and no other indictments or prosecutions to be instituted for any alleged violation of the law up to the time the new 2 cent rate is put in effect under this arrangement so far as lies within the power of the Governor.

(7.) The Governor to advise all people against bringing any penalty suits pending final determination of the questions involved and to ask the people as a whole to acquiesce in this arrangement.

(8.) The suit pending before Judge Pritchard to be diligently prosecuted, without, however, the State's waiving any question of jurisdiction.

Later in the day, the Governor made public a statement in which he referred to the acceptance of this agreement by the railroads as a victory for State rights and the people's rights against "the oppression of the railroads [and] the interference of the Federal courts." It is a victory, but there is nothing to be proud of in the methods by which it was gained. In the same petitions in which they surrender the protection of the Federal court, the two railroads declare that the agreement was assented to under duress, because of threats that if they did not assent, worse things would happen to them. They point out that by similar methods of "coercion and intimidation" the state could fix the passenger rate at 1 cent and compel the railroads to put it in force, although obviously unconstitutional. The state's present victory was gained by threats of retaliation in entirely different fields than the one under dispute, a method which in the case of an issue between individuals would be called blackmail.

It will be observed that in this whole controversy the real point at issue was whether or not the railroads should put the reduced rate in force while its fairness was being judicially determined. At the direction of Justice Pritchard, who had also earlier issued the injunction suspending the operation of the law, the railroads were giving with each ticket sold at the old rates a refund coupon, representing in each case the difference between the existing rate and the rate proposed by the new law. These coupons were to be valid if the law were finally upheld. This is a much fairer method of procedure than the one which the railroads, under pressure of threats from the state officers and unwilling to suffer the odium of what would be alleged as law breaking, have finally agreed, though under protest of duress, to adopt. The case of the fare from New York City to Coney Island clearly brings out this point. In August, 1906, a New York judge, in an obiter, announced it as his opinion that the fare of 10 cents charged by the Brooklyn Rapid Transit Company to Coney Island was illegal and that 5 cents was all that should be charged. Rioting followed, and the company sought determination of this question in the courts. Pending decision of the legality of the 10-cent fare, the company issued for each fare paid a rebate coupon good for 5 cents if the 10-cent fare were overthrown. Five months later, the highest court in New York State decided that a 10-cent fare to Coney Island was legal.

Under this method of procedure no one suffered. Both the railroad company and its passengers were protected. On the other hand, if the Brooklyn Rapid Transit had been forced to charge only 5 cents while the law was being passed upon by the courts, it would have had no means of recovery for the difference between the 5 cents paid and the 10 cents which should have been paid during the intervening five months before the law was declared void. To sue hundreds of thousands of passengers, each for a small sum, is impracticable; a railroad corporation is a responsible party. The North Carolina passenger-rate dispute as now compromised is an example, first, of the loss which will unjustly fall on the railroads in that state if the reduced rate is overthrown in the United States Supreme Court; and, second, of the sort of inconsistent hostility to railroads described by President Finley at Nashville. The whole incident is important, not so much because of its conflict between State and Federal authority, as because the railroads have not been able to obtain the protection which would have been granted, as a matter of course, to any citizen.

NEW PUBLICATIONS.

[redacted]

It is refreshing to take up a work dealing with electric traction on a large scale and find that one must be constantly on guard against overstatement and exaggerated estimates and in which the main idea of the author is not to depreciate the steam locomotive but to tell what really can be done. The authors of this book have evidently gone on the principle that "good wine needs no bush," and so in the first words of their preface they say that "the considerations which have led to the adoption of electric traction on the larger steam railroads have generally been peculiar to the local circumstances," and that "in the application of electricity to long distance lines, it is to be steadily borne in mind that the steam locomotive has demonstrated itself to be the most efficient self-contained machine, considering its varying functions, that the engineer has yet devised. To compete with this machine, every appliance entering into the electric traction installation must compare from every point of view, as regards efficiency, with this most highly developed and perfect mechanism. The electric locomotive installation duplicates, in many respects, the steam locomotive installation." These quotations are given to show the mental attitude of the authors, and that they are not among those who have donned their funeral habiliments or festal dress—according to the point of view—to attend the obsequies of the old iron horse.

While the book is issued from the press of an American firm it has an English viewpoint throughout, which perhaps accounts in part for its conservatism. The first chapter deals with the old problem of traction and acceleration. This it does thoroughly and at some length, entering carefully into details of tests and results, giving tables of factors and data required for the solution of its formulae; but, on the whole, it considers that the formula evolved by Aspinall is as reliable as any because "little interest attaches to tractive resistance at speeds of less than 10 miles per hour," while, for speeds greater than that, this formula "leads to very trustworthy results." This covers tractive resistance at constant speed. Then follows a chapter on acceleration. This has many diagrams, showing curves of resistance and speed, and these serve "to bring out very forcibly the limits of attainable average and 'schedule' speeds and to show that for a one-mile run between stops an average speed of 45 miles an hour is practically unattainable." With these diagrams comes consideration of the part that can be played by various types of equipment in obtaining results, and how the weight of this equipment rises if a high rate of acceleration without undue heating is to be maintained.

The book then goes on to give an analysis of the tractive force and the power and energy at the axles, and then takes up the characteristics of railroad motors. Here again a word of caution is sounded in reference to the fact that high schedule speed involving frequent stops and rapid acceleration can only be obtained "at very disproportionately increased cost." The discussion throughout the chapter hinges about the a.c. single-phase motor, and the conclusion that is dispassionately drawn is that the d.c. motor is superior. The electric power generating plant is taken up in detail and its working analyzed; and the designer is warned against a too great refinement, lest he may find to his cost that "thermal gains are not always commercial gains."

High tension transmission, sub-stations and the distributing system follow and after them a fully illustrated chapter on locomotives and motor cars, special attention being given to the work on the New York Central, the Baltimore & Ohio and the Valtellina Line in Switzerland, as well as the apparatus used in the Berlin-Zossen trials. In this chapter there is another criticism of the single-phase system, in the statement that "from the standpoint of its technical merits, the single-phase commutator motor is at present a factor in the railroad electrification problem only in so far as the possibility of its further improvement at an early date entitles it to consideration. Although the last three years have witnessed the advent of several types of single-phase commutator motor, each of which constitutes a great step in advance of the old induction type single-phase motor without commutator, there is still a wide gap to be bridged before it can, on the basis of its engineering merits, rival the continuous-current motor. The single-phase motor has the non-technical advantage that it is now fully realized that some radical innovation is essential to the success of railroad electrification. It appeals to the speculative instincts of human nature to take up a promising novelty rather than undertake radical but comparatively uninteresting modifications of a well-tried and reliable system, especially as there is a prevailing belief that this would only postpone the inevitable, ultimately successful, introduction of an alternating current railroad motor. It will, however, not be denied that a treble or quadruple increase in the traditional continuous-current trolley voltage would greatly increase the practicability of introducing electric traction on main railroads without discarding continuous-current railroad motors." This certainly is a clean-cut non-partisan statement of the present situation. Con-

tinuing this subject it is said: "The preparation of a rigid quantitative comparison is, in such a case as this, beset with difficulties, but it should be evident from the data set forth, that pending considerable further development, the continuous current motor has as yet no rival for city and suburban work.

"For interurban work, it is believed that the 600-volt continuous-current motor can generally hold its own; nevertheless there appears insufficient reason why advantage should not be taken of the higher economies incident to employing higher voltage at the motor."

The last chapter of the book is devoted to trucks and many of the more prominent types are illustrated and described in detail. The authors express a decided preference for the European type of truck as compared with the American, and doubt the desirability of equalizing between the wheels. In this they state, however, that the preference for the European model is confined to European engineers for they have no record of any adoption of the type in the United States.

There is at the end an exceptionally good index, which, as the book is to be used for rapid and ready reference, is most essential.

Wrentmore's Batter Tables. By C. G. Wrentmore, C. E. New York: Engineering News Publishing Co. 8 in. x 9½ in.; 197 pages; cloth. $5.00.

This is a book of tables for determining the length of braces, diagonals and rivet spacing when the batter or inclination of the part to the base is known. There are 192 tables for batters ranging by sixteenths from 1/16 in. to 12 in. to the foot, a page being devoted to each, and each of these tables are given in two sections. One gives the length of the hypothenuse for any base from 1/16 in. up by sixteenths, and the other gives the altitude for the same base dimensions. All dimensions in the tables are given in decimal fractions of a foot, and these are readily converted to nearest sixteenths for use on drawings by means of a conversion table on the inside of the front cover that gives the equivalent decimal fraction of a foot for all measurements from 1/32 in. to 12 in., increasing by increments of 30 seconds. The tables will undoubtedly be a great convenience, especially to those who are working out details of structural iron and steel.

CONTRIBUTIONS

Fuel Consumption of Gasolene Motor Cars

Omaha, July 26, 1907.

To the Editor of the Railroad Gazette:

Referring to editorial in the *Railroad Gazette* of June 7:

The figures as to the relative cost of gasolene and steam cars must have been based on some old style, impractical gasolene car. These statistics show the cost of gasolene as $7.50 per 100 miles as against oil at $4.90 per 100 miles and coal at $2.69 per 100 miles, making it appear that gasolene motors are highly expensive to operate as compared with steam. As far as the Union Pacific is concerned, this figure for gasolene is wrong, as accurate statistics show that Union Pacific motor cars are being operated at a cost of $3.36 per 100 miles for fuel. This figure covers a period of operation of more than two years and shows the cost to be less than one-half the amount shown in the table printed with the article in question.

W. R. M'KEEN, JR.,
Supt. M. P. & M.

The Salt Lake City Union Station.

Chicago, Ill., July 29, 1907.

To the Editor of the Railroad Gazette:

Referring to the criticism of the Salt Lake City union station by "S" in your number of July 26th: Your correspondent evidently does not understand the plans, or the operating conditions at Salt Lake City, which are not at all similar to the way stations he refers to. That city, in common with many such locations in the West, is a terminal point from which trains, many of them short locals, originate in both directions—east and west. There are, however, a few through trains, and it is intended to take care of these on the last track or two from the building proper. The other trains originating here will stand with their rear ends at the platform designated in the drawing as "train shed," for which there is ample track length, as is shown in the general yard plan.

It is true that the umbrella sheds are 440 ft. long, but this does not mean that the trains themselves are restricted to this length, because the climatic conditions include no intense heat, and a very short winter season, during which time only it is necessary to protect passengers going to and from trains, which are then shortest, and an umbrella shed 440 ft. long, which allows accessibility under cover to the platforms of about seven cars, is sufficient for this purpose. It would seem to be absurd to compel passengers to climb stairs and go over bridges, or through tunnels, when all trains are perfectly accessible on the "archaic" level. This would seem to dispose of the objections raised to the arrangements for handling passengers.

There are no "island" platforms shown in this plan in the sense of platforms elevated above the rail between the tracks; but the entire floor of this building, as shown in the end elevation published, is level with the top of the rails.

Regarding the handling of baggage: It is both feasible and intended at this place to handle most of the baggage by setting baggage cars on the spur track shown in the plan opposite the baggage room, which gives a minimum of trucking and handling. It is true that there will be some little late baggage which will have to be trucked, and to avoid crossing tracks which may be occupied by trains, the tunnel, with lifts as shown, is provided. It is expected that practically all of the mail and express will be similarly handled to and from cars set in on the spur provided for that purpose; and it may be noted that at present this is the arrangement satisfactorily used at this place. It is true that some little trucking may be necessary with this as with any arrangement of depot. Complete tunnels for handling baggage, express and mail have been discussed but are regarded as unnecessary under the conditions.

The reasons given above are so obvious that this explanation seems hardly necessary to any one at all familiar with this subject.

JOHN D. ISAACS,
Consulting Engineer, Bridges, Buildings & Structures, Harriman Lines.

Government Accident Bulletin No. 23.*

The Interstate Commerce Commission has issued Accident Bulletin No. 23, containing its report of railroad accidents in the United States during the three months ending March 31, 1907. The number of persons killed in train accidents was 421, and of injured 4,920. Accidents of other kinds bring the total number of casualties up to 20,563 (1,293 killed and 19,270 injured). These reports deal only with (*a*) passengers and (*b*) employees on duty. Under "passengers" are included postal clerks, express messengers, employees on Pullman cars, newsboys, live-stock tenders, men in charge of freight, etc.

Table No. 1.—*Casualties to Persons.*

	Passengers.		Employees		Tot'l persons reported	
	Kil'd.	Inj'd.	Kil'd.	Inj'd.	Kil'd.	Inj'd.
Collisions	52	1,340	163	1,431	215	2,780
Derailments	58	1,050	82	629	140	1,679
Misc. train accidents, incl. boiler explo.	16	75	50	386	66	461
Total train accidents	126	2,474	295	2,446	421	4,920
Coupling or uncoupling	..	..	62	947	62	947
While doing other work about trains	..	..	78	4,558	78	4,558
In contact with overhead bridges, etc.	2	4	26	407	28	411
Falling from or getting on cars or engs.	34	432	176	3,220	210	3,652
Other causes	22	426	472	4,356	494	4,782
Total (other than train accidents)	58	862	814	13,488	872	14,350
Total, all c'asses	184	3,336	1,109	15,934	1,293	19,270

The number of employees killed in coupling accidents in this quarter shows a diminution of 25 per cent. as compared with the quarter last preceding or with that of one year ago. This is a gratifying indication of an improvement in safety appliances, which it is to be hoped will be maintained. The other principal items in the present record show no important changes as compared with the last preceding quarter, which was marked by large aggregates of both killed and injured. The number of passengers now reported killed in train accidents (126) is, indeed, 30 per cent. smaller; but the record includes two collisions (Table 2*a*, Nos. 30 and 31) killing 41 persons and two derailments (Nos. 1 and 18) killing 41; and the total of 126 is more than twice the total of this quarter in 1906.

The principal items in the present bulletin, compared with the last preceding quarter and with the quarter one year ago, appear as follows:

		Bulletin No. 23.	Bulletin No. 22.	Bulletin No. 19.
1	Passengers killed in train accidents	126	180	62
2.	Passengers killed, all causes	184	234	111
3.	Employees killed in train accidents	295	291	212
4.	Employees killed in coupling	62	84	81
5.	Total passengers and employees killed, all causes	1,293	1,439	1,126

Table No. 2.—*Collisions and Derailments.*

	No.	Loss.	Persons Killed.	Persons Injured.
Collisions, rear	538	$499,505	50	586
" butting	279	630,518	93	1,101
" trains separating	194	52,977	2	110
" miscellaneous	1,067	652,199	70	983
Total	2,078	$1,835,259	215	2,780

*The five most serious accidents are collisions 30 and 31, and derailments 1 and 18, in Table 2*a*, and the explosion noticed in the last paragraph of the report. These accidents may be identified by reference to the *Railroad Gazette* records as follows:

Collision No. 30, Alta Vista, Kan., Jan. 2.
Collision No. 31, Fowler, Ind., Jan. 19.
Derailment No. 1, Williamsbridge, N. Y., Feb. 16.
Derailment No. 18, Colton, Cal., March 28.
Explosion at Sandford, Ind., Jan. 19.

In the cases of the two collisions the Government's report contains some interesting details concerning the causes which were not given in the earlier accounts.

Derailments				
Due to defects of roadway	1[illegible]7	$[illegible]68	23	[illegible]
" defects of equipment	7[illegible]1	[illegible]	[illegible]	[illegible]
" negligence of trainmen [illegible]	[illegible]	[illegible]	3[illegible]	[illegible]
" unforeseen obstruction of [illegible]	[illegible]	1[illegible]2,645	[illegible]	[illegible]
" malicious obstruction of [illegible]	1[illegible]	[illegible]	[illegible]	[illegible]
" miscellaneous causes	11[illegible]	44[illegible]	[illegible]	[illegible]
Total	1[illegible]	$1,70[illegible]	110	1,[illegible]
Total collisions and derailments	[illegible]	$[illegible]110	[illegible]	[illegible]

Following is the usual list of Class A train accidents—all in which the damage is reported at $10,000 or over, notable cases in which passengers are killed, and those doing damage less than $10,000 and down to $2,000, whenever the circumstances or the cause may be of particular interest

TABLE No. 21.—*Causes of Fifty-one Prominent Train Accidents (Class A)*

[NOTE.—R, stands for rear collision, B, butting collision, M, miscellaneous collisions, D, derailment, P, passenger train, F, freight and miscellaneous trains.]

COLLISIONS.

No.	Class.	Kind of train.	Killed.	Injured.	Damage to cars, engines, roadway.	Reference to record	Cause.
1	M	F. & F.	7	20	$800	34	Employees killed and injured in a caboose, being pushed on yard track; butting collision, both trains disregarded yard speed limit.
2	M	P. & F.	0	1	1,250	64	Freight train moving from side track to main track at night struck by following freight. Markers had not been turned from green to red, and brakeman had turned switch without looking at electric indicator connecting with automatic block signal.
3	B.	F. & P.	0	2	3,600	98	Empty engine started from interlocking station on wrong main track; intended to run through crossover and signalman had cleared the signal, but did not throw crossover switch; signal had but one arm, which is cleared for either of the two routes; engineman on duty 17 hours.
4	M	P. & F.	0	1	3,200	67	Switch out of order; signalman gave clear hand signal, assuming, erroneously, that switch had been spiked by repair man.
5	B.	F. & F.	0	7	4,118	19	Illegible train order, order written 3d 73; taken to read 2d 73, operator failed to check order when it was read aloud in his presence; despatcher caused unnecessary confusion by putting two orders in one.
6	B.	P. & F.	0	1	4,582	33	Engineman misread despatcher's order. (See note in text below.)
7	B.	P. & P.	1	18	4,700	23	Engineman misread name of station in despatcher's order; order legibly written; conductor had not properly delivered order to engineman; gave order to brakeman; brakeman gave it to fireman and he to the two enginemen of the two engines.
8	R.	F. & F.	2	2	5,250	16	Engineman ran past 2 automatic block signals set against him.
9	B.	F. & F.	0	0	5,970	5	Despatcher sent order to 2d and 3d No. 50 when it should have been sent to 1st and 2d No. 50. (See note in text below.)
10	B.	P. & F.	1	26	6,262	101	Freight train backing into side track; rear part broke loose and ran back down grade into head of passenger train. Conductor set hand brakes but could not stop cars until too late. Air brakes had been bled because of the bursting of a hose.
11	B.	P. & P.	4	107	7,745	97	Regular eastbound passenger train ran past meeting point.
12	M.	P. & F.	1	42	8,000	4	Misplaced switch. Switch had been opened by man in charge of freight train, intending to enter main track thinking that the passenger train (No. 4) had passed. The train which had passed was No. 2.
13	B.	F. & F.	3	2	8,500	53	Conflicting train orders, 12:30 a. m. Despatcher at fault was 39 years old, experienced in train and telegraph work, but had served only 1 night as despatcher. He forgot an order which had been issued by the other despatcher about an hour before. Had not receipted for this outstanding order.
14	M.	P.	0	6	9,567	29	Misplaced switch at station. Target of switch covered with snow.
15	R.	P. & P.	1	15	10,100	30	Approached station (8 p.m.), not under control; faulty flagging.
16	R.	F. & F.	2	5	11,000	21	Excessive speed, and failure of standing train to flag.
17	R.	P. & P.	0	11	11,025	9	False clear block signal. (See note in text below.)
18	B.	F. & F.	0	3	11,100	88	Eastbound ran past signal at meeting point at 4 miles an hour.
19	B.	P. & F.	0	11	11,170	31	Westbound passenger train disregarded wait order. (See note in text below.)
20	B.	P. & F.	2	12	11,300	63	Westbound extra freight (2 a.m.) neglected to head in at entrance to side track; engineman asleep.
21	R.	P. & F.	6	1	11,900	6	Freight followed passenger train from station (4 a.m.) within 5-minute time limit and ran into passenger train unexpectedly stopped; weather very cold.
22	R.	P. & F.	0	16	12,000	55	Passenger train unexpectedly stopped (3 a.m.) run into at rear by freight. (See note in text below.)
23	M.	P. & F.	5	3	12,100	58	Extra freight entered main track in face of fast train, disregarding automatic indicator at switch. (See note in text below.)
24	B	P. & F.	[illegible]	1[illegible]	1[illegible]	[illegible]	[illegible]
25	M	P. & F.	[illegible]	[illegible]	[illegible]	[illegible]	Freight [illegible] passenger [illegible] main track [illegible]
26	B	F. & F.	1	[illegible]	1[illegible]	[illegible]	Northbound train disregarded meeting order. [illegible] As the [illegible] was on the side track and [illegible] was taken for [illegible] the northbound train passed without stopping
27	M	P. & F.	1	1	18,844	18	Runaway on steep grade; engineman continued using steam too long after passing summit.
28	M	P. & F.	0	3	21,900	66	Passenger train disregarded distant and home automatic block signals, ran into side of freight train. Fireman had called clear signals to engineman without seeing signals; engineman also ignored rule requiring an all right hand signal at this point
29	B.	F. & F.	1	3	27,102	8	Runaway on grade. See note in text below.)
30	B.	F. & P.	32	75	31,100	11	Operator failed to deliver order. (See note in text below.)
31	R.	P. & F.	9	8	48,500	10	Passenger train ran past block signal and freight disregarded time limit. (See note in text below.)
32	M.	P. & F.	0	15	73,625	27	Maliciously misplaced switch, damage largely due to fire.
33	B.	P. & F.	5	11	75,300	1	Misplaced switch. (See note in text below.)
Total......			87	504	$516,843		

DERAILMENTS.

No.	Class.	Kind of train.	Killed.	Injured.	Damage	Reference to record	Cause.
1	D.	P.	19	149	$2,600	79	Unexplained. (See note in text below.)
2	D.	P.	2	15	.....	106	Broken rail.
3	D.	P.	0	12	5,650	77	Derailing switch thrown under train by repairmen testing interlocking apparatus.
4	D.	P.	0	2	6,700	78	Broken rail. One passenger car destroyed by fire which started in oil lamps.
5	D.	P.	3	3	8,747	73	Engineman (who was killed), disregarding slow order, ran into side track at 50 miles an hour. Engineman thought to have been asleep; fireman had spoken to him about excessive speed, but not with the necessary determination and energy.
6	D.	F.	1	0	9,350	76	Open draw.
7	D.	P.	2	49	10,500	121	Maliciously misplaced switch.
8	D.	P.	1	5	11,260	82	Broken rail.
9	D.	P.	6	11	15,119	38	Misplaced switch; occurred 4 a.m., no lamp on switch. (See note in text below.)
10	D.	F.	0	3	16,000	37	Runaway on 3 per cent. grade; negligent management of brakes; hand brakes were in use, power brakes alone being deemed unsatisfactory for so steep a grade.
11	D.	F.	1	1	16,750	117	Roadbed washed out at side by flood in river; engineman is said to have been keeping good lookout and to have thought roadbed intact. Track inspected one hour before and traversed by a train 30 minutes before.
12	D.	F.	0	1	17,055	42	Unexplained.
13	D.	P.	3	35	18,700	47	Unexplained.
14	D.	P.	1	1	21,500	75	Switch out of order; rod maliciously loosened, switch new and in good condition 2 days before. Wreck mostly destroyed by fire, which started from heater in car or train lamps.
15	D.	F.	3	0	22,000	118	Middle pier of bridge gave way as train passed over, undermined by flood believed to have been caused by cloudburst. The dam caused by the wreck divided the stream in such a way as to destroy both abutments.
16	D.	P.	1	23	29,430	69	Unexplained, believed some part of engine broke and fell to the ground, speed, 28 miles an hour.
17	D.	P.	0	14	60,000	81	Brake beam on rear truck of tender fell on track and derailed cars.
18	D.	P.	22	116	28,685	115	Misplaced switch, engineman failed to keep good lookout and approached yard at too high speed. (See note in text below.)
Total....			65	470	$299,846		
Grand total			152	974	$816,689		

Collision No. 30, killing 32 persons and injuring 75, was caused by the mistake of a telegraph operator. Westbound passenger train No. 29, running from A to B, C and D, etc., had orders to meet eastbound passenger train No. 30 at C and eastbound train No. 14 at B. No. 29 train arrived at B and entered a side track opposite the station, and eastbound train No. 14 proceeded on its way. While No. 29 was on the side track, the operator was called upon by the despatcher to take an order changing the meeting point with No. 30, making it B instead of C. According to his own statement, the operator, on receiving notice of this order to make a change, and while continuing to give his attention chiefly to the receiving of the message, went through the motion of striking the signal lever at his elbow so as to change it from the clear to the stop position, but

he did not make sure that the signal actually went to that position; and whatever he did or did not do to the lever, the signal was not caused to indicate stop. Before he had finished taking the message No. 29 backed out of the side track and proceeded westward along the main line past the station.

When the train passed his window the operator picked up his lantern and ran out in the attempt to stop it, though not so promptly as he otherwise would have done, because he thought that the train would stop for water a short distance west of the station, as was often or usually done. In giving the stop signal he swung his lantern so violently that the flame was soon extinguished. He then ran to the pump house near by and picked up the pumpman's lantern and tried to use it, but that also went out. He then ran back to the office and found that his signal was not in the stop position. The operator then decamped, first telling the despatcher that he felt certain that a collision would occur, and that he was afraid of being mobbed. Train No. 29 went on, and a short distance west of the station collided with No. 30. The operator subsequently came back, or was brought back, and made a statement to the county attorney.

According to the rules the despatcher should not issue an order, as, for example, to a westbound train at B, requiring it to wait at B for an eastbound train of the same class, if avoidable. When unavoidable, an order may be thus issued if the superior train (the westbound) has already stopped or is scheduled to stop at that station, or has received a previous order to stop there; and provided the weather is clear and the line is sufficiently straight and level to give an approaching engineman ample time to bring his train to a stop before reaching the signal; and provided further, that in case of a passenger train two torpedoes have been placed on the rail by the operator. As No. 29 was already stopped at B, the despatcher is held by the superintendent blameless so far as this rule is concerned, though the operator, knowing the rule, should either have put down the torpedoes or else have called the conductor into the office before finally accepting the order. The operator had been in the service of the company only five days and at this station only two days (nights). He was 18 years of age, though in applying to the company for employment (and also to another company at the same time) he gave his age as 23 and averred that he had had several years' experience, when, in fact, he had worked as an operator only 18 months. The report says that his size and general appearance indicated a man much older than 18. The collision occurred about 4.25 a.m., and the operator had been on duty about 10 hours. He stated that he had been awake all night, and there is no evidence of anything like intoxication.

Collision No. 31, occurring about 2.14 a.m., killing nine persons and injuring eight, was between an eastbound passenger train and a westbound freight, the freight being at the time partly in a side track, which it was entering. The passenger train ran past a block signal set against it at F, and the collision occurred a few rods east of the signal. The passenger train was running at high speed, although there was a dense fog at the time which made it impossible to see the signal light more than a few hundred feet; and the signal which was disregarded was on a post 40 ft. high and 25 ft. to the left of the track. The engineman chargeable with this neglect was a man of experience and his record was one of the best on the road. He asserted that the block signal indicated clear and that his speed was low—about 25 or 30 miles an hour; but these statements are both disproved by conclusive evidence to the contrary. The men in charge of the freight train are also held blameworthy in connection with this collision, as, notwithstanding the protection afforded to their movement by the block signal at F, the rule required that freights should in all cases be clear of the main track five minutes before the time for the arrival of any passenger train.

Collision No. 6, occurring about 2 a.m., was due to the engineman of a freight train misreading a despatcher's order. He was running in the inferior direction and received an order making his train superior from A to C. Subsequently he received another order modifying this. This second order contained instructions concerning five meeting or waiting points and mentioned two trains besides his own. It contained four complete sentences. The engineman, in reading, ran the second and third sentences together and wrongfully assumed that two superior trains were to wait for him at a certain station, when the order in fact named only one of those trains as being required thus to wait. This second order was not delivered to the conductor of the train. It was on Form 19, not requiring signatures, and was delivered by the operator to a man on the engine of the train as it slowly passed his station, but it was not delivered to the conductor, who was on the rear end of the train, because neither the conductor nor the rear brakeman was in position on the step of the caboose to receive the order as the station was passed. The engineman, though having received his copy of the order, should not have continued on his journey beyond that station without a hand signal from the conductor to proceed. This he did not receive, the conductor and rear brakeman having ignored the stop signal.

Collision No. 9 was due to the error of a despatcher in sending an order to the wrong train. He sent the order to station A and to station D, giving an extra westbound train right over the first and second sections of an eastbound regular train from A to D, but in sending the order to D he addressed it to the conductor and engineman of the second and third sections of the regular train. The first section had already left D and the despatcher was aware of the fact. He seems to have assumed that the address of the order as sent to D corresponded with the statement in the body of the order, when in fact it did not correspond. The station operator who received the order at D did not discover the discrepancy, nor was it noticed by the operator at A.

Collision No. 17, occurring in the middle of the night, took place on a line worked by manual block signals, communication from cabin to cabin being by bell code. The signalman at A, 45 years old, and in the service of this company eight months as signalman (and formerly as brakeman), appears to have given a clear signal to the second train when he was not certain of the information he had received from station B. He claims to have received "four bells," meaning "block clear," but the signalman at B claims that he sent five bells, meaning block not clear. The signalman at A appears to have been in doubt concerning the bell signal and yet he did not ask B to repeat it. Both signalmen are reported as of good habits and good records. A large part of the damage incident to this accident was caused by a fire which was started by coals from the firebox of the locomotive.

Collision No. 19 was due to negligence on the part of both the conductor and the engineman of a passenger train. They had received an order to wait at S until 8.45 a.m., but passed that station at about 8.38, although the order had been given to them only about 13 minutes before. The conductor entirely forgot the order and he was dismissed. The engineman had misread the order and thought that he had a right to go to another station farther on. As he was passing S the fireman looked at his watch and spoke to the engineman; but the engineman, in response to this, simply pulled the order out of his pocket and handed it to the fireman without looking at it, evidently having no doubt that his reading of the order had been correct. Before the fireman had time to finish reading the order the collision occurred. Both the conductor and engineman were men of long experience. They had been on duty about three hours.

Collision No. 22 was due to the inefficiency of the flagman of a passenger train. This flagman, 24 years of age, who had been in the service about three months, started out to flag the following train, but took neither torpedoes nor fusees. After going a short distance he returned to his train to get his overcoat, and before he could again go out a sufficient distance for his signal to be of any use the following train was upon him.

Collision No. 23, between a fast first class train and a switching freight, was due to the carelessness of a brakeman of the freight train, who turned the switch from the main track to a siding without heeding the indication of the electric visual signal, which would have warned him that the fast train was approaching. The line at this point is equipped with automatic track-circuit block signals, and the fast train had already passed the point at which it set the switch indicator when the switch was turned. This train occupied only about 1 minute and 36 seconds in running from the signal at the entrance of the block section to the misplaced switch, and when it came on, at full speed, the freight had just fouled the main track. The brakeman at fault had been in the service of the road about 14 months. The enginemen had told him particularly to look at the indicator before turning the switch. It is possible that he looked at the indicator, but allowed considerable time to elapse after looking before turning the switch, the fast train meantime passing the block signal showing clear. Another collision in this quarter (No. 2 in the table) was due to the neglect of a trainman to make proper use of an automatic indicator at a switch.

Collision No. 25 was due to inefficient management of brakes. The freight train, westbound, running slowly along a passing track while waiting for a passenger train moving in the same direction, was allowed to run a few feet too far at the end of the passing track and so fouled the main line. The passenger train, coming along just at that moment at full speed, struck the freight, and the passenger engine was overturned. The freight train consisted of 23 cars, but had air-brakes in use on only four cars. The engineman asserted that he was ignorant of the fact that the other 19 cars had been disconnected. At a station about four miles back a non-air car had been put in the fore part of the train with the view of saving time at the next station, where that car was to be left. One of the brakemen claimed to have informed the engineman about the change in braking power.

Collision No. 29 was due to a freight train becoming uncontrollable on a steep grade about 2 a.m. The men in charge of the train were experienced, but appear to have exercised poor judgment. It is believed, though not proved, that an angle cock had been shut at the third car from the engine, so that the air-brakes were not effective on that part of the train behind the third car, and

for this misplacement of the track the conductor and engineman are held responsible. Aside from this, however, these men had allowed the train to attain too high speed before taking action to check the speed, and in addition to this the brakeman at the rear of the train, who should have opened the conductor's brake valve when the engineman sounded the alarm whistle, neglected to do so.

Collision No. 33 was due to a misplaced switch and occurred about 9 p.m. A northbound passenger train running at full speed, entered a siding and struck a southbound freight train which was standing there. Both engines were demolished and from their fireboxes the wreck took fire, three Pullman cars and 11 freight cars being completely destroyed. The switch had been left wrong by an employee of another road, the side track being used in common by the two roads as a connecting track.

Derailment No. 1, killing 19 persons and injuring 149, is reported as "cause unknown," the railroad company stating that its investigation into the circumstances of the accident has not yet been completed. The train derailed consisted of five passenger cars, drawn by two electric motors. It was running at full speed on a curve of 3 deg., the outer rail of which was superelevated 4½ in. Two cars were overturned. The track consisted of rails weighing 100 lbs. to the yard, laid on 21 ties to each 33 ft., with tie plates. The ballast was stone and the whole track was well built and maintained. In the cab of the leading motor were four men, the engineman, his helper, an electrical inspector, and the assistant superintendent of the division. These men estimate the speed of the train at the time of the derailment at 45 to 50 miles an hour, which estimate is corroborated by the record at the last block signal station, compared with that at the power house, where note of the time was made when power was automatically shut off by the breaking of the third-rail electrical conductor at the moment when the cars jumped the track. The report of the railroad company further says that in making a test run some time after the accident, with a train made up like that which was wrecked and with all conditions similar, the speed proved to be 48 miles an hour at the point of the accident. A careful examination was made of the track and wreckage immediately after the derailment, but although indentations were found on wheels and rails, it was impossible to determine whether these marks had anything to do with the cause of the derailment, or were only effects.

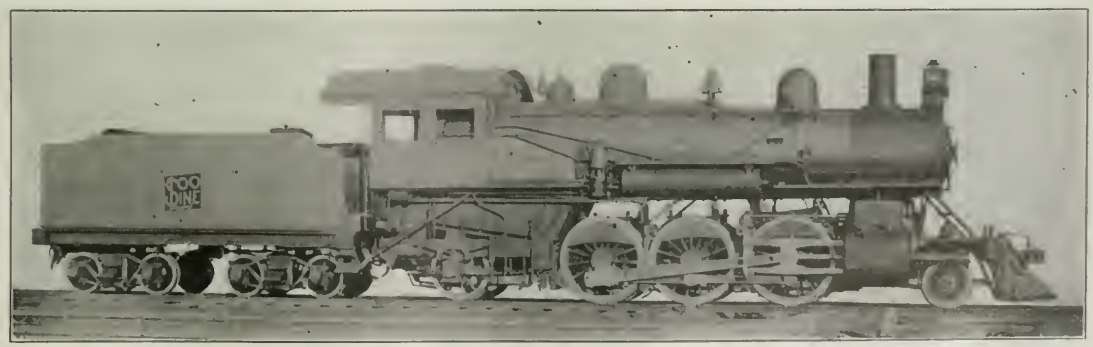
Derailment No. 18 appears to have resulted from gross negligence on the part of a number of different persons. A passenger train approaching an important station at high speed was derailed at a misplaced switch. The train was run not only in disregard of a rule requiring trains to be run within the yard limits with speed under control, but also apparently with recklessness as regards the switch which was misplaced and which caused the derailment; for it appears that the air-brakes on the train which, according to all the available evidence, were in good order, had not been applied before the engine ran off the track. The engineman was fatally injured, dying 11 days after the accident, and he made no intelligible statement. The train consisted of an engine and 14 cars. Six of these cars were completely broken up, and three others were badly wrecked. Most of the passengers who were killed were riding in two ordinary cars, not vestibuled, which were the first two cars in the train, while the cars behind these were not only heavier but were, most of them, vestibuled. The train, running at from 50 to 65 miles an hour, ran over the misplaced switch and entered the side track at such high speed that the engine was overturned at a point a few feet beyond the point where it left the main track. This switch was 1,585 ft. within the yard limit. There was a good view of the switch from the approaching train. The engineman of the passenger train was an experienced employee of this road, but the men in charge of the switching engine, who had left the switch set in the wrong position and abandoned, were comparatively new to their work. The foreman of the crew had been employed at this point only four weeks, though he had had railroad experience before. The switchman who was immediately responsible had worked in the yard about six weeks, but had had several years' experience in railroad work. The engineman and fireman of the switching engine had worked in the yard only three days.

Derailment No. 9, occurring about 4 a.m. and causing the death of four passengers and of the engineman and fireman, happened at a misplaced facing-point switch, the speed of the train at the time being about 35 miles an hour. The switch was found locked in position for the side track. It had been used by a freight train about 40 minutes before, but the question who was blameworthy for the misplacement has not been settled. The switch had no lamp, being a new one. The lamp had been received for it, and it was to have been put in position the next day. The engine was equipped with an electric headlight, by the aid of which the engineman could undoubtedly have seen the position of the switch target in season to stop the train before reaching the switch, but from the position in which the dead body of the engineman was found after the derailment it is concluded that he was not keeping a good lookout. There is evidence that he had crouched down behind the boiler head to light a cigar.

Explosion.—One of the most serious train accidents occurring in the quarter under review was due to an explosion. It is not classed either as a collision or a derailment, and therefore does not appear in Table 2*a*. In this accident 14 passengers and two other persons were killed and 33 passengers and six other persons were injured. The victims were on a passenger train approaching a small station, at low speed, and the deaths and injuries were due to an explosion of powder in a car of a freight train standing on a side track. The explosion, from some cause unknown, occurred just at the moment that the express car of the passenger train passed the powder car. The passenger cars were wrecked and the total amount of damage to the cars and locomotive was $11,300. The freight car in question contained 500 kegs of powder. It was stationary at the time and had been so for at least 12 minutes. There had been heavy continuous rains for several hours previous. The car containing the powder was comparatively new. After an exhaustive investigation by officers of the road the cause of the explosion still remained a mystery.

Prairie Locomotive for the Minneapolis, St. Paul & Sault Ste. Marie.

The American Locomotive Company has recently built 10 two-cylinder compound prairie (2-6-2) locomotives for the Minneapolis, St. Paul & Sault Ste. Marie. For a number of years the two-cylinder cross compound locomotive has been successfully used in both freight and passenger service on this road; but, heretofore, the fast freight work has been done by moguls. These are the first prairie engines that have been put in service. The reason for this change was that as it was desired to use them for both freight and passenger work, the prairie, with its wide firebox, offered a better opportunity to get a large grate and the necessary ample steaming capacity for passenger service, than the mogul.



Prairie Locomotive Built by the American Locomotive Company for the Minneapolis, St. Paul & Sault Ste. Marie.

In working order the engines have a total weight of 191,500 lbs., of which 133,000 lbs., or 69½ per cent., is carried on the driving wheels. The engines are compounded on the Schenectady principle, the high-pressure cylinders being 22½ in. in diameter by 26 in. in stroke and the low-pressure 35 in. in diameter by the same stroke. This gives a cylinder ratio of 2.42. The high-pressure cylinder is equipped with a piston valve and the low-pressure with an

Allen-Richardson slide valve, the valves being actuated by the Stephenson link motion.

The boiler is of the extended wagon top type with sloping back head and throat sheet, and is made in three courses, the outside diameter of the first and smallest ring being 60¼ in. The tubes, of which there are 266, are 2 in. in diameter and 15 ft. long, which gives a heating surface of 2,077 sq. ft., the total heating surface of the boiler being 2,243 sq. ft.

These locomotives, like so many others, show the wide variation in practice in the location of the injector check. The photograph shows that it is set well to the front. As a matter of fact, its center line is just 10 in. from the inside face of the front tube-sheet. As the hole is 2½ in. in diameter the edge of the stream of entering water is only 8¾ in. from the plate. This is quite contrary to the practice on other roads. A comparative determination of effects of different locations on tubes and steaming capacity would be interesting. The firebox is 90 in. long and 62¼ in. wide, giving a grate area of 39 sq. ft. The water spaces are large, being 5 in. wide at the mud-ring and increased to 7 in. at the crown-sheet at the sides and to 6 in. at the back end.

There is here a further variation in practice in the use of flexible stays. By comparing this boiler with others that have been made recently by the same company it will be found that one boiler with a length of 108 in., had a double row of flexible stays up each side and across the top, with clusters in the upper corners. The fireboxes in these prairie engines have a grate length of 90 in. and a length at the door of about 103 in. Yet here no flexible bolts are used at all. It is quite true that this corresponds with older practice, but the question arises why one firebox should need four vertical and two horizontal rows of these bolts and another, only 5 in. shorter, should need none at all. It does not seem that the difference can be wholly either in the difference in the length or the degree of forcing to which the fire is subjected. Possibly the matter is worthy a more thorough investigation than it has yet received. The frames are of cast-steel with double front rails and a separate slabbed section at the rear for the trailing trucks.

In the matter of weight equalization a departure has been made from the ordinary practice in equalizing the front and main driving wheels with the front truck and the rear drivers with the trailing truck, instead of equalizing the two rear drivers and the trailing truck together as is usual in this type.

The following are some of the principal dimensions and ratios of these engines:

Cylinders, diameter h. p.	22½ in.
Cylinder, diameter l. p.	35 "
Piston, stroke	26 "
Wheel base, driving	11 ft. 4 "
" " total engine	29 " 3 "
" " engine and tender	56 " 6½ "
Weight in working order, drivers	133,000 lbs.
" " " total engine	191,500 "
" " " engine and tender	309,100 "
Heating surface, tubes	2,077.6 sq. ft.
" " firebox	165.9 "
" " total	2,243.5 "
Grate area	38.9 "
Journals, main driving	9½ in. x 12 in.
" trailing driving	9 " x 12 "
" front truck	6 " x 12 "
" trailing truck	8 " x 14 "
" tender	5½ " x 10 "
Steam pressure	200 lbs.
Firebox, length	90⅛ in.
" width	62½ "
" thickness crown, side and back sheets	⅜ in.
" tubesheet	½ in.
" water space	5 in.
Tubes, number	266
" diameter	2 in.
" length	15 ft.
" thickness	No. 11
Exhaust nozzle	5 in. and 5¼ in.
Stack, height above rail	14 ft. 9⅝ "
Stack, diameter	18 "
Tank capacity, water	6,000 gals.
Tank capacity, coal	10 tons
Valve, type, h. p.	Piston
" type, l. p.	Allen-Richardson
" travel	6 in.
" lap, h. p.	1¼ "
" lap, l. p.	1 "
" exhaust clearance	¼ in.
" lead	0
" lead at ⅛ cut off, l. p. cylinder	¼ in.
Wheels, diameter, driving	63 in.
" front truck	33 "
" trailing truck	46 "
" tender	33 "
Tractive effort	26,750 lbs.

$\frac{\text{Weight on drivers}}{\text{Tractive effort}}$	= 5.0
$\frac{\text{Weight on drivers}}{\text{Total weight}}$	= 69.15*
$\frac{\text{Total weight}}{\text{Tractive effort}}$	= 7.2
$\frac{\text{Tractive effort x diameter of drivers}}{\text{Heating surface}}$	= 757.0
$\frac{\text{Heating surface}}{\text{Grate area}}$	= 57.5
$\frac{\text{Firebox heating surface}}{\text{Total heating surface}}$	= 7.3*
$\frac{\text{Weight on drivers}}{\text{Heating surface}}$	= 59.3
$\frac{\text{Total weight}}{\text{Heating surface}}$	= 85.5

Volume of equivalent simple cylinders = 8.99 cu. ft.

$\frac{\text{Total heating surface}}{\text{Vol. of equivalent simple cylinders}}$	= 250.0
$\frac{\text{Grate area}}{\text{Vol. of equivalent simple cylinders}}$	= 4.34

Tube heating surface equated to firebox heating surface (Vaughan's formula)	536.8 sq. ft.
Total equated firebox heating surface	702.7 "
Ratio of equated to actual heating surface	1 to 3.19
Ratio, volume of high to low-pressure cylinder	1 to 2.42

*Per cent.

The Maximus Brake.

The accompanying drawing shows the construction of an ingenious accessory mechanism applied to the foundation brake gear of a car to automatically produce a pressure on the brake shoe inversely proportional to the varying coefficient of friction at different speeds and thus to give a uniform retarding effect throughout the stop. The apparatus is an English invention and has been developed in connection with both the vacuum brake and the Westinghouse brake. Referring to the drawing, Fig. 1, which shows the application of the apparatus to one end of a four-wheel truck, it will be seen that the right-hand brake shoe is suspended by a rigid hanger in the ordinary manner. The left-hand shoe, however, is suspended by a link from a bell crank rigidly attached to a square shaft which extends across the end of the truck outside of the end piece. To this square shaft are also rigidly fastened two short lever arms which have pins at their ends working in circular slots in the casting bolted to the end piece and shown partly in section. This casting forms a seat for the spiral spring, the stem of which is also attached to the square shaft. The tension in this spring can be adjusted by the double nuts on the outer end of the stem. Below the spring is shown a ratchet slide which engages with a toothed pawl which is pivoted and which is normally disengaged by the pressure of the square shaft against the vertical leg. Power is transmitted from the brake cylinder through the pull rod shown at the top to the truck lever which is supported by the fixed hanger shown just to the left of the axle. This truck lever carries a roller which works in a V-shaped cam slot in the connecting yoke attached to the left-hand brake shoe and passing under the axle. The right-hand brake shoe is connected with the truck lever by a short link passing over the axle. When the brakes are applied the truck lever is pulled to the left by the pull rod in the usual way and draws the two brake shoes up tight against the circumference of the wheel. As soon as the friction is sufficiently great to cause the left-hand brake shoe, which is hung from the bell crank, to stick and begin to move down, the square shaft moves to the right against the spring pressure, pivoting about the end of the short lever arm extending downwardly. The initial tangential retarding effect at the brake shoe is thus made a constant quantity depending on the tension on the spring. At the high speeds when the coefficient of friction is low the pressure exerted by the truck lever is made correspondingly high. At the instant that the brake shoe begins to drag and to move the square shaft to the right against the spring pressure the toothed pawl is released and engages with the ratchet slide. This slide is connected back to the cylinder lever by a rod, and when it engages with the pawl all further movement of the cylinder lever and, therefore, any further increase in pressure at the brake shoe through the truck lever is arrested. In making a stop at high speed the brakes are applied with the maximum force which continues to be exerted until the tangential pull on the brake shoe releases the stop pawl and checks any further increase in braking power. As the speed falls, due to the retarding action of the brakes, the coefficient of friction increases. This causes the left-hand brake shoe to tend to drag farther and farther downward. As it moves downward the roller on the truck lever goes up in the slot of the connecting yoke and in effect opens out the toggle joint connection between the two brake shoes, thereby relieving automatically the pressure on the shoes without altering the pull at the upper end of the truck lever. If the car is moving in the opposite direction the movement of the apparatus is in the reverse direction to that described. The left-hand brake shoe moves up instead of down and the bell crank pivots about the end of the upper short lever arm. The yoke rises instead of falling and the roller on the truck lever moves downward in the cam slot, accomplishing exactly the same effect. The drawing shows the arrangement

of the apparatus at one end of the truck only. The locking mechanism however is applied only at the end of the truck nearest the center of the car. The brake shoes on the other pair of wheels on the truck are suspended from two links but are connected together with the same arrangement of brake levers. Their action

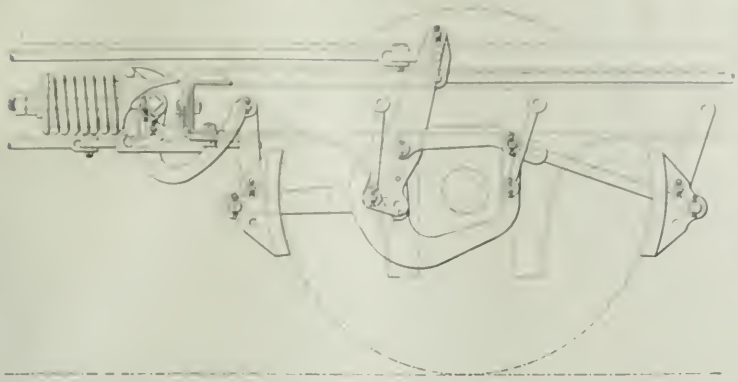


Fig. 1—Maximus Brake Apparatus Applied to Four-Wheel Truck.

under the constantly increasing coefficient of friction as the speed is reduced is precisely the same as that already described.

Figure 2 shows the apparatus as applied to a four-wheel truck on the North Eastern Railway of England. The square shaft extends across the end of the truck and the bell crank hangers with the regulating springs are mounted at each end of the truck end piece directly in line with the wheel treads. The ratchet and pawl are in the center line of the car, the connecting rod extending back to the brake cylinder levers.

The value of this apparatus is chiefly in making stops from high speed. With the ordinary brake apparatus the pressure on the brake shoe is constant, being limited to about 80 or 90 per cent. of the weight on the wheel in order to prevent skidding at the end of the stop. At very high speeds the coefficient of friction is less than one-third the coefficient of friction at low speeds and consequently an arrangement of brake apparatus employing a constant braking pressure from the beginning to the end of the stop has an efficiency when first applied of not more than 26 per cent., at medium speeds 52 per cent. and near the end of the stop 80 per cent., or an average of but little over 50 per cent. With the Maximus brake the initial braking power is increased to 160 per cent. or more of the weight of the car either by changing the foundation brake leverage or by increasing the size or pressure in the brake cylinders. This braking power is effective at the beginning of the application, but it is gradually and automatically eased off in the manner described to 80 or 90 per cent. of the load as the train comes to a stop, giving an average

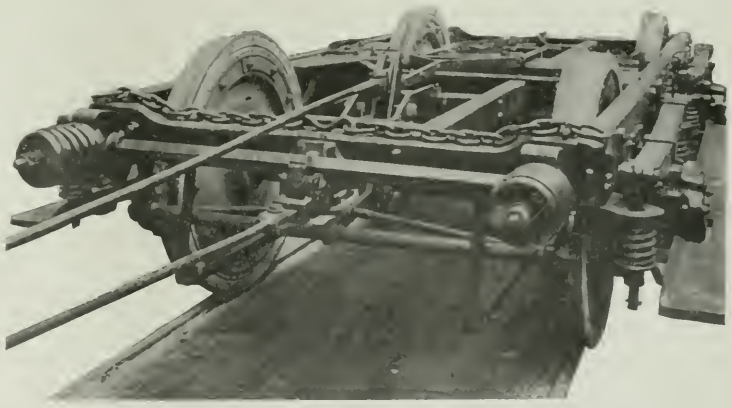


Fig. 2—Application of Maximus Brake to North Eastern Railway Four-Wheel Truck.

diagram shown in Fig. 3. These tests were made on a strip of straight track between York and Pilmoor during January and February, 1906. The stops shown for the ordinary brake were made by slipping one six-wheel coach braked on the four end wheels only to 62 per cent. mathematically of its weight. The same coach was then taken into the shop and fitted with the Maximus brake apparatus with the same percentage of weight braked. The tests were then repeated under the same conditions, both tests being made on days which were clear and dry. The highest initial speed

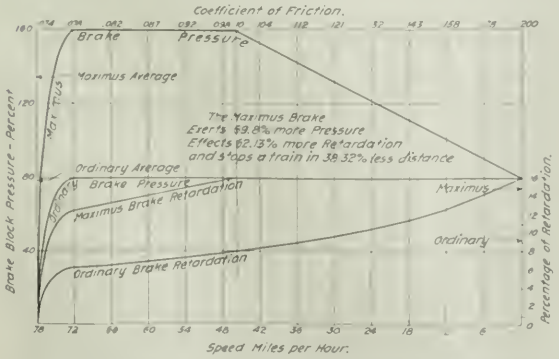


Fig. 3—Comparative Pressure and Retardation of Maximus and Ordinary Brakes.

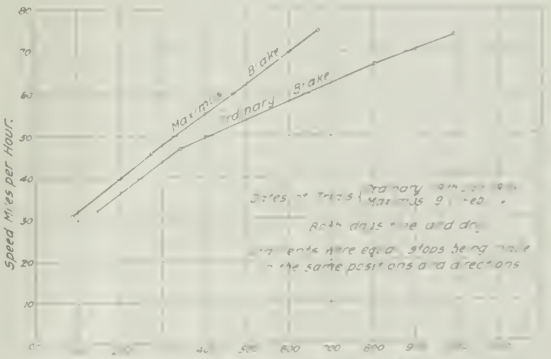


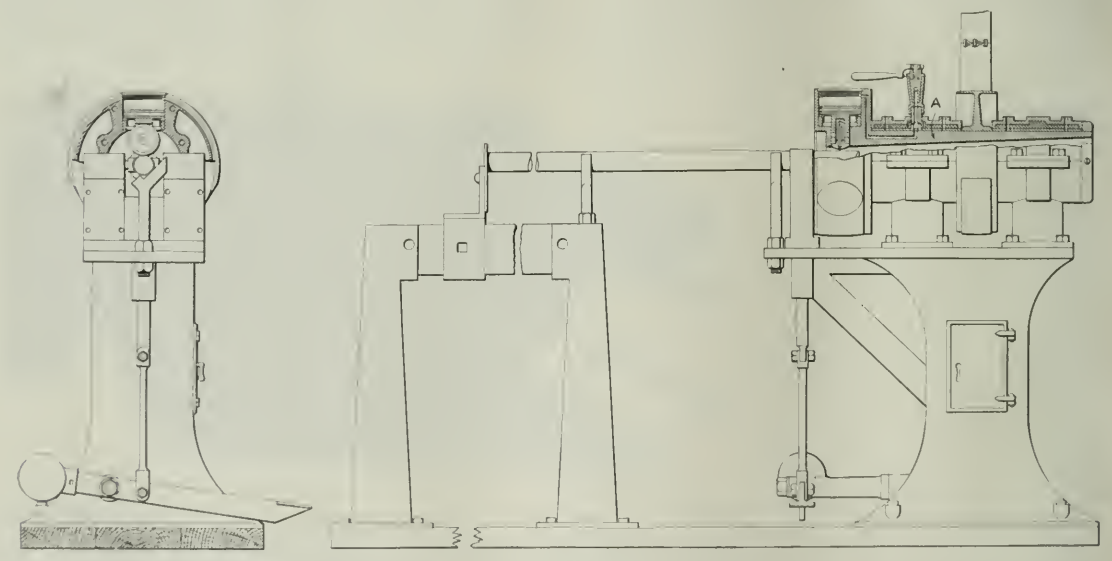
Fig. 4—Diagram of Brake Trials on the North Eastern Railway.

attained was 74 miles an hour with the ordinary brake and 75 miles an hour with the Maximus brake. With the Maximus brake the car was stopped from 75 m.p.h. in 2,010 ft. The coach, fitted with the ordinary brake, was stopped at 74 miles an hour in 2,970 ft. Equating the two steps for equivalent speeds the saving was 34 per cent. At 60 miles an hour the saving was 26.5 per cent. More recent tests have shown even greater saving in distance in making stops.

The action of the brake being entirely automatic the engineman does not need to be careful in making emergency or service applications. Full braking power can be thrown on at either high or low speed without danger of skidding the wheels or making uncomfortable stops. The action of the brake is said to be very smooth and uniform at both high speeds and low speeds. So successful have the trials been in England that the Great Western has already bought the rights to apply the apparatus to all of its passenger stock. It is controlled by the Maximus Brake Syndicate, Limited. Queen Anne's Chambers, Westminster, London. The licensees for Great Britain are Taite & Carlton, 63 Victoria street, London. Harvey E. Brown, Managing Director of the Maximus Brake Syndicate, with headquarters at the Southern Hotel, St. Louis, Mo., is introducing the device in the United States.

Pneumatic Tube and Pipe Cutter.

A pneumatic tube and pipe cutter designed by S. H. Lewis, assistant general foreman, is in use at the shops of the Seaboard Air Line at Portsmouth, Va. It can be easily operated by one man. With an air pressure of 50 lbs. per sq. in. it can cut three 2-in. locomotive tubes per minute, including the handling. If the air pressure is increased, the capacity increases also. Furthermore, the cutter is very economical in air consumption.



Pneumatic Tube and Pipe Cutter; Seaboard Air Line Shops.

The machine consists of a sleeve A turning in long bearings and driven by a pulley keyed near its center. At the end of the sleeve is an enlargement containing three cylinders to which pistons are fitted. These cylinders stand on radial lines and the pistons have roller cutters attached. There are ports through the sleeve as shown that lead to the outer end of the cylinders, through which air is admitted by means of the three way cock. Stops for the tube and Y supports are provided beyond the end of the machine and the tube is firmly clamped in position by pressure on a pedal.

After the machine is started the tube is placed in position to be cut, resting on the supports and shoved back against the stop. It is clamped by the pedal and the handle of the three-way cock is turned to admit air to the outer ends of the cylinders. This forces the pistons in and the cutters against the tube. As the circular head revolves the cutters roll around the tube and are forced in and cut off the piece in a few revolutions.

The piece cut off passes out at the back end through the hollow tapered spindle. When the tube is cut, the air valve is moved to exhaust and the cutters open by centrifugal force to receive another tube. As the tube is clamped by the pedal it can be fixed and released instantly without loss of time, and as the tube does not revolve, the machine is practically noiseless. In addition to these advantages the boiler maker does not have to mark each tube where it is to be cut, as the length is fixed by the adjustment of the stop. This is of value in cutting new tubes into safe ends, as the work of handling the tubes is materially lessened.

The cutters are of steel ⅛ in. thick and 3 in. in diameter; they are cheap, and their life is long. One set of cutters in the Seaboard Air Line shops has been in service for four months and has made 24,000 cuts without grinding on 2-in. tubes, approximately ⅛ in. thick.

Previous to building this machine the number of engines that could be turned out of the shop was dependent on the tube work; but since its installation the amount of tube work to be done is not considered in deciding upon the number of engines to be turned out. At the present time, with an output of six engines that are receiving a general overhauling per week, and notwithstanding the fact that other facilities have been greatly increased, the one tube cutter in service is idle a large part of the time.

An American State Owned Railroad.*

Instances of government ownership and operation of railroads have been rare in America. The Western & Atlantic Railroad furnishes perhaps the most important example in our history. That road was begun under a legislative act of 1836, built with public funds, and operated by the state government during periods of prosperity and depression, of peace, war and political reconstruction until 1870, when it was finally leased to a private corporation.

In 1826, Wilson Lumpkin, afterwards Governor of Georgia, made a survey through central Georgia and the Cherokee territory to the northwestward and reported that a route could there be had for a railroad. At this time steam locomotion was hardly contemplated for railroads in America, and Lumpkin proposed that the motive power should be furnished by teams of mules.

The idea upon which Lumpkin had acted in his survey was never abandoned. The revised charter of 1835 of the Georgia Railroad recites in its preamble: "The people of the West have in contemplation to make a communication between the city of Cincinnati and the South Atlantic coast by means of a railroad, and the best route for such communication is believed to be through the state of Georgia. The building of the Georgia Railroad is now in progress and will be an important link in the line of said communication." Among the projects was one for the state of Georgia to build a large part of the desired communication as a distinctly public enterprise. The legislature which met in December, 1836, passed a law which directed the survey and construction of a railroad from a point near Rossville to some eligible point on the southeastern bank of the Chattahoochee river, and provided funds not to exceed $350,000 a year, unless a future legislature should otherwise enact. The road was named the Western & Atlantic. A year later an increased provision of funds was made by authorizing the sale of state bonds

*Abstract of an article in the *Yale Review* by Ulrich B. Phillips, of the University of Wisconsin.

in amounts not more than $200,000 in any one year. By an act of 1838 an appropriation of $1,500,000 in 20-year 6 per cent state bonds supplemented and superseded the earlier provision.

Under the Act of 1836 the survey for the Western & Atlantic was pushed rapidly forward and by the end of 1837 specifications for the first 50 miles of the road were ready. In April the contracts for the grading of 50 miles were let and in October 50 miles more. By February, 1839, the contractors were working about 2,000 men on the road, and fair promise was given for the completion of the first 100 miles by the autumn of that year. In some sections, however, cuts and fills were exceedingly heavy, and some cuts which ran through rock formations were necessarily slow and expensive.

But financial troubles now came in a flood. The contractors on the road were informed of the state of finances and authorized to suspend work or carry it on with the prospect of delayed payment as they should see fit. In the dearth of other opportunities for their labor in the stagnation of business most of the contractors were disposed to complete the work on their sections, and even to secure additional contracts on the northern end of the line, and proposed to accept payment in the unsalable scrip of the state. The contracts for grading the remainder of the route were let at the end of 1839, with the one important exception of the section which was to include a tunnel a quarter of a mile long—the only tunnel on the route. The continued strain on credit, however, caused such severe decline in the market rates for state scrip, that most of the contractors, by the spring of 1842, suspended work.

The delay in the progress of the road, it happened, was not a cause of general regret. The depression of credit, each month more severe, had forced the stoppage of work on all the roads which were expected to connect with either end of the Western & Atlantic. The importance of that road lay in its becoming a connecting link of a general system. It would be of no use to forge the link until the chain was approaching readiness. Furthermore, neither of the railroads from the ocean gateways had reached within 60 miles of the beginning of the Western & Atlantic, and it would be an extravagance to haul rails and rolling stock over the wretched country roads to the isolated state railroad, which, if built, would begin on a vacant hill-top and run through ravines and forests to no terminus of consequence. The completion of the roadbed, without the laying of the superstructure, would entail a loss through the washing of the soil in the cuts and fills. The continued depression of state credit, meanwhile, made it inexpedient to attempt to buy rails.

The commission advised, in February, 1841, that the lower 52 miles of the route alone be prepared for the superstructure, and work on the northern part of the route be neglected; that as soon as one of the railroads from Macon or Augusta should reach the connecting point, the superstructure should be laid on the 52 miles and the road be put in operation for that distance; that meanwhile, the state should give financial aid to the company roads and enable them to make the Western & Atlantic connection. The state government approved most of these items and an act of December, 1841, dissolved the commission, replacing it with a disbursing agent, ordered the completion of the road for 52 miles when it should become feasible, and the suspension of work on the upper part of the route. The laying of rails for the 52 miles was in progress from 1843 to 1845; and thereafter, under an act of 1842, the road was gradually extended through the application of the net earnings from its operation. Active work was resumed under an act of 1847, and the road was completed to Chattanooga, May, 1851. Meanwhile, after 1845, times were growing much better; cotton prices rose again to satisfactory levels, business in general revived, and state scrip could be sold at par. An act of 1847 ordered the completion of the road, providing $375,000 in state bonds as the limit for the work.

The prospect for profitable traffic became much brighter. In 1845 and 1846 lines from Augusta and Savannah had reached the Western & Atlantic terminus. During 1848 the Nashville & Chattanooga Railroad was organized and put under contract. The branch from the main stem of the Western & Atlantic at Kingston was soon afterwards completed to Rome, and, aided by a steamboat on the river, attracted trade from the valley of the Coosa in Alabama. At the same time building of the Etowah flouring mills on the line of the road stimulated the production of wheat to an unprecedented extent.

With the piercing of Tunnel Hill, October 30, 1849, the completion of the road became easy. The last rails were laid in the spring of 1851. In May of that year the first train ran to Chattanooga. The road was 138 miles long and graded through much of its length for a double track, though equipped with only a single one, of 5 ft. gage. It crossed three river valleys and the dividing watersheds. Its track was a patchwork of strap rails and flange rails laid on wooden stringers, and "bridge rails," of the shape of an inverted U, spiked directly to the cross ties. Its rolling stock consisted of 13 engines, four passenger cars, two baggage cars, four box cars and six platform cars. The epoch of operation and its problems had begun.

In 1852 Governor Cobb secured as Superintendent William Wadley, who had [illegible] as Superintendent of the Central of Georgia. W[illegible] was at once felt with [illegible]. During the spring and [illegible] were [illegible] the substitution of T rail for the [illegible] and the rolling stock was rapidly increased. The [illegible] of the road advanced from less than $[illegible] and $[illegible] in 1851 to $77,170 in 1852 [illegible] $176,[illegible] in 185[illegible]. S[illegible] of these amounts as exceeded the expenses of operation were applied to betterments and charged to account of construction.

Wadley was succeeded in January, 1853, as Superintendent of the Western & Atlantic by George Yonge, and he in 1854 by Thomas F. Cooper. The position was later held by James M. Spullock from the summer of 1855 until the end of 1857, when the accession of Joseph E. Brown to the Governorship and his appointment of John W. Lewis brought a distinctly new régime in Western & Atlantic affairs. Until the business-like administration of Brown and Lewis began, the commonwealth had continually felt that it had a white elephant on its hands. The people were anxious lest the road and its money should become the instrument of political tyranny and corruption, but feared, on the other hand, that a still greater power would be established for possible evil if the road were sold or leased to a private corporation. The *Federal Union* in an editorial January 31, 1851, which in its dread of corporation control has a very modern tone, spoke as follows:

"The road has never yet had a fair trial. within the last two years large improvements have been made on some parts of it, and great additions to its equipment; several branch roads have also been built which will add greatly to the business of the main trunk; and now, just as the proudest hopes of the friends of the road are about to be realized, it is proposed to turn over this great work with all its splendid prospects to a company of speculators. But the pecuniary loss would not be all that the people would suffer by this transaction. A large corporation, like a mighty Colossus, with one foot at Savannah and the other at Chattanooga, will bestride the state, whilst its iron fingers will be felt in every election and will direct the future legislation of the state. No matter what guards and checks this legislature may throw around such a corporation, when they once get control of such immense resources they will elect a legislature to suit themselves and will break all these bands like cobwebs. We are willing to entrust the management of the road to the people, whether the Whigs or Democrats are in power, for we believe that the large majority of both parties are honest men and their agents are always responsible to the people for their conduct, but a gigantic corporation has neither soul nor conscience and owes no responsibility to any tribunal whether in heaven or on earth. The influence of corporations is already felt in every fibre of our legislation; it can be seen in every vote that is taken on this subject, and if ever these corporations get control of the State road, they will govern the state."

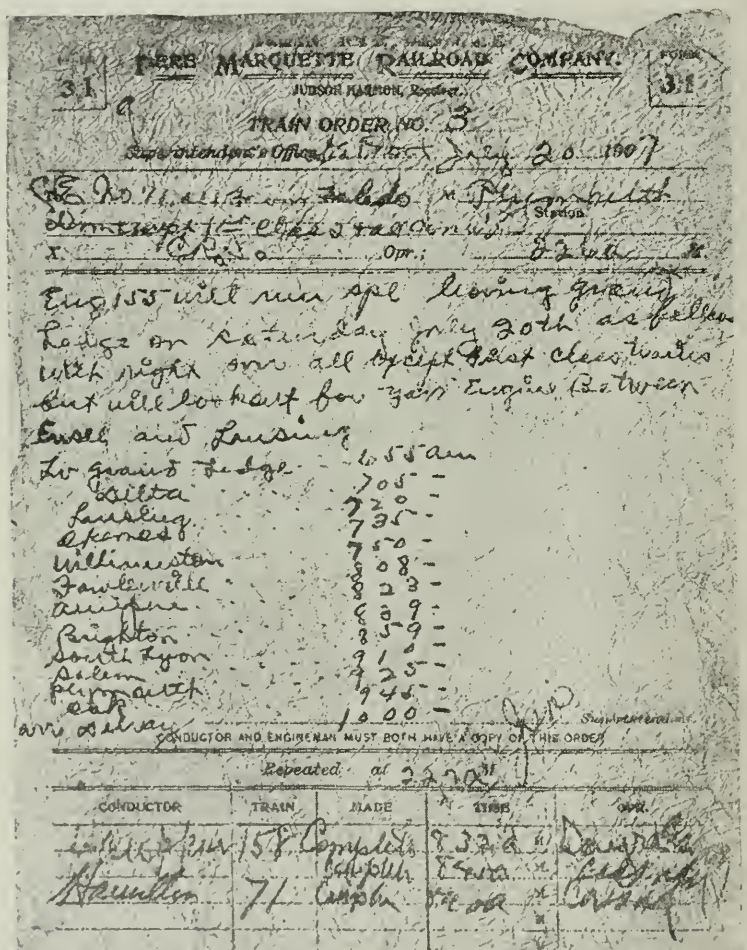
A vital problem was that of freight rates. Here the crux was in the question of whose interests the state road ought primarily to subserve. Ought rates to be high for the sake of large returns to the treasury, or low to benefit the citizens who were consumers of western produce? Ought local tariffs to be on the lowest basis, so as to increase the prosperity along the route of the road in Georgia, or ought the through rates to be at the minimum so as to attract business from afar and cheapen the food supply throughout the cotton belt? Ought the rates on goods for transfer to the connecting lines in Georgia to be on a reduced basis for the benefit of the established towns like Macon and Augusta, or ought the tariff to be absolutely uniform and thus promote the growth of a distributing center of food supplies for the cotton belt at the Western & Atlantic terminus? The actual policy as to freight rates was based on a few substantial principles: the road ought to yield a reasonable return on the investment; it ought to promote the welfare of the people of the state at large; it ought to subserve the special interests of the people along the route when they did not conflict with those of the state at large, but in case of such conflict the larger interest ought to prevail. These doctrines, of course, were easier to formulate than to apply in concrete cases with general satisfaction. Indeed freight rates seem to have been altered with some frequency to allay clamor.

The fact that the road was for a period incomplete and operated for strictly local business, caused the rise of local enterprises which shortly led to vigorous demands on the ground of protection to vested interests. The growing of wheat and corn along the route yielded large returns so long as the road was unfinished, but was thereafter embarrassed by the western competition. There was also phenomenal growth at the southern end of the road of a town first called Terminus, then Marthasville, and finally Atlanta. The grain raisers, of course, objected to any reduction of rates for western cereals, while Atlanta protested against any tariff which would encourage shippers to send cars past her depot unbroken. These protests were at times of some avail. For example, in November, 1855, a rule was put in force that all down traffic on the Western & Atlantic should bear the same charges whether bound for Atlanta or points below. At the same time rates on corn were fixed on a strictly distance basis, the road was laid off into seven divisions of distance, and the rate for corn in sacks fixed at five cents a bushel for one unit of distance, six cents for two units, seven cents

for three, and so on to 11 cents for the whole length of the road. Four cents a bushel was included in this tariff for terminal charges and one cent for carriage over each unit of distance.

The disproportion of down traffic and up traffic was enormous. No tonnage tables are available for the ante bellum period, but the figures from the report of 1868-1869 are perhaps a fair illustration of this characteristic feature of the road. In that year the through tonnage southward from Chattanooga to Atlanta was 233,022,932 lbs., and the through tonnage northward between the same stations was 6,089,500 lbs. The total freight southward was above 350,000,000 lbs., while the total northward was below 30,000,000. This meant that 11 cars out of every 12 had to go back empty, and the profit on the downward load was diminished in all such cases by the cost of hauling back the empty car.

From 1861 to 1863, there is to be noted the heavy traffic on



Schedule of Special Train Wrecked at Salem, Michigan.

government account, the large nominal earnings in depreciated currency, and a great deterioration of track and rolling stock. In 1864, Sherman's army destroyed much of the track and equipment, a destruction which was crudely restored, in part only, by the Confederate government and the state before the end of the war. The road was operated by the United States military authorities and was restored to the commonwealth on September 25, 1865, a rough patchwork of damaged and crooked rails, laid on rotten crosstles and on rough poles and other makeshifts; eight miles of track at the upper end were entirely missing, while the rolling stock was fit for the scrap heap. In 1866 1867 there followed a period of vigorous rehabilitation; there was an immense press of traffic to supply the exhausted country, a pressure increased by delay in reopening the seaboard lines; the gross earnings for 1865-1866 were $1,315,756.40, and for 1866 1867 $1,273,191.35; net, $360,655.69 and $585,729.13; large sums were devoted to rebuilding.

In 1870 there ensued a travesty of administration with wholesale mismanagement, extravagance and plundering, shared in by numerous politicians. Blodgett, the Superintendent, is said to have stated, with grim humor, that he took charge of the road to manage its "public and political policy." N. P. Hotchkiss, the Auditor, when asked how he had managed to save up 20 or 30 thousand dollars in a year or two out of a $2,000 salary, explained that it had been done "by the exercise of the most rigid economy." Blodgett and others were afterwards indicted for various crimes, but were pardoned by Conley, the last Republican Governor. By the autumn of 1870, the officials of connecting lines began to protest against the Western & Atlantic track as too dangerous to trust their cars on. Blodgett was robbing the road of all it was earning and of all he could borrow in its name, and now demanded an appropriation of $500,000 from the State for repairs. The condition of things had now become intolerable for the people, and a great cry arose for the road to be taken out of politics.

At the meeting of the legislature in October, 1870, a law was passed providing for the lease of the road, on adequate security, for 20 years, at not less than $25,000 a month. A company headed by ex-Governor Joseph E. Brown at its head, and including railroad presidents and politicians, Democrats and Carpet-Baggers, made a bid of $25,000 a month, furnished acceptable security and received the award of the lease. At the end of 1870 the Western & Atlantic accordingly passed out of state operation. When the term of the lease expired in 1890, a new lease, which now has some years yet to run, was made of the state road to the Nashville, Chattanooga & St. Louis at $420 000 a year. The existing status of the road as public property under private operation continues to be viewed in the state with general satisfaction.

The Salem Train Order.

We print herewith a fac-simile, slightly reduced, of the train order which figured in the disastrous collision at Salem, Mich., July 20, made from a plate for which we are indebted to the *Detroit News*. This copy of the order was made at Plymouth by the night operator, and the copy for the freight train (Train No. 71) was delivered by the day operater about 8.40 a.m. Further particulars are given in the editorial on page 114.

Earnings of German Roads.

At the beginning of the year 1906 there were 34,124 miles of standard gage railroads in Germany, 21 per cent. more than there were 10 years ago. The area of the German Empire is 208,780 square miles and the population is 62,125,000. The receipts from passenger traffic for the year 1905 were $163,773,750, 63 per cent. more than in 1895. The passenger and baggage traffic contributed 28 per cent. to the total receipts. There are four class rates for passengers. The first class averaged but 4 per cent. of the passenger traffic; second class, 21 per cent., and third and fourth class, 75 per cent. The average earnings per passenger per kilometer (0.62 miles) was about six-tenths of a cent, 12 per cent. less than in 1895. Freight earnings were $376,585,020, an increase of 57 per cent. over 1895. The receipts per ton per kilometer were about 8 cents. Ninety-two per cent. of the standard gage road is owned and operated by the governments of either the confederacy or the separate states; the balance is owned by private joint-stock companies. The net income on the capital invested in all the roads averaged 6.4 per cent. a year. There were 606,612 employees and officials in the service in 1905. Salaries, wages, etc., including $12,278,120 devoted to institutions and other expenses for their benefit, amounted to $209,618,500, an increase of 17 per cent. over the expenditure per person in 1895.

The Trans-Andine Railroads.

BY LEWIS B. FLEMAN.

The present year has been marked by two events which are important in the history of South American railroads. The first was the completion of the Chilean Trans-Andine, after many years of construction in the face of heavy difficulties, to a point where, at an elevation of 10,500 ft., nothing intervenes between it and the Argentine Trans-Andine Railroad but a mile of granite mountain through which a tunnel is being driven as fast as possible. The other event was the discovery, 500 miles south of the Transandine route, of a pass through the Andes whose highest point is at an elevation of only 2,260 ft., and so open that a broad gage line can be run through from the coast of Chile to Bahia Blanca and Buenos Aires without building a single tunnel.

The west coast of South America, as far as freight, mail and passenger services are concerned, is as remote from New York and London as Australia, and twice as remote as South Africa. The people of Chile, Peru and Ecuador, when voyaging to Europe, sail down the coast, around Cape Horn and then north again to Buenos Aires or Montevideo, where a direct European connection is made. The time required is from five to eight weeks, and the expense

Grading for the Chilean Trans-Andine.

is almost as much as making a direct first-class trip around the world following the usual northern hemisphere routes. The much shorter Panama route is no less expensive and, owing to the slow and irregular coasting steamer service, usually takes as much or more time than the all-water route by the Horn.

Mail to Peru and Ecuador usually comes by Panama, but the great bulk of the freight to these countries as well as Chile, pays the high insurance covering the passage by the Horn rather than meet the expense of the double trans-shipment at Panama and the delays to freight by that route on account of the overcrowded condition of the isthmian railroad. For the people of Chile, and for many Peruvians, the completion of the first transcontinental railroad will cut down the expense of the European voyage 30 per cent., and save in time of transit of both passengers and mail almost 50 per cent.

Chile will obtain favorable freight rates over the broad-gage line building by the newly discovered low-grade pass of San Martin, which is now breaking all South American records for rapid construction. Trans-shipment of goods to train will be made at Buenos Aires, La Plata or Bahia Blanca, from where they may be carried to destination without further transfer. The cost of trans-shipment will be more than met by the saving in insurance. There will be avoided the passage of the tempestuous Horn and also, for six months of the year the even greater danger of exposure in the unprotected Chilean harbors to the "northers," storms of great violence which occur on the southern Pacific coast during the winter season. A second handling at Chilean ports would probably prove too costly to warrant shipping freight to Ecuador and Peru across the continent by rail, and relief for these countries will be deferred until the completion of the Panama Canal.

The historic Uspallata Pass, on the line of the Trans-Andine Railroad, has formed the principal land route of travel between the Pacific and Atlantic coasts of South America ever since the Spanish conquerors of Peru first crossed by it when descending into Chile to found the present cities of Santiago and Valparaiso. The highway discovered and opened up by these early "makers of empires" was the same one over which the Argentine patriot, San Martin, poured the troops that struck the death-blow to Spanish power in South America at Chacabuco. The population center of the southeastern part of the continent is in the vicinity of the Rio Plate where the three cities of Buenos Aires, Rosario and Montevideo contain between them nearly 2,000,000 inhabitants. On the west coast Valparaiso and Santiago are in almost the same latitude as the mouth of the Plate, and a line drawn between these two centers cuts the Andes almost exactly at Uspallata Pass.

Long before a railroad over the mountains was considered feasible 700 miles of direct line was built across the Argentine pampa to the rich and populous wine-growing province of Mendoza, at the foot of the Andes and on the line of the old approach to Uspallata pass. On the Chilean side the extension of the government road up the fertile valley of the Rio Aconcagua to Los Andes penetrated for some distance the outer ranges of the mountains and approached even nearer than the Argentine road to the summit of the divide. The terminals of these two roads were only about 60 miles apart in an air line and, when the Trans-Andine Railroad was proposed, a survey showed that they could be connected by rail with something like 110 miles of track.

Clearing Snow on Rack Section of Argentine Trans-Andine.

The 70 miles of the Argentine section of this line—from Mendoza to Las Cuevas, where the summit tunnel is now being driven—follows the open valley of the Rio Mendoza for nearly all of its length and involves no difficult construction. It was completed several years ago and has been in operation ever since, doing a good business in the summer months in carrying mail, passengers and light freight. On the Chilean side, however, where only 40 miles had to be built, the physical obstacles to be overcome in building a line that would be protected at all exposed points from the snow-slides that every spring sweep down the steep slopes of the Andes, have made progress so slow that only this spring have the rails been laid up to the portal of the summit tunnel.

The last 13 miles of the Chilean section presented to the engineers the most difficult problems. The snow that causes all the

Approach to Uspallata Pass on the Chilean Side, Showing Railroad Grade on the Right and Government Wagon Road on the Left.

trouble in winter is partly the result of natural precipitation and partly the result of slides from the slopes of the 20,000-ft. mountains that hem in the pass. This snow is from 10 to 60 ft. deep by spring time, and when an accumulation of seven months begins to slide in the thaws of November and December, whole faces of the mountains often break away. The coach road running up to the pass is rebuilt each spring at an expense of $60,000 by the Chilean government. During the summer it is one of the best mountain highways to be found in any part of the world, but it is so completely ground down and scoured out by the slides that its reconstruction involves both regrading and resurveying.

The engineers who built this section of the railroad had to conform to the limiting grades, and also protect the track from the onslaughts of the spring slides and the winter snow to permit operation all the year round. The heaviest snow-sheds of the North American transcontinental railroads would be about as useful here as canvas wind shields in preventing the track from being carried off down the mountain. The method adopted of tunneling deep into the sides of the mountains at all exposed points was a heroic measure, but undoubtedly the only one that would have succeeded under the circumstances. The last 13 miles leading up to the divide is broken by 15 tunnels, all through the solid rock, and some of them over a quarter of a mile long.

The summit tunnel, which is being driven at an altitude of 10,500 ft., will be a little over two miles long. It is the longest tunnel ever attempted at so great a height. The international boundary line between Chile and Argentina cuts the tunnel almost in the middle, 3,000 ft. below the base of the colossal statue of Christ, which, as shown in one of the photographs, crowns the summit of Uspallata Pass. Work has been in progress for 18 months and about half a mile has been driven from each end. Little headway was made at first because all the native laborers were inexperienced in the use of the special machinery employed, but from the present rate of progress it is expected that the headings will meet some time in the latter part of 1908.

Up to this time passengers and light mail and baggage have been carried over the pass by stage three times a week during five or six months of the summer, the time from Buenos Aires to Valparaiso being from 40 to 60 hours, depending largely on whether snow was falling on the summit. Though the schedule calls for the trip over the pass between Los Andes and Mendoza between daylight and dark of the same day it usually happens that delays force the passenger to spend a night in one of a group of stone huts at Las Cuevas, near the summit. With the completion of the tunnel, trains will be run from coast to coast on a 30-hour schedule every day of the year. At the present time the boats carrying mail to and from the west coast leave Valparaiso every two weeks and take about two weeks in the passage to Montevideo, so that mail or passengers missing a boat must wait 13 days, or a total of 27 days, before reaching the east coast. The railroad will save from 12 to 26 days in either direction for mail and passengers.

The International Boundary Line Between Chile and Argentina at the Summit of Uspallata Pass.

This Uspallata line, however, cannot hope ever to do an ex-

The Argentine Trans-Andine Railroad Approaching Uspallata Pass.

tensive freight business because of the heavy grades, some of which, where the rack system is employed, run as high as 8 per cent. This together with the high price of coal in that part of South America will make the carrying of anything but light packages too expensive to permit competition with the steamship lines. For this reason the recent discovery of a favorable location for a broad gage line through the hitherto practically unknown southern pass of San Martin is most important.

The pass of San Martin lies in a region until lately unexplored. Because of the determined stand made by the warlike Arauco Indians, the early Spanish conquerors of Chile were never able to extend their influence beyond the broad river Bio-Bio, which, at about the 38th parallel, cuts transversely across the country from the Andes to the coast. These Indians long ago became peaceful agriculturists, but Chileans still refer to the Bio-Bio as the "frontier," and though the extension of the government railroad to the south has done much to encourage settlement, the country is still wild and forbidding.

The announcement of the discovery of an open pass through the Andes at an extreme altitude of 2,300 ft. was received with incredulity in all parts of South America. The Oroya Railroad in Peru, which penetrates only the first range of the Peruvian Andes, had to climb to an elevation of 18,000 ft.; the railroad to Quito, the Ecuadoran capital, from Guayaquil its port, ascends to more than 13,000 ft. In Colombia, the capital, Bogotá, while a short day's journey to the Pacific coast if a railroad could be built to scale the lowest of the lofty passes that exist in that region, on account of the difficulty of building such a road, still has to depend on the tedious two weeks' trip to the Carribean down the Magdalena river. From one end of the continent to the other, from the 22,000-ft. Chimborazi in the north to the 23,500-ft. Aconcagua in the south, is a continuous chain of great peaks 20,000 ft. above the sea. The famous Pass of Uspallata has always been considered the most favorable for travel on account of its comparatively low altitude of 13,000 ft.

The commission which settled the boundary dispute between Argentina and Chile traversed a part of the San Martin Pass several years ago, and it seems almost incredible that the men composing it could have neglected to note the favorable conditions for a main route of transcontinental travel. An enormous pile of green bottles which was pointed out to me in the rear of the cabin in which the commission made its headquarters in this region may furnish an explanation of the carelessness of these men.

A little more than a year ago a trader, William Angemeyer, a German by birth, an American by citizenship and a Chilean by residence, traveled through the pass on horseback, and realizing its many advantages for obtaining through it by for a railroad survey. Even before the survey was finished a company of French and Chilean capitalists with European backing had begun the construction of a line that will be extended through the pass to San Martin in Los Andes on the Argentine pampa, where connection will be made with the Buenos Aires Southern, which began extending simultaneously from its terminus at Neuquen. Trains are now running over several miles of both extensions and a through service will be begun not long after the opening of the Uspallata line.

Chilean Portal of Summit Tunnel under Uspallata Pass.

The rainfall at the latitude of San Martin—about 40 deg.—is nearly double that at Uspallata, and the snowfall in the higher mountains is proportionately heavy. The pass, however, at its highest point hardly touches the snow belt, and the snowfall is very light, rarely lying for a week at a time. No one of the four lakes that wind their way through this break in the mountains has ever been known to freeze over.

Lake Lacar, at the Eastern End of San Martin Pass.

In a recent trip through San Martin Pass from the Chilean coast to Argentina and back again, during the coldest days of midwinter, no temperature lower than 23 deg. Fahr. was recorded, and no snow was encountered of a greater depth than 14 in. Most of the way was entirely clear of snow, that met with having been at the top of the temporary bridle trail 1,000 ft. above the pass proper.

The pass is formed by a chain of lakes, each from 20 to 40 miles long. They run nearly east and west and empty successively into each other until their waters ultimately reach the Pacific at Valdivia through the Valdivia river. There are several favorable routes of approach to the pass for a railroad, but that which is being followed is up the Rio Valdivia and the Calle-Calle and San Pedro rivers. The government railroad extends to Collilelfu, where the new line begins. The 20 miles from Collilelfu to Lake Rinhue, the first of the four lakes, has just been put in operation.

Through the pass the line will skirt the open stretches along the lakes, heavy cutting being necessary only at three or four points where the mountains rise sheer from the water. It is a fortunate circumstance that, while each of the lakes lies in a great crack in the mountains, there is enough open space along at least one side to permit of comparatively inexpensive railroad building.

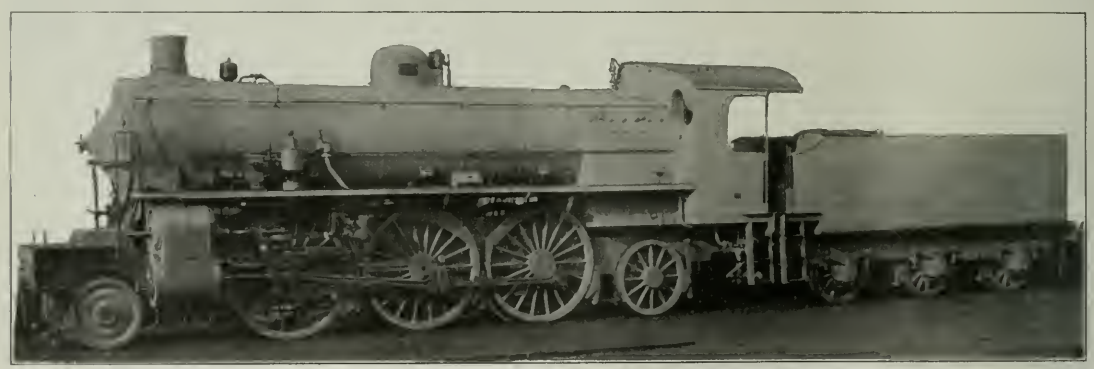
There are no new engineering problems to be solved on this route and only one piece of construction that is likely to prove costly. This is the 10 miles of grading between the lakes Panguipulli and Perihuelco, which have a difference of elevation of about 1,000 ft. Some heavy rock cutting will be necessary here; also the construction of at least two, and possibly four, very high

but short bridges. On the Choshuenco river, which connects these two lakes, there is a 200-ft. waterfall of sufficient volume to furnish power to operate the railroad for 150 miles in each direction and to supply abundant power for local use.

Until the completion of the railroad, traffic through the pass is to be handled by small steamers, one of which is already in service on each of the lakes. Navigation will be shortly opened between the two upper lakes, Perihueico and Lacar, by a lock on the connecting river, and the two lower lakes may also be thus united. The traffic at present is principally cattle and foodstuffs going from Argentina to Chile.

A Balanced Compound Locomotive for the Italian State Railroads.

The accompanying drawings illustrate a locomotive embodying several features novel in express locomotive design, such as the equalized connection of the driving and pilot axles in place of a four-wheeled truck; the permissible oscillation of every axle-box in the engine about a longitudinal axis in such way as to relieve frames and axles of all strain due to diagonal movements of the one in respect to the other through the deflexion of the springs or in traversing curves; in the engine proper, the use of two piston valves distributing steam to four cylinders, each valve being independently variable in its travel by means of a duplicate reversing gear for suiting the ratios of expansion, high-pressure to low-pressure, to the widely-varying conditions of gradient and service for which these engines are intended. This ability to vary the cut-off in a balanced compound having only two valves—so differing from any two-valved engines constructed in America—is a point of great importance, for it enables machines to be set, either periodically in the shops, or by means of a second reversing gear (and in the hands of an adept engineman) to the average requirements of any section of the line. Once these requirements are ascertained by practice the duplicate reversing gear may be abandoned. Experience in nearly all the countries of Europe has shown that once the most economical working of the compound system has been determined on various sections, and a mean struck between extremes, it is safer to remove any possibility of interference with this mean at the hands of enginemen, whose duties might often interfere with a timely attention to the ratios of expansion from high to low pressure.



High Pressure Side of Four-Cylinder Compound; Italian State Railroads.

The utility of the duplicate reversing gear for operating the two valves will be appreciated from a knowledge of the fact that these engines are to work the traffic over all the most important trunk lines of Italy from Chiasso, on the Swiss frontier, to Milan, to Bologna, over the Apennines to Florence, thence to Rome and to Naples and also on the line from Florence to Pisa (Mediterranean division). The passage of the Apennine north of Florence comprises gradients of from 2.5 to 2.27 per cent. So far, it has been usual to detach the express engines at either side of the mountain and to couple at the train-head the most powerful freight engine available and to run another powerful freight engine, tender forwards and uncoupled from the cars, behind the train.

The old freight engines have just been replaced by some remarkably powerful balanced compound freight locomotives having two cranked axles, and with these aiding there is a possibility of a greatly accelerated mountain passage. It is true that it is proposed to electrify this mountain section; but in view of the fact that the electric service may break down at any time, as recently occurred for a period of three weeks on the Simplon tunnel railroad, it would be impossible to do without a powerful reserve of self propelled locomotives at Pistoja—the foot of the mountain. Again, on the line from Florence to Rome there are continuous grades 44 miles long and gradients as great as 64.4 ft. between Orvieto and Chiusi, this rise being 6.2 miles long. Consequently, a two-valved engine, whose high and low-pressure cylinder volumes were similar to the Italian, and whose admissions were quite fixed and invariable from the very construction of the machine, as in certain American examples, could not be employed economically on the extremely variable profiles of Italian lines. By the employment, however, of greater ratios between cylinder volumes it is usual to make no difference in the cut-off of the two groups, but at very high piston speeds the total atmospheric back pressure on exceptionally large l.p. pistons may be somewhat prejudicial to free working.

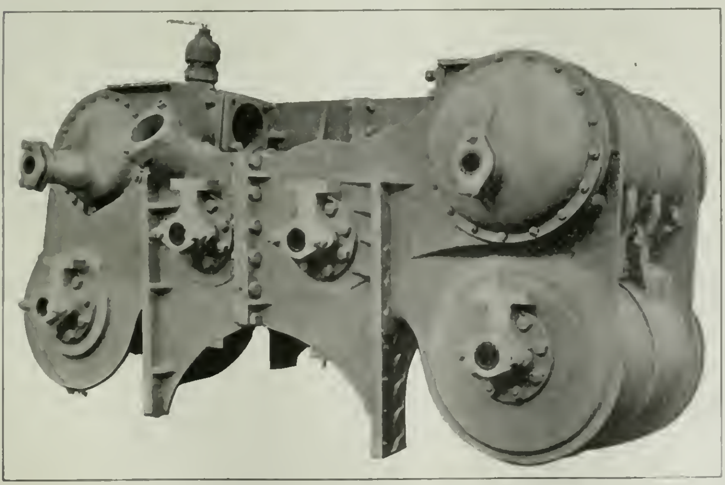
It will be seen from the drawings that the variable cut-off is made possible by the special arrangement of the cylinders: two high-pressure on one side and two low-pressure on the other side of the engine, one valve serving each group, and the opposite ends of each group of cylinders being in constant communication between themselves by means of crossed passages, so that the pressure exerted by the opposing forces of the two pistons in the same group is always and constantly equal in respect to the two cranks keyed at 180 deg. in connection with those two pistons. The balancing of the engine forces has been found to show a marked superiority by the equilibrium of steam pressures thus maintained, which is alike conducive to a regular turning moment in starting heavy trains, to a notable stability and smooth motion when speeding, and to a saving in track maintenance costs through the reduction of the wheel weights here rendered possible for the balancing of the revolving masses. The other advantages of two valves in the place of four are found also in the Vauclain compounds—that is, the passage through two valves of double the weight of steam that must traverse four valves, tending thus to efficiency in reducing variations of temperature and resulting condensations. Their internal loss by mechanical friction is naturally less than in four-cylinder single-expansion engines having four valves, and this, especially when superheated steam is employed in these latter, represents more power available for traction or for speed, and in such case the single-expansion engine becomes inferior in simplicity to the compound in consuming more steam without including the amount extra needed to overcome its own greater internal friction.

The Italian engine always works compound. It has no intercepting valve. For starting purposes there is a momentary admission of boiler steam to the low-pressure cylinders. This is entirely automatic and can only occur while the throttle is in the first stage of its opening, and only when the engine is set in full forward gear, as customary when starting a train. It just suffices to enable the high-pressure valve to obtain full admission; when the machine at once becomes quite capable, as a compound, for starting slowly any load up to 1,000 tons, or of 350 to 400 tons with rapid acceleration. The main throttle is of the Zara type, having a self-balancing action as soon as the throttle handle is moved for relieving it, first of all, of the full pressure of the boiler steam on its single seat. The lower portion of the valve is a loose-fitting piston, around the disc of which the preliminary admission of steam leaks away to the engine with the object of gradually applying the pressure, automatically, and so starting the wheels without slipping them. The succeeding phases of admission are graduated up to the moment when the throttle valve attains that full opening which is usual, from the first lifting, in all valves as ordinarily designed. The pilot valve for live steam admission to the low-pressure cylinders is connected by pipe to an extended cover on the high-pressure valve chest in which the extension spindle of the h.p. valve forms a sort of slide-valve which, when in full travel, opens the way to the receiver. From this it is obvious that back pressure from high-

pressure steam, as common in some systems of auxiliary admission, is here avoided.

The receiver referred to is a copper pipe carried around the walls of the smokebox close to the tube sheet for the purpose of reheating the steam before entering the low-pressure valve. A "Coale" anti-vacuum valve is fitted on the top of this pipe and a relief-pressure "Coale" valve, regulated to the proper pressure, is fitted over the receiver—see left hand side. Relief valves are also applied to all the cylinder covers.

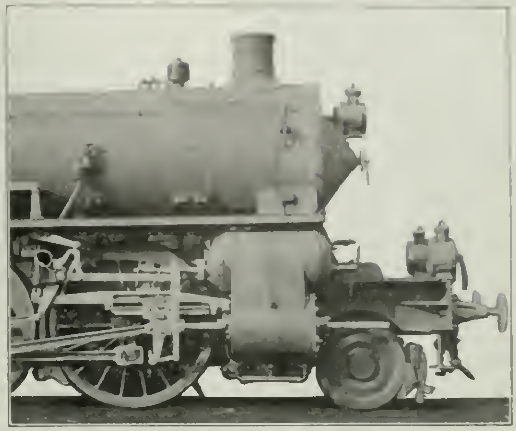
All the main driving rods work on the same axle, to effect which the inside cylinders are slightly inclined from horizontal. There can be no question that such arrangement effects a more perfect balancing than is practicable by balancing through the intermediary of side rods (or 2 x 0.5 = 1, system), and that it involves no more strain upon the cranked axle than in "divided engines" of the Webb or de Glehn order. The late Professor von Borries maintained that the efforts of the outside engines were absorbed almost entirely by the side rods and the driving wheels in connection with them. None the less, according to popular notion, "divided-engine" axles may be made of about half the strength of the single-driver axles—a fallacy at once apparent when it is considered that in the moments of the greatest stress, that is when starting a train, both single and double driver axles are equally liable to the full stress of all four pistons on one axle, and that if the divided-engine axles are really not designed to resist the torque of four pistons simultaneously then they are at a great disadvantage compared with the unicentric balanced engine. When the rear wheels of a divided-engine slip, all the power of four pistons minus that lost in skidding is applied on the front motor axle, direct or else through the side rods; and, when the front wheels alone slip, nearly the whole power is transferred to the crank pins of the rear motor axle. The same concentration of cylinder power occurs with unicentric balanced engines under the same accidental conditions, consequently it is impossible to attribute any superior equalization of the work in two-motor axles than in one-motor axles—if those axles be coupled together by side rods. In the old Webb engines and in the de Glehn engine, "No. 701," there was unquestionably an absolute division of the work at all times because their motor axles were not connected by side rods; but since rods were employed for connecting divided-motor engines no claim to any advantage over one-motor axles could be substantiated for the former. In other respects the double motor locomotive labors under real disadvantages: by the distance often separating the h.p. and l.p. cylinders as in the Webb-de Glehn-Cole types and in the constructive complication ensuing therefrom. In the Italian engine the crank axle is of the Z type of square section, forged in nickel steel, bored out hollow in all parts save the oblique arm. The mechanical details are best studied in the drawings given, but it may be remarked here that all the riding springs in the locomotive are compensated with levers from the third to the fifth axle while the leading driver has a single traversing spring.



Perspective View of Cylinder Casting.

The pilot truck frame is connected or equalized with the leading pair of driving wheels so as to form, with these latter, a four-wheeled truck, which is said to be practically equivalent in function to the ordinary four-wheeled pilot for high speeds. The arrangement is based upon the Krauss-Helmholtz equalized truck which has been in use for many years for fast [illegible] trains in Bavaria. The Italian arrangement for fast express engines differs from the Krauss in that, by the use of a swing [illegible] of a fixed pivot, any difference which may arise between the pilot and leading driving wheels [illegible] so to which shall yield at either end of the [illegible], is decided by the action of the swinging bolster which [illegible] such difference.

The designer of this locomotive, Signor G. Zara, first applied this arrangement to the [illegible] locomotives which he designed for



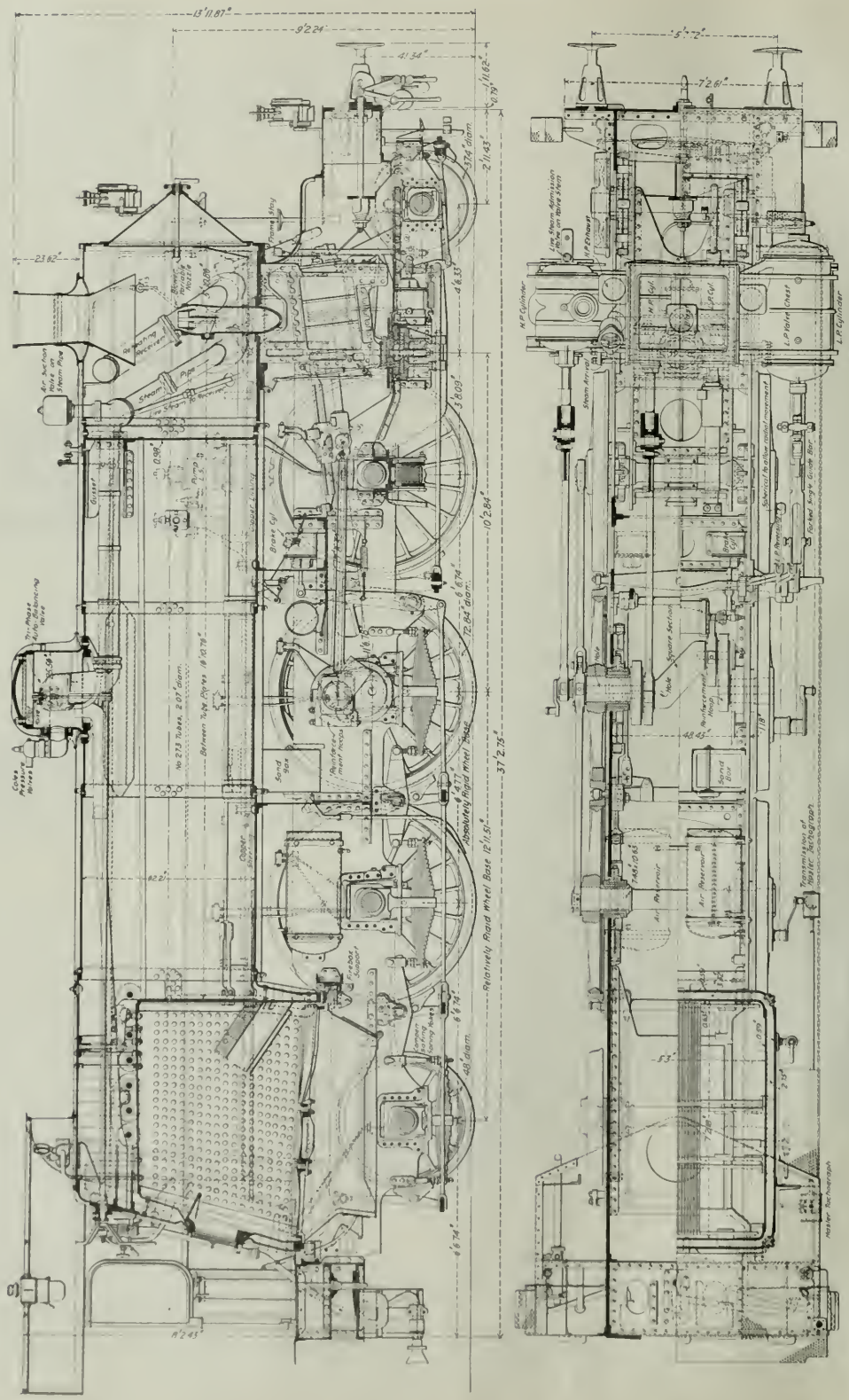
Front End of Low Pressure Side of Four-Cylinder Compound; Italian State Railroads.

the Valtellina electric railway [electric equipment by Ganz, of Budapest], and the Zara model was afterwards copied in the electro locomotors now operating in the Simplon tunnel by Brown, Boveri & Co. This form of equalized pilot truck, having proved successful for the electrical motors, has now been adopted extensively for Italian locomotives.

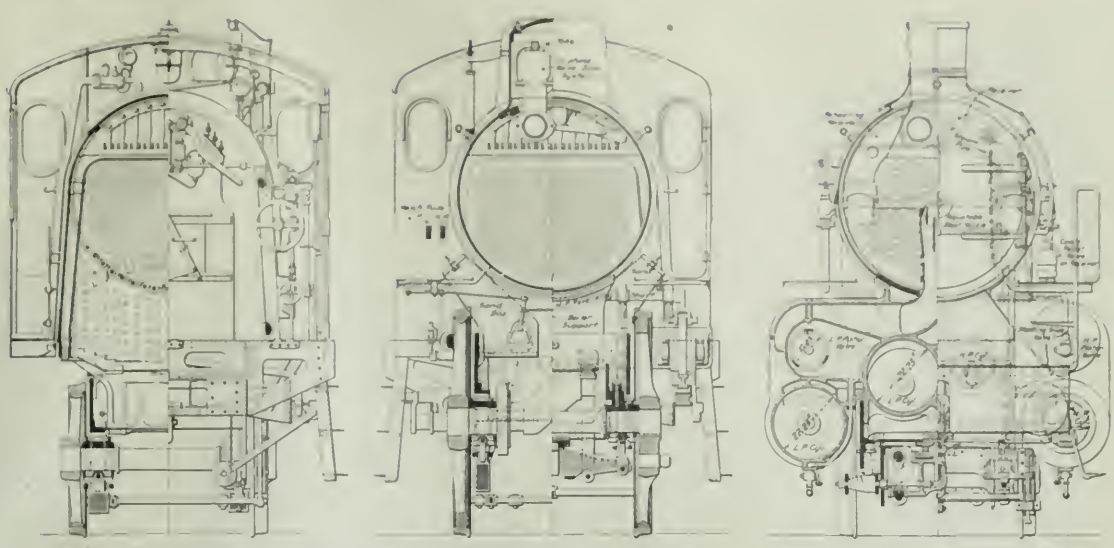
The right-hand photographic view shows one of the reversing rods, the position of the other being visible in the cross section showing the cranked axle. The left-hand view is a little more complicated by the addition of the Westinghouse air pump and the oil-feed pump. The compressed air reservoirs are concealed by the deep frames, near the firebox, and the sand boxes have the form of a saddle below the boiler and are readily accessible from both sides of the engine. It is worth notice that the brake blocks are only applied at the backs of the wheels where they relieve the strain on the axle boxes when in use.

In addition to the dimensions figuring on the plans the following may be given: Boiler pressure, 227 lbs. per sq. in.; grate area, 37.63 sq. ft.; total heating surface, 2,537 sq. ft.; weight, empty, 135,300 lbs., loaded, 151,250 lbs.; maximum for adhesion, 95,700 lbs. This latter is the maximum driving-wheel load allowable on Italian express engines until the roads are reconstructed. Any additional adhesion would call for a novel type of express locomotive having eight connected drivers. The present engines represent the power limits for such light wheel loads, and in this respect are instructive as showing the maximum of power obtainable in a minimum weight, and in a short length adapted for existing turntables throughout the Italian railroad system. They are designed for express speeds of up to 75 miles per hour with trains of up to 400 metric tons, or with fast accommodation trains of 450 tons. With the International trains-de-luxe they are found to pick up, easily, 30 minutes, and more, lost in delays during a run, and their boilers generate an abundance of steam in respect to the very economical steam consumption by the engines, although the Welsh coal employed in these new boilers—not reversed on the frames as heretofore—only evaporates, on the best average, 7.5 lbs. of water for each pound of fuel.

The new locomotives were built by the firm, Società Italiana Ernesto Breda, of Milan, and the delivery of the engines was made in the presence of the Director-General of Italian Railroads with exceptional attention and formality. Some of the more important

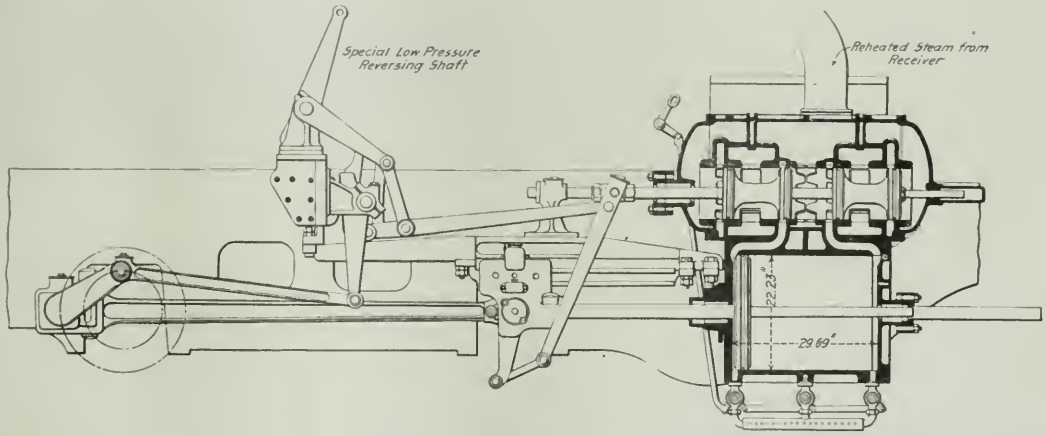


Longitudinal Section and Plan Section of Four-Cylinder Balanced Compound Locomotive for the Italian State Railroads.

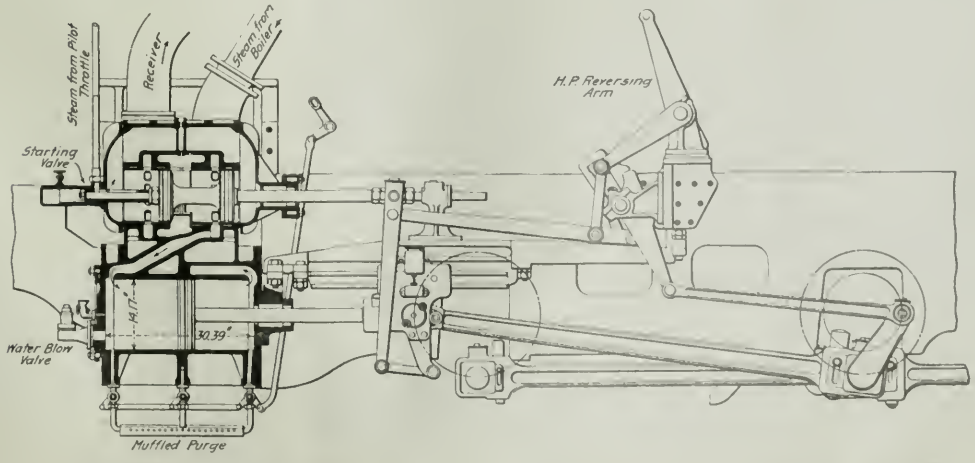


Half Section at Firebox and Rear Elevation. *Half Section and Main and Front Driver.* *Half Section at Smokebox and Front Elevation.*

Sections of Four-Cylinder Compound Locomotive for the Italian State Railroads.



Low Pressure Cylinder, Valve and Valve Motion for Four-Cylinder Compound; Italian State Railroads.



High Pressure Cylinder, Valve and Valve Motion for Four-Cylinder Compound; Italian State Railroads.

of the dimensions of these engines and the ratios between them are as follows:

Cylinder, diameter, h. p.	14.17 in.
Cylinder, diameter, l. p.	22.23 "
Piston stroke	25.59 "
Steam pressure	227 lbs.
Heating surface, firebox	112 sq. ft.
" " tubes	2,425 "
" " total	2,537 "
Grate area	37.63"
Wheels, diameter, drivers	72.84 in.
" " trailing	48.00 "
" " front truck	37.40 "
Weight on drivers	95,700 lbs.
Weight, total, in working order	151,250 "
Tubes, number	273
" diameter	2.07 in.
" length	16 ft. 10.76 "
Tractive power	20,612 lbs.
Ratio, high to low-pressure cylinders	1 to 2.46

$$\frac{\text{Weight on drivers}}{\text{Tractive power}} = 4.64$$

$$\frac{\text{Total weight}}{\text{Tractive power}} = 7.34$$

$$\frac{\text{Weight on drivers}}{\text{Total weight}} = .63$$

$$\frac{\text{Tractive power} \times \text{diameter drivers}}{\text{Heating surface}} = 571.64$$

$$\frac{\text{Heating surface}}{\text{Grate area}} = 67.42$$

$$\frac{\text{Firebox heating surface}}{\text{Total heating surface}} = 4.41$$

$$\frac{\text{Weight on drivers}}{\text{Total heating surface}} = 37.72$$

$$\frac{\text{Total weight}}{\text{Total heating surface}} = 59.62$$

Volume 2 h.p. cylinders ..... 4.66 cu. ft.

$$\frac{\text{Total heating surface}}{\text{Volume of h.p. cylinders}} = 544.42$$

$$\frac{\text{Grate area}}{\text{Volume of h.p. cylinders}} = 8.08$$

Tube heating surface equated to firebox heating surface	590 sq. ft.
Total equated firebox heating surface	702 "

New Union Station for Three Roads at Waco, Tex.

The new union station recently built by the St. Louis Southwestern at Waco, Tex., is shown in the accompanying illustrations. The other roads which use the station are the International & Great Northern and the San Antonio & Aransas Pass. The St. Louis Southwestern and the International & Great Northern previously used jointly a small one-story frame station on Third and Mary streets, on the north end of the block which the new terminal now occupies. The San Antonio & Aransas Pass had a separate station of its own about half a mile away.

The new station is at the corner of Fourth and Mary streets, in the business center of the city, and four blocks from the Brazos river. It is 145 ft. x 70 ft. outside, the long dimension being on Mary street, and a covered platform 60 ft. wide extends through to Third street over the site of the old station.

The building material is red brick faced with buff brick, the trimmings being gray stone. The tower is 19 ft. square and 70 ft. high. The roofs are covered with black Bangor slate and all ridges and hip rolls are trimmed with buff terra cotta. The interior has two general waiting rooms, for whites and negroes respectively, each 41 ft. x 49 ft.; ticket office, 16 ft. x 16 ft.; ticket lobby, 19 ft. x 25 ft.; women's retiring room (white), 17 ft. x 22 ft.; men's smoking room (white), 17 ft. x 24 ft.; and smoking and retiring rooms for negro men and women, 12 ft. x 17 ft. each. The baggage room, at the north end of the building, is 26½ ft. x 41¾ ft., and adjoining it is the express room, 21 ft. x 23 ft. 10 in.

Union Passenger Station Built by the St. Louis Southwestern at Waco, Tex.

Main Waiting Room (Negroes' Waiting Room Beyond); Waco Station.

The two general waiting rooms are connected with plastered arches and colonial columns. The walls in the general waiting rooms are wainscoted 8 ft. high with Tiffany white enameled brick. Above the wainscot the walls are plastered with Acme cement tinted gray. The ceilings over the waiting rooms are plastered and have heavy beams and cornices in 12-ft. squares. The height of the ceilings in the waiting rooms and ticket lobby is 25 ft. and in the other rooms 14 ft. The floors in the waiting rooms, lobby, toilet and smoking rooms are Venetian mosaic, finished around the walls with a sanitary base of terrazo marble. The building is heated by steam and lighted by electricity.

The street, driveways and inter-track spaces are all paved with vitrified brick on a foundation of concrete. The cost of the terminal, including street paving and necessary track changes, was approximately $60,000. The plans were prepared in the office of J. S. Berry, Superintendent of Bridges and Buildings of the St. Louis Southwestern, and all work was done by company forces. We are indebted to F. H. Britton, President of the St. Louis Southwestern of Texas, for the information.

Chinese authorities have decided that all railroads built by Chinese shall revert to the government 25 years after they are opened.

GENERAL NEWS SECTION

NOTES.

The legislature of Alabama has appropriated $50,000 to pay the expenses of resisting the suits which have been begun in the courts by the railroads to secure the annulment or modification of the rate laws recently passed.

The Railroad Commissioner of Michigan has sent to all of the roads in the state a letter calling attention to the necessity of good locks on switches. He has found many unlocked switches and some which have no locks.

Complying with a recent state law, the Pennsylvania Railroad has remeasured its main line, and the distance between Philadelphia and Pittsburg will hereafter appear on the time tables two or three miles less than heretofore.

According to a press despatch from Cleveland, a strike of union boilermakers in the shops of the Lake Shore & Michigan Southern Railway at Elkhart, Ind., has been settled by the company's agreeing to entirely abolish the piecework system.

An order recently issued by the Texas State Railroad Commission, requiring the Southern Pacific to run double daily passenger trains between San Antonio and Victoria, has been suspended by a restraining order from the District Court.

Somebody in Texas has estimated that the more elaborate accounts which must henceforth be kept by the railroads in compliance with an order of the State Railroad Commission, will cost the companies $300,000 additional yearly for clerical help.

Western papers say that the railroads between Chicago and Kansas City have decided to reduce the time of their through express trains from nine hours to eight hours 30 minutes. The time of these trains was lengthened from eight and one-half hours to nine hours a few months ago.

The Public Service Commission of the Second District of New York State has ruled that railroads may sell round trip excursion tickets to the state fair at Syracuse, with a coupon giving admission to the fair grounds; but a passenger must not be compelled to buy the admission ticket in order to secure the excursion rate.

The legislature of New York has passed a bill, which has been signed by the Governor, repealing the clause in the franchise tax law under which railroad grade crossings in first-class and second-class cities are exempted from liability to the franchise tax. This means that the right of a railroad to cross a street is to be regarded as property and may be assessed for taxation.

The presidents of a number of important railroads met at the office of President Underwood of the Erie in New York City last week and discussed the question of abandoning excursions in order to increase their income, with a view to counteracting in some degree the reduction caused by the recent enactment of 2-cent rate laws by several states; but no action was taken, each road being left to act for itself.

The state of Connecticut has passed a law, similar to the federal law, limiting the working hours of railroad telegraph and telephone operators. At offices which are not open at night the operator may work 12 hours, but at other places the ordinary limit is eight hours a day. The only exception to this is in cases of "sickness, death, wrecks or washouts." The penalty for disobedience is $1,000 fine, or ten times as much as the fine prescribed in New York State.

A new line of steamers from Vancouver, B. C., to the west coast of Mexico, subsidized by the Canadian and Mexican governments jointly, is now in operation. The steamship Georgia has made one voyage from Vancouver south to Salina Cruz, the western terminus of the Tehuantepec National Railway, stopping at intermediate ports. There was little or no cargo at Vancouver for this first voyage, so that the vessel was loaded at Puget Sound ports.

The new laws of the State of Texas, requiring a certain number of brakemen on trains and requiring the use of electric headlights on locomotives, and regulating the working hours of trainmen and telegraphers, went into effect July 12. Mr. Van Vleck, of the Southern Pacific, is reported as saying that on his road the headlights alone will cost about $200,000; while the increase in wages and the cost of changing terminals, in consequence of the limitation of working hours of trainmen, will for the whole state and for all the roads run up into the hundreds of thousands.

The Wabash has reconsidered its decision to establish a passenger rate of 2 cents a mile in all territory east of Chicago. As the only road having lines both east and west of Chicago, the Wabash is a member of both the Western and the Central Passenger Associations. It found itself making 2-cent interstate rates in the territory west of Chicago and 2½ and sometimes 3 cents east. This led to a notice of intention to make a uniform rate of 2 cents a mile, but it is now announced that interstate rates are not to be disturbed, except in cases where the through rates exceed the sums of the local rates.

The committee on car efficiency of the American Railway Association has issued a statement showing surpluses and shortages of revenue freight cars on July 10 on all of the principal roads. These figures show the conditions as to over and under supply of cars as reported to the committee without regard to the number of cars owned. By comparison with February 6 last, the date showing minimum surpluses and maximum shortages since such figures have been compiled, it is found that July 10 shows an increase in surpluses of 37,459 and decrease in shortages of 85,739 cars, or a net improvement of 123,198 cars for an average of 79 roads.

An advance of 20 per cent. in freight rates recently announced by the Metropolitan Steamship Co. has raised the level of water rates between Boston and New York to a parity with the all-rail rates. It is said that the tendency in the last few years among coastwise steamship companies has been to lessen constantly the margin of difference between competitive rail and water rates. The New Haven water lines for several years have been gradually increasing the rates on the Providence and Fall River boats to New York, until at present there is no practical difference in the cost of freight between the rail and water lines. It is said that the advances in water rates have been due to the increased cost.

A lumber manufacturer in the Northwest says that his inability to promptly fill orders for carload shipments, which, a few months ago, was due to a scarcity of cars, is now due to a scarcity of cars of the right kind; that is to say, the railroad, according to this shipper, has enough cars standing around his station to take all of his lumber, if only they could be used; but the road will not allow its own cars to be sent off its own line, and the other cars which are standing there empty cannot be sent to the points to which the lumber is destined. In other words, the railroad has begun to comply with the rule which forbids sending foreign cars in a direction opposite to that which will take them home—a refreshing revival of conscience.

Out of 1,196 surprise tests on the Union and Southern Pacific in a recent month, in only 16 cases did enginemen fail to observe signals. Eighteen different tests were applied, besides special tests. All red flags, crossing, station and block signals were observed. This is the fourth year of surprise tests on the Southern Pacific and the third year on the Union Pacific lines. Tests are made in person by each division superintendent and his subordinates, and the general superintendents and general managers are required to make a number of surprise tests every month. Two or more of each of 18 different kinds of surprises must be made on each division each month. These tests cover the use of torpedoes, fusees, slow and red flags, switch lights out and at danger, and all semaphore signals.

According to a press despatch from Chicago, the Post Office Department has decided that on the railroads west of that city it can save $1,000,000 a year by occupying less room in the mail cars on the railroads; and the railroads have been notified of the purpose of the department to make this change. Railroad officers are complaining of this, and also of the severe enforcement recently of penalties for delays. One officer says that the fines levied by the Government against his road, in one quarter, amounted to $40,000. The Department now adheres, it is said, to the rule providing that if mails are late 10 times on any route during a period of 90 days the road shall be assessed 15 per cent. of the pay of that route for the quarter. Under the speed standards as now established it will be a marvel if any of the big Western roads escape having their important mail trains late more than 10 times in 90 days. As to car room, it is said that the Post Office Department is preparing in many cases to insist upon one size car westbound and an entirely different car eastbound. One of the Government inspectors is quoted as telling a railroad official that this was being done because of the knowledge that, rather than deadhead cars over their routes, the railroads would in all such cases use the larger car both ways, whereas the Government would have to pay for the larger size car in only one direction.

English Excursions.

An excursion run from Burton-on-Trent to Blackpool, England, on July 19, for the employees of Bass, Ratcliff & Gretton, brewers, filled 17 special trains, all of them starting between 4 and 6:45 a.m. The distance traversed was 121 miles, the journey covering parts

of four different railroads. The whole expense of the excursion was borne by the employers, including side trips in steamers and admission to all the Blackpool shows.

On the excursion of the employees of the Great Western Railway from Swindon, the first week in July, over 25,000 people left that town for a week's holiday, the employees taking their wives and families and the town being nearly deserted. On the fifth of July 22 special trains left Swindon, all before 7 a.m. Three of these trains, carrying 4,500 passengers, went to London; five to Weymouth and the Channel Islands, with 6,000 passengers, three for Plymouth and the West, with 5,500, and four for Weston-super-Mare, with close on 5,000 holiday makers. In addition, more than 3,000 people visited South Wales, and 2,500 the North of England. The traveling arrangements were conceived in the most generous spirit, the company providing free passes for employees and their families over its own road, and tickets at reduced rates for journeys over foreign lines. The only restriction imposed was that each man must decide on his holiday resort a fortnight beforehand, in order to simplify the arrangements for transporting the vast number of travelers. The special time table issued for this occasion fills 16 pages.

Welding Locomotive Frames with Thermit.

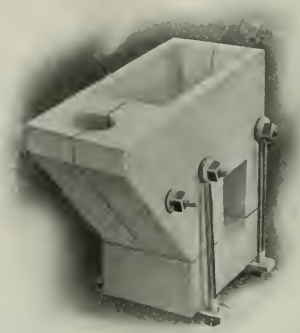
The Goldschmidt Thermit Co., 90 West street, New York, has recently developed a new and simple method for welding locomotive frames which employs fire brick moulds instead of the usual sand mould. These moulds are shown in the accompanying illustrations. They are made in three parts, two side pieces and a bottom piece, the necessary gate and riser being formed in the moulds, as well as the collar around the fracture. They are made in four sizes for frames from 3 in. wide and 4 in. deep to frames 5 in. wide and 6 in. deep. For intermediate sizes the bricks can be cut to fit. In welding frames the fracture is prepared in the usual way by drilling 1 in. holes along the line of the break and jacking the

Parts of Firebrick Mould for Welding Locomotive Frames.

Mould and Crucible Ready for Pouring.

parts open from $\frac{1}{16}$ in. to $\frac{1}{8}$ in. The contact surfaces of the right-hand and left-hand bricks are covered with a thin layer of fire clay and then bolted together around the fracture. The contact face of the lower brick is coated with clay and squeezed up against the side bricks and then the openings around the frame are carefully luted by squeezing in fire clay. The mould is surrounded with a sheet iron or wooden box which is filled with sand and thoroughly tamped as an additional precaution against the escape of molten steel. The crucible is placed in position over the pouring gate and the charge melted and poured in the usual way after the mould and frame have first been heated red hot. The use of these standard moulds eliminates much of the preliminary work which was formerly necessary and allows the welding to be done quickly and accurately. The moulds are furnished at the uniform price of $5 a set of three pieces. They can only be used once.

Where the fracture is located in a part of the frame which makes it impossible to use these standard moulds a simple process of making the mould out of green sand has been developed. Yellow



Frame Mould Assembled.

wax is used as a pattern or matrix for the casting and is shaped around the fracture in the form of the collar desired. The mould box is then placed in position and moulding sand, consisting of a mixture of fire clay and sand, is tamped around the matrix in the usual manner except that a small hole is left in the lowest part of the mould. The patterns for gate and riser are made of wood and placed in the mould in the usual way. After the mould box is filled and tamped the gate and riser patterns are withdrawn and a torch applied through the riser. The intense heat melts the wax matrix which runs out through the opening at the bottom. The heat is continued until the metal is red hot and the mould is thoroughly dry, after which the opening at the bottom is closed with a sand core. Pouring is then performed in the regular way.

Test of Holmes Rod Packing.

A thorough test of Holmes' metallic packing, made by the Holmes Metallic Packing Co., Wilkesbarre, Pa., was recently completed by the Philadelphia & Reading. An eight-wheel switch engine, No. 1,356, built by the Baldwin Locomotive Works, was equipped on February 11, 1906, with Holmes' metallic packing applied to the left piston rod and right valve stem and the opposite rod and stem were packed with other packings. The locomotive was worked 24 hours a day for seven days in the week with a steam pressure of 205 lbs., and, during the 16 months ending June 8, 1907, made over 75,000 miles. At the end of that time the rod and stem packed with the Holmes' metallic packing was absolutely steam tight and both the rods and the packing were in perfect condition. The piston rod had been reduced less than $\frac{1}{64}$ in. in diameter. The packings on the opposite rod and stem during the same period were renewed 41 times, eight new sets of packing being applied during one month, December, 1906. The rod required turning with a reduction in diameter of $\frac{1}{64}$ in.

The Yale & Towne Triplex Hoist.

It will be observed in the upper photograph on page 71 of the *Railroad Gazette* of July 19, 1907, illustrating an article on "The New Blacksmith Shop of the Union Pacific at Omaha," that a Yale & Towne triplex chain block is in use holding a locomotive frame in front of the frame fire. These hoists are made by the Yale & Towne Manufacturing Co., New York city.

New Warehouse at Newark for the Central of New Jersey.

On August 1 the Newark Warehouse Company, a subsidiary company of the Central Railroad of New Jersey, opened a large new building at Mechanic, Lawrence and Ward streets, Newark, N. J., for handling freight coming to and from the city on the New Jersey Central. Cars will be switched into the ground floor of the building, where their contents will be unloaded and raised by a complete elevator system of 11 elevators and eight gravity conveyors

to the floors above or unloaded directly onto trucks. The whole building is made of reinforced concrete. It occupies a city block, is six stories high and has 370,000 sq. ft. of floor space. Six thousand tons of steel were used in its construction. Fifty freight cars can be accommodated on the tracks inside the building, which has room for the storage of 12,200 carloads of freight.

Exports Through Atlantic and Gulf Ports.

The *Wall Street Journal* publishes the following figures of grain exports through the Atlantic and Gulf ports, compiled by the traffic department of the Chicago Board of Trade. The figures are for the years ended June 30, 1906 and 1907.

Grain Exports for Two Years.

	Corn		Wheat.	
	1906.	1907.	1906.	1907.
Boston and Charlestown	6,769,128	4,693,998	297,542	2,622,505
Portland and Falmouth	401,148	149,742	967,767	1,189,815
New York	24,528,389	21,761,363	7,504,594	18,679,225
Philadelphia	11,684,063	6,368,221	1,201,980	8,394,150
Baltimore	26,237,722	19,917,037	1,669,578	5,026,578
Newport News, Norfik, Prtsmth	4,421,561	1,940,544	160,000	943,359
Total	74,042,011	54,820,895	11,741,461	36,852,632
Galveston	13,643,529	5,663,301	3,816,916	14,172,021
Mobile	1,901,491	2,307,570	110	862
New Orleans	18,881,433	8,236,918	1,521,354	5,496,965
Total	34,429,053	16,328,192	5,338,410	19,669,818
Percentage via Atlantic ports	68.26	77.05	68.74	65.2
Percentage via Gulf	31.74	22.95	31.26	34.8

Although the proportion of wheat exports via Atlantic ports declined, the proportion of flour exports increased, being 86.83, as against 81.84 in the 1906 crop year. The flour totals in barrels follow:

	Seaboard.		Gulf	
	1907.	1906.	1907.	1906.
Exports	8,980,128	8,065,998	1,361,260	1,789,837
Per cent.	86.83	81.84	13.17	18.16

Third Class Passenger Cars in Canada.

The Canadian Railway Commission has ordered the Grand Trunk Railway to have third-class carriages put on its trains throughout the entire system in Canada. The road has the right to appeal from the order to the Supreme Court. Third-class would probably mean a general rate of 2 cents a mile.

Record Earnings of the United States Steel Corporation.

The net earnings of the United States Steel Corporation for the second quarter of 1907 (April 1 to June 30) were $45,503,705 against $41,750,125 in the previous high record quarter, which was that ended December 31, 1906. The net earnings for the six months ended June 30, were $84,626,197. This compares with the first half year's net earnings of previous years as follows:

1906	$76,750,523	1903	$61,568,235
1905	53,331,012	1902	64,377,500
1904	32,699,611		

The unfilled orders on hand June 30, 1907, amounted to 7,603,878 tons, somewhat less than at the ends of the last three quarters. The falling off in new business in July as compared with July of last year is estimated at 25 to 30 per cent.

Carrying Coals to Newcastle.

The people of Tonawanda, N. Y., had their curiosity aroused recently by the appearance at that port of a steamer flying the Norwegian flag. It was the "Polleux," loaded with 860,000 ft. of spruce lumber from St. John, N. B., consigned to a wholesale lumber dealer. This is nearly the same as carrying white pine to Michigan, and serves as a reminder that "times have changed."

INTERSTATE COMMERCE COMMISSION RULINGS.

Rate on Cotton Waste from Augusta, Ga., to New York, Reduced.

Commissioner Clements has announced the decision of the Commission in the case of Riverside Mills v. Southern Railway et al. It appeared that defendants' rate on cotton waste, a by-product of cotton goods, in bales, from Augusta, Ga., to New York, is 41 cents per 100 lbs., or the same as the rate on cotton goods between the same points, though cotton waste has considerably less value and involves much less risk and expense in transportation than cotton goods. The Commission held that cotton waste should be carried at less rates than cotton goods, and that no higher rate than 35 cents per 100 lbs. should be charged for its transportation by sea and rail from Augusta to New York.

Rate on Cotton Goods from Augusta, Ga., to New York, Upheld.

In an opinion by Commissioner Clements decision has been announced in the case of the Warren Manufacturing Co. et al. v. Southern Railway et al. The Commission held that the absorption of a competing line of railroad by another in alleged violation of the statutes of a State or of the Sherman anti-trust act can be considered by the Commission only if it results in unreasonable rates. The long-continued carriage of any article of freight at certain rates, while establishing a presumption that such rates are reasonable and remunerative, is not alone conclusive, but to carry such presumption must show a settled practice or policy. Where a rate is comparatively the lowest in its territory on a given article of freight and by reason thereof has been made the basis of reductions from competitive points, it will not be further reduced on the ground alone that it had at stated periods in the past been somewhat lower, unless it be shown that it is unreasonably high for the service performed. In this case the rate of 41 cents per 100 lbs. on cotton goods by sea and rail from Augusta, Ga., to New York was held not unreasonable, and the complaint was dismissed.

Grain Rates from Oklahoma to the Gulf Reduced.

In an opinion by Commissioner Prouty decision has been announced in the case of the Territory of Oklahoma v. Chicago, Rock Island & Pacific et al. The complaint asked reduction of the rates on wheat and corn from all stations in Oklahoma on the lines of the defendants when moving to Galveston for export. The defendants are the various railroad companies carrying this grain from points of origin in Oklahoma to Galveston, the other originating roads being the Atchison, Topeka & Santa Fe; Gulf, Colorado & Santa Fe; St. Louis & San Francisco, and Missouri, Kansas & Texas. The other defendants are railroads which receive this traffic at various junction points and carry it to destination. The Commission found that defendants' rates on wheat and corn from points in Oklahoma to Galveston for export are unreasonable and ordered them reduced.

The Basing Point System Upheld.

In an opinion by Commissioner Clements, decision has been announced in the two cases of the Commercial and Industrial Association of Union Springs, Ala., v. Louisville & Nashville et al., involving the reasonableness of rates from St. Louis, Nashville and Memphis to Union Springs as compared with the rates from the same points of origin to Columbus, Ga., and Montgomery, Eufaula and Opelika, Ala. No basis was found for a conclusion that the rates to Union Springs are unduly discriminatory, nor for a conclusion that the rates are unduly high in themselves. The Commission held that in a territory where the basing point system has been in operation since the advent of railroads, rates to a complaining point made by a combination of the through rate to the nearest trade center and the local rate beyond, need not, under the construction of the fourth section of the Act by the Supreme Court, be reduced to the basis of every neighboring point of like distance when the other points in the group whose rates are desired have the advantage of water or other competition. The complaint was dismissed.

Compression of Cotton in Transit.

The case of the Commercial and Industrial Association of Union Springs, Ala., v. Central of Georgia has been decided in an opinion by Commissioner Clements. This case involved alleged undue discrimination against Union Springs in the privilege of compression of cotton in transit. Complainant alleged that defendant refuses to apply the through rate from points of origin to points of ultimate destination on cotton shipped into Union Springs, there compressed and again shipped out, and that defendant being interested in compresses at other points favors such other points in hauling cotton there for compression. The Commission held that the testimony does not support the first alleged discrimination. The facts developed as a basis for the second alleged discrimination were conceded to be in a measure true, but whether compression of cotton in transit should be considered an incident of transportation, and therefore a matter wholly within the discretion and control of a carrier as to the instruments employed, neither the grower nor the consumer being directly interested, the Commission declined to decide without a general investigation covering the whole field of production and markets. Such a question cannot be determined on an insufficient inquiry at a single point. The complaint was dismissed.

MANUFACTURING AND BUSINESS.

J. W. Taylor, Jr., is associated with J. H. Burwell, Fisher building, Chicago, representing Edward H. Smith & Co., the Seeger-Gallasch Refrigerator Co., and the Automatic Ventilator Co.

The Vredenburg Company, 1332 Monadnock block, Chicago, was recently organized to take charge of the advertising of engineering, contracting and manufacturing companies. The manager, Clar-

ence Vredenburg, was editor and manager of *Engineering World* from its beginning until its recent sale.

The Atlantic Coast Line has installed in its shops at South Rocky Mount, N. C., a five-ton, three-motor, 72-ft. span electric Northern traveling crane made by the Northern Engineering Works, Detroit, Mich.

Iron and Steel.

The Lake Superior Corporation has taken a contract for 21,000 tons of rails for a Canadian road.

It is estimated that the mills have on their books orders for more than 2,000,000 tons of rails, over half of which is for 1908 delivery.

The New York, New Haven & Hartford and one or two other eastern roads are in the market for an aggregate of 2,000 tons of bridge material.

The American Bridge Company has orders for 15,000 tons of structural steel for the Portland & Seattle and for 350 tons for the Delaware & Hudson.

The McClintic-Marshall Construction Company has orders from the St. Louis & San Francisco for 3,000 tons of structural steel for new shops at Springwell, Mo., and from the Western Pacific for 2,000 tons of bridge material.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Corvallis & Eastern.—J. W. Newkirk has been elected Treasurer, with office at Portland, Ore., succeeding G. W. Talbot, resigned to go to another company.

New Orleans & North-eastern.—See New Orleans Terminal.

New Orleans Terminal.—D. D. Curran, President of the New Orleans & North-eastern, has been elected also President of the New Orleans Terminal.

St. Joseph & Grand Island.—See Virginian Railway.

Virginian Railway.—F. W. Russell, Secretary of the St. Joseph & Grand Island, has been elected Secretary of the Virginian Railway, with office at Norfolk, Va., effective August 15.

Wisconsin State Railroad Commission.—John Barnes, Chairman, has resigned.

Operating Officers.

Boston & Maine.—G. H. Folger, Superintendent of the Boston Terminal division, has been appointed to the new office of Assistant General Superintendent. G. L. R. French, Assistant Superintendent at Springfield, Mass., succeeds Mr. Folger. W. H. Ford, Assistant Superintendent at Lyndonville, Vt., succeeds Mr. French. George W. Cree succeeds Mr. Ford.

Chicago & Alton.—W. B. Causey, Engineer of Maintenance of Way at Bloomington, Ill., has been appointed Superintendent at that place, succeeding W. L. Derr, resigned to go to another company.

Mexican Central.—E. R. Walter has been appointed Acting Superintendent of the Chihuahua division during the leave of absence of W. T. Provence. S. J. Ross has been appointed Acting Superintendent of the Coahuila & Pacific and Saltillo divisions.

Mexican Southern.—W. L. Morkill, General Manager, has resigned, effective early next fall, to go to a company in Peru.

Union Pacific.—H. V. Hilliker has been appointed Trainmaster at North Platte, Neb., succeeding J. F. Clabaugh, resigned.

Traffic Officers.

Boston & Maine.—A. S. Crane, Export Freight Traffic Manager, has been appointed Assistant Freight Traffic Manager, with office at Boston. T. A. Dugan, Assistant General Freight Agent at Boston, has been appointed General Freight Agent, with office at Boston. George H. Eaton succeeds Mr. Dugan. F. S. Davis has been appointed Assistant General Freight Agent at Troy, N. Y.

Cleveland, Cincinnati, Chicago & St. Louis.—N. R. Johnson, General Agent at Cincinnati, has been appointed General Agent of this company and of the Peoria & Eastern at Peoria, Ill., succeeding to the duties of H. M. Griggs, division freight agent, transferred. C. O. Stimson, assistant division freight agent at La Fayette, Ind., has been appointed General Agent at that place. See New York Central Lines.

Grand Trunk.—C. E. Dewey division freight agent at Toronto, Ont., has been appointed Assistant General Freight Agent, with office at Montreal, Que.

New York Central Lines.—H. M. Griggs, division freight agent of the Cleveland, Cincinnati, Chicago & St. Louis at Peoria, Ill., has been appointed Assistant General Coal and Ore Agent of the New York Central Lines, with office at Cincinnati, Ohio.

Peoria & Eastern.—See Cleveland, Cincinnati, Chicago & St. Louis.

Engineering and Rolling Stock Officers.

Chicago & Alton.—See this company under Operating Officers.

Colorado Southern, New Orleans & Pacific.—H. M. Hensen, supervisor of bridges and buildings of the Denver, Kansas & Gulf, has been appointed Superintendent of Bridges and Buildings of the Colorado Southern, New Orleans & Pacific, with office at Beaumont, Tex.

Iowa Central.—W. D. Wheeler, Division Engineer at Minneapolis, Minn., has been appointed Chief Engineer of this company and of the Minneapolis & St. Louis, succeeding H. G. Kelley, resigned.

Minneapolis & St. Louis.—See Iowa Central.

Missouri Pacific.—A. C. Brower has been appointed Division Engineer at Wichita, Kan., succeeding E. C. Welch, transferred to the St. Louis, Iron Mountain & Southern.

Pennsylvania.—C. D. Gray has been appointed Assistant Master Mechanic at Ormsby, Pa.

Purchasing Agents.

Isthmian Canal Commission.—C. E. Dole is Acting General Purchasing Officer, with office at Washington, D. C.

LOCOMOTIVE BUILDING.

The Chicago & North-Western has ordered 10 ten-wheel locomotives from the Baldwin Works.

The Atchison, Topeka & Santa Fe has ordered 17 consolidation locomotives from the Baldwin Works.

The Wheeling Terminal Railway has ordered one locomotive from the American Locomotive Company.

The Butte, Anaconda & Pacific has ordered four locomotives from the American Locomotive Company.

The Philadelphia & Reading, it is said, is about to build 10 freight locomotives at its Reading, Pa., shops.

The Florida Phosphate Mine Corporation, Greenbay, Fla., is said to have ordered three locomotives from the Vulcan Iron Works.

The Sacramento Valley & Eastern, which is under construction, is in the market for locomotives. D. M. Riordan, 42 Broadway, New York, is President.

CAR BUILDING.

The Erie is reported to be figuring on new freight equipment.

The Louisville & Nashville is building at its own shops 3,000 freight cars.

The Louisiana & Arkansas has ordered one mail and baggage car from Barney & Smith.

The Canadian Pacific has ordered 500 box cars from the American Car & Foundry Company.

The Northwestern Elevated, Chicago, has ordered 40 cars from the American Car & Foundry Company.

The Illinois Tunnel Company, Chicago, is said to have ordered 500 cars from the Bettendorf Axle Company.

The Harriman Lines have ordered 250 50-ton tank cars of 12,500 gallons capacity, from the Cambria Steel Company.

The Georgia Southern & Florida has ordered one baggage and mail car and four express cars from Barney & Smith.

The Charlotte Harbor & Northern has ordered one passenger and baggage car and two coaches from Barney & Smith.

The Mobile, Jackson & Kansas City is in the market for 400 box cars of 40 tons capacity and 600 flat cars of 40 tons capacity.

The Northern Railway of Costa Rica has ordered 100 box and 100 flat cars from the Western Steel Car & Foundry Company.

The Delaware, Lackawanna & Western has ordered one baggage and mail car, one dining car and four coaches from Barney & Smith.

The Gulf & Ship Island has ordered three coaches, one baggage car, one mail and baggage car and one chair car from Barney & Smith.

The Sacramento Valley & Eastern, which is under construction,

is in the market for cars. H. M. Reardan, 42 Broadway, New York, is President.

The Mobile, Jackson & Kansas City has ordered thirty 36-ft. Hart convertible cars of 80,000 lbs. capacity from the Rodger Ballast Car Company.

The Higgins Oil & Fuel Company, Beaumont, Tex., has bought 25 tank cars of 80,000 lbs. capacity, or 10,500 gallons, from the German American Lines.

The Washington, Utah & Western, as reported in the *Railroad Gazette* of July 26, has ordered five 11-ft. flat cars of 70,000 lbs. capacity from the American Car & Foundry Company for October, 1907, delivery.

The New York Central Lines, as reported in the *Railroad Gazette* of May 31, recently ordered 11 baggage cars, seven mail and baggage cars and one passenger and baggage car from the American Car & Foundry Company.

The Chicago & Eastern Illinois, as reported in the *Railroad Gazette* of July 5, has ordered 2,000 steel underframe National dump cars of 100,000 lbs. capacity from the National Dump Car Company for January 1908, delivery. These cars will weigh 40,100 lbs. and will be 36 ft. 6 in. long, 9 ft. 8 in. wide and 4 ft. 6 in. high, inside measurements, and 10 ft. wide and 8 ft. 10½ in. high, over all measurements. The special equipment includes:

Brake beams	Simplex
Brake shoes	Streeter
Couplers	Janney
Draft rigging	Miner

The Isthmian Canal Commission is in the market for 500 all-steel double dump cars of 12 cubic yards capacity and 5-ft. gage, 100 cars for November 1, 1907, delivery at New York City, and 100 each month thereafter until all are delivered. These cars are to be 19 ft. long, 9 ft. wide and 1 ft. 10½ in. high, all inside measurements. The special equipment includes:

Axles	Open hearth steel
Air brakes	Westinghouse
Brake beams	Simplex
Brake shoes	Streeter
Couplers	Tower or Chicago
Draft rigging	Miner
Journal boxes	McCord
Trucks	Arch-bar
Wheels	33-in., 600-lb.

RAILROAD STRUCTURES.

Clinton, Iowa.—The Chicago & North-Western has let a contract for a double-track steel bridge to cross the Mississippi river. The bridge will cost $2,000,000 and is to be finished by February, 1910. It will be south of and adjoining the present single-track structure.

Clover Bar, Alb.—The May-Sharp Construction Company is building the piers for the Grand Trunk Pacific bridge across North Saskatchewan river.

Fort Worth, Tex.—The St. Louis Southwestern will build a new freight house at this place which, together with team tracks and storage yard, will cost $250,000.

New York, N. Y.—The Brooklyn Rapid Transit is to build a repair shop costing $300,000.

Ottawa, Ont.—The Grand Trunk has filed plans for a terminal station to cost $250,000 and a hotel north of the station to cost $1,000,000. Another hotel, on Nepean Point, may also be built.

Pittsburg, Pa.—The Pittsburg & Lake Erie, it is said, proposes to build a bridge over the Ohio river near this place to cost more than $1,000,000.

The Baltimore & Ohio, it is said, will build large storage warehouses and a cold storage plant at this place.

Vancouver, B. C.—The Vancouver, Westminster & Yukon will, according to press reports, soon begin work on the approaches to the proposed bridge over the Second Narrows. The plans for the bridge are said to have been approved by the Railroad Commission.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

Alberta Wheat, Coal & Oil Railway.—This company proposes to build from Pincher Creek Station, Alb., on the Crows Nest Pass branch of the Canadian Pacific, to oil wells owned by the Rocky Mountain Development Company and the Western Oil & Coal Consolidated Company. The company also proposes to build a spur from Pincher Creek Station to Pincher Creek on condition that the town guarantees $10,000 of its bonds.

Atlanta, Birmingham & Atlantic.—This company has secured its right of way into Birmingham, together with land for yards in the city.

Atlantic [illegible].—[illegible] one 42-mile line from Portsmouth, N. H., to Dover, and another, Me., with a branch line to York Beach and recently completed a connecting link from York Beach north to Kennebunk, 11 miles. This connects with the company's 27-mile line from Kennebunk to Cape Porpoise. Kennebunkport, West Kennebunk, Sanford, Springvale, Biddeford and Saco. By the use of connecting lines a route is formed to Old Orchard and Portland. The new line, it is said, completes a route of [illegible] miles from Lewiston, Me., through Boston and New York to Wilmington and other points in a considerable district around Philadelphia, Pa., with the exception of the break at the ferry across the Hudson river.

California Roads.—The Spencer Construction Company, Contractor, and the Lamb Davis Company, it is said, will [illegible] a railroad in Chelan county, up the Chiwawa valley via Lake Wenatchee to the Red mountain district. The company is capitalized at $1,000,000, and it is said has $1,000,000 on hand to carry out the work.

Canadian Pacific.—It is said that the company intends to double-track its main line from Winnipeg, Man., west to Brandon, 133 miles. Work on the double-tracking of the main line between Winnipeg and Fort William, Ont., was, it was announced this spring, to be finished this year.

Clark-Rocheport Railroad.—Right of way has been secured for this line, which is to run southwest from Clark, Mo., to Rochepport, 24 miles. James D. Wade, St. Louis, Mo., is interested.

East Moline & Campbell's Island.—Incorporated in Illinois to build a belt line from East Moline, Ill., around Moline to Campbell's Island in the Mississippi river. The Directors are: Joseph F. Porter and James F. Lardner, of Davenport, Iowa; Burton F. Peek, Cyrus E. Dietz and O. E. Childs, of Moline, Ill.

Enid, Blackwell & Osage Interurban.—This company has been incorporated in Oklahoma with $1,000,000 capital stock, to build from Enid, Okla., to Pawhuska, 85 miles. Headquarters are at Enid. The incorporators are George W. Bear, Frank Bradfield, John R. Clover, S. I. Hudkins, A. W. McQuilkin, T. C. Cone and Guy S. Manatt, all of Enid.

Erie.—Preliminary surveys have been made for a low-grade cut-off on the Delaware division, which, it is said, will eliminate many curves and will shorten the present line 34 miles.

Franklin & Towamensing Street Railway.—This company, it is said, has secured all the right of way for its proposed line from Slatington, Pa., to Lehighton, nine miles, and work is to be begun at once.

Grand Trunk.—This company, it is said, plans extensive additions to its Brockville, Ont., yards.

Grand Trunk Pacific.—It is expected that, before winter, grading will be finished to Edmonton, Alb., 740 miles west of Winnipeg, and tracks laid to a point 456 miles from Winnipeg.

Gulf, Colorado & Santa Fe.—Work is under way on the rehabilitation of the old Gulf & Interstate, which runs from Beaumont, Tex., to Galveston and was recently taken over by the G., C & S. F.

See Corporation News.

Kansas City Southern.—Work was begun near Mena, July 1, on the 120-mile cut-off to secure easier grades from Siloam Springs, Ark., south along the Arkansas-Indian Territory boundary line to Cherokee Junction, Ind. T., thence to Fort Smith, Ark., and through Sebastian and Scott counties, joining the old main line near Mena. (March 15, p. 385.)

Las Vegas & Tonopah.—Preliminary surveys have been made for a line from Goldfield, Nev., to Tonopah, 16 miles. It is said that within two weeks grading will be finished on the extension from Rhyolite to Goldfield, 76 miles.

Long Island.—Work has been begun on the four-track cut-off between Glendale Junction and Woodside at the entrance to Sunnyside yard in Long Island City. (March 15, p. 386.)

Mexican Central.—The Atotonilco branch from Ocotlan, on the Guadalajara division, northeast to Atotonilco, 30 miles, was opened for traffic on July 1.

Mexican Roads.—The Guerrero Development Company has made surveys for a road from Acapulco, Guerrero, into the interior toward Mexico City, and is asking bids for building the first 150 miles. The company owns large tracts of mineral and timber lands in Guerrero.

It is said that Rafael Arodena intends to build a road from Santa Teresa, Coahuila, on the Mexican Central 65 miles to his cotton plantation.

Milwaukee Northern (Electric).—Grading has been finished on this line from Milwaukee, Wis., to Port Washington, and work

is about to begin on the rest of the line from Port Washington to Sheboygan. It is expected that the road will be ready for operation early in September.

National Lines of Mexico.—It is said the Mexican Government will begin at once the construction of a new line about 365 miles long from Durango, on the Mexican International, southwest to Mazatlan, on the Pacific coast.

Pacific & Eastern.—Surveys are reported made by this company for a line from a point in Siskiyou county, Cal., north to Crater Lake, in Klamath county, Ore., 100 miles. It is said that a length of 11 miles is already in operation and rights of way are being secured. The work is being done by the company's men. W. C. Morris, President, Portland, Ore.; G. W. Donnell, Chief Engineer, Medford, Ore.

Pennsylvania Lines West.—It is said that the gravity yard to be built near Bedford, Ohio, is to have a capacity for 2,300 freight cars, instead of 1,300 as originally intended.

Quebec & Lake St. John.—The Gosford branch, from Valcartier Station, Que., to Riviere aux Pius, six miles, was opened Aug. 1.

Spokane & Inland.—The Western division was to be opened for traffic south to Colfax, Wash., on August 1. It has been in operation to Rosalia, 30 miles north of Colfax, since March.

Texas & Pacific.—Track has been laid to Eunice on the line under construction from Bunkie, La., to Eunice, 35 miles. The road, which was the Louisiana East & West, is to be operated as part of the Avoyelles division of the Texas & Pacific.

Texas Roads.—E. W. Grove and others of St. Louis, Mo., are planning a road from Kingsville, Tex., on the St. Louis, Brownsville & Mexico, to San Antonio, 150 miles. It is said that San Antonio has been asked to give a bonus of $100,000 in money, and land for terminal facilities as a condition preliminary to building the line.

Toledo & Fort Wayne (Electric).—Incorporated in Ohio with $10,000,000 capital to build an electric line from Toledo, Ohio, southwest to Fort Wayne, Ind., about 75 miles. The incorporators include: E. J. Pinney, H. J. Nord, T. C. Willard, L. A. Goldstein and J. E. Lowry.

Western Pacific.—According to press despatches, this road will be opened for business from Salt Lake City, Utah, to Steptoe, Nev., 170 miles, early in September.

Wisconsin Central.—This company, it is said, has made surveys for a belt line around the northern part of Manitowoc, Wis., ending at Buffalo and Chicago streets, where a warehouse and a car ferry transfer bridge are to be built. It is understood that the necessary property was bought some years ago.

Yankton Southern.—This company has bought the franchise and right of way of the Houston, Sabine & Red River, on which some grading has been done. (See June 21, p. 917, and March 15, p. 385.)

RAILROAD CORPORATION NEWS.

Atchison, Topeka & Santa Fe.—J. P. Morgan & Co., New York, have bought the unsold balance of the $26,000,000 10-year convertible 5 per cent. bonds, of which about $9,000,000 were subscribed to by stockholders and about $2,000,000 disposed of to other interests. It is said that the bonds were sold to J. P. Morgan & Co. at about 98. The bankers are offering them for sale at 100¼.

Atlantic Shore Line (Electric).—This company opened for traffic on July 21 its connecting line between York Beach, Me., and Kennebunk, 16 miles. This line connects the Southern division, which was formerly the Portsmouth, Dover & York, with the Northern division, which was formerly the Atlantic Shore Line Railway, these companies having been consolidated last year under the name Atlantic Shore Line Railroad. Almost half of the connecting link is built on private right of way. The maximum grade is 4 per cent. and the numerous culverts and bridges are of concrete or steel. The opening of this link makes it possible to travel over electric railways from New York to Bath, Me., and beyond. The road carries a heavy summer passenger traffic and has three electric locomotives for hauling freight cars. It connects with the Boston & Maine at Springvale, Kennebunk, West Kennebunk and Wells. At Cape Porpoise, near Kennebunk, it has a pier and freight-house and has leased other wharfs from the town. It is planned to ultimately establish a steamship line from this port to Portsmouth and Boston. Electricity is generated by water power at Kennebunk and Sanford, and by steam plants at Kennebunk and Kittery Point. The company is controlled by A. H. Bickmore & Co., New York. It has $700,000 4 per cent. preferred stock, $2,000,000 common stock and an authorized issue of $3,000,000 4 per cent 20-year refunding bonds.

Baltimore & Ohio.—Earnings for June, 1907, and for the 12 months ended June 30 were as follows:

Month of June, 1907.			
Gross earnings	$7,196,085	Inc.,	$623,271
Operating expenses	4,747,839	"	526,525
Net earnings	$2,448,246	Inc.,	$96,746
Year Ending June 30, 1907.			
Gross earnings	$82,243,922	Inc.,	$4,851,866
Operating expenses	54,880,091	"	5,364,870
Net earnings	$27,363,831	Dec.,	$513,004

Buffalo & Susquehanna.—Fisk & Robinson, New York, have sold $900,000 5 per cent. equipment trust notes, dated August 11 and maturing in 20 equal semi-annual instalments. They are part of an issue of $1,200,000 and are secured on 20 locomotives, 800 steel coal and coke cars and 200 steel underframe box cars.

Buffalo, Rochester & Pittsburg.—A semi-annual dividend of 2½ per cent. on the $10,500,000 common stock has been declared payable August 15, a reduction of one-half of 1 per cent. as compared with the last semi-annual dividend. The stockholders, however, will receive as large a return on their holdings as formerly, because a dividend of 2 per cent. has been declared on the stock of the Mahoning Investment Company, which stock was distributed last December to holders of Buffalo, Rochester & Pittsburg stock to the extent of 25 per cent. of their holdings. The Mahoning Investment Company took over the coal properties of the railroad.

Central of Georgia.—See Wrightsville & Tennille.

Chicago Electric Traction.—This company has been sold under foreclosure for $330,000. The company operates 31 miles of line from Chicago to Harvey, Ill. It has been in the hands of a receiver since 1900, no interest having ever been paid on the $650,000 first mortgage 5 per cent. bonds of 1929. The road is ultimately to be merged with the Chicago & Southern Traction, which runs from Harvey to Kankakee, 40 miles.

Dublin & Southwestern.—See Wrightsville & Tennille.

Gulf, Colorado & Santa Fe.—This company has arranged for trackage rights over the St. Louis, Watkins & Gulf from Oakdale, La., to Alexandria, 38 miles, and over the Texas & Pacific from Alexandria to New Orleans, 194 miles. The Gulf, Colorado & Santa Fe is building an extension from Cravens, La., to Oakdale, 25 miles. It intends ultimately to build to New Orleans.

Houston & Brazos Valley.—It is said that this road, formerly the Velasco, Brazos & Northern, which runs from Anchor, Tex., to Velasco, 20 miles, and connects with the St. Louis, Brownsville & Mexico at Angleton, Tex., has been sold to Yoakum interests.

Interurban Railway & Terminal.—This company, which owns 83 miles of broad gage interurban road from Cincinnati, Ohio, to New Richmond, Lebanon and Bethel, is to issue $1,000,000 preferred stock, part of which will be exchanged for $900,000 of the outstanding $2,500,000 common stock, while the remainder will be used to pay off old obligations.

Mahoning Investment Company.—See Buffalo, Rochester & Pittsburg.

Pittsburg, McKeesport & Greensburg.—See West Penn Railways.

St. Louis, Brownsville & Mexico.—See Houston & Brazos Valley.

Southern.—Earnings for June, 1907, and for the 12 months ended June 30 were as follows:

Month of June, 1907.			
Gross earnings	$4,609,305	Inc.,	$315,735
Operating expenses and taxes	3,432,709	"	207,012
Net earnings	$1,176,596	Inc.,	$108,723
Year Ending June 30, 1907.			
Gross earnings	$56,657,994	Inc.,	$3,016,556
Operating expenses and taxes	44,699,282	"	4,926,143
Net earnings	$11,958,712	Dec.,	$1,909,587

Toledo, Ann Arbor & Detroit (Electric).—The property of this company, which has been in the hands of a receiver since August, 1906, is to be sold under foreclosure between September 3 and 17. It is partially built between Toledo, Ohio, and Ann Arbor, Mich.

West Penn Railways (Electric).—This company has bought a controlling interest in the Pittsburg, McKeesport & Greensburg, which runs from Trafford City, Pa., on the Pittsburg Railways, to Youngwood and Hunker, 29 miles, and has outstanding $1,030,000 stock and $1,350,000 first mortgage, 5 per cent. bonds of 1931.

Wrightsville & Tennille.—The stockholders of this company and of the Dublin & Southwestern met on August 1 to authorize the consolidation of the two roads, to increase the capital stock of the Wrightsville & Tennille from $300,000 to $600,000, and to authorize an issue of $300,000 bonds. The Wrightsville & Tennille runs from Tennille, Ga., to Hawkinsville, and it owns the entire $200,000 stock of the Dublin & Southwestern, which runs from Dublin, Ga., to Eastman, 31 miles. The Wrightsville & Tennille is controlled by the Central of Georgia.

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EDITORIAL ANNOUNCEMENTS.

THE BRITISH AND EASTERN CONTINENTS edition of the Railroad Gazette is published each Friday at Queen Anne's Chambers, Westminster, London. It contains selected reading pages from the Railroad Gazette, together with additional British and foreign matter, and is issued under the name Railway Gazette.

CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.

ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

OFFICERS.—In accordance with the law of the state of New York, the following announcement is made of the office of publication, at 83 Fulton St., New York, N. Y., and the names of the officers and editors of The Railroad Gazette:

OFFICERS:

W. H. BOARDMAN, *Pres. and Editor*	RAY MORRIS, *Secretary*
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BRAMAN B. ADAMS	FRANK W. KRAEGER
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RODNEY HITT	BRADFORD BOARDMAN

CONTENTS

VOL. XLIII., No. 6. FRIDAY, AUGUST 9, 1907.

A suggestion for profitable use by the mills of the larger crop-ends of ingots from which rails are rolled in accordance with the proposed modified specifications comes from Robert W. Hunt, a good authority on rails. The reason for cutting off only 10 to 12 per cent. of the top of the ingot, instead of twice as much, is because this added discard means waste and reduced output. Perhaps these crop-ends can be converted into a profitable by-product. Captain Hunt's idea is to make angle-bars of them. Most of the angle-bars used at present are the same composition as ordinary soft wire rods, being made by the mills from the same ingots and rolled at the same time that the billets for the rods are produced. They are punched and sheared cold. Angle-bars made from rail ingot crop-ends would have nearly the same constituents as the rail steel; and at first thought high-carbon steel for angle-bars seems objectionable. But their use would not be a new departure, for the Canadian Pacific's angle-bar specifications are substantially those of its rail steel, with a carbon content of from 0.50 to 0.65. The Canadian Northern is also using high-carbon bars. The late A. Torrey was perhaps the first to recognize the economy of high-carbon steel in angle-bars and used them on the Michigan Central, of which he was Chief Engineer. He noted the rapid wear of soft bars, due to the motion of the rails, and the fact that they would take a permanent set and thus hold down the rail joint. He found that sometimes when the soft angle-bars were removed from a low joint the rails would spring back to a level surface. The high-carbon bars, especially those made from crop-ends, will break more readily than the others, of course, but a broken angle-bar is not a serious matter and with ordinary watchfulness no harm should result.

Still another suggestion for a profitable use of nearly all of the proposed 25 per cent. discard from the ingot comes from the chief engineer of one of the most important railroads of this country. It is that the ingot be not cropped but all of it made into the bloom and rolled to a finished rail section. Then cut from the rail 8 ft. lengths until strictly homogeneous steel, without piping, is reached. These 8 ft. lengths can be rolled into almost any imaginable section and shape for steel ties by the York cross-rolling process. It is believed that the amount of work put into the metal tie by this cross-rolling process will be quite enough to make a sufficiently strong tie, and especially for the reason that the larger rail sections rolled into steel ties have great excess strength, so that there would be a large coefficient of safety even if defective metal were used. There is one difficulty about this: No shape of steel tie has yet been devised to entirely fill the office of the wooden tie. It is necessary to secure a resiliency which will somewhat correspond to that afforded by the material of the wooden tie, the slight lateral movement of the spike in the wood and the slight canting of the rail due to the fact that it is not held with absolute rigidity to the tie. The steel tie must be made of such a form as to prevent its lateral movement in the ballast. It must also be capable of insulation, for apparently the electric track circuit for signaling purposes has come to stay. The steel tie also needs protection from rust. We have, therefore, clean cut problems for the designing engineer. If he can devise a form of steel tie that will satisfy the requirements, the cross-rolling process, either applied to old rail or to piped rail, is apparently cheap and effective.

The Pennsylvania is having a hard time satisfying the many demands of the city authorities in completing the plans for its terminal improvements in New York and Brooklyn. Last week, after long and apparently unnecessary delay, the Board of Estimate finally granted the franchise for building the Glendale cut-off, the last connecting link between the Manhattan crosstown tunnels and the New York Connecting belt line around Brooklyn, but on the same day the Municipal Art Commission rejected the plans for the Hell Gate bridge. The Commission was not satisfied with the attempted ornamentation of the massive towers flanking the great steel arch, and the architects will have to try again, which means more delay in starting the work. Since the time when Mr. Cassatt first announced the company's plans for an entrance in New York and an enlargement of the terminal facilities in Brooklyn and Long Island City the Pennsylvania has been met on every side with obstructive tactics. The Board of Aldermen held up the required franchises because the railroad refused to pay up the graft demanded. With the assistance of other powerful interests which were being obstructed in the same way, the company succeeded in having the Legislature transfer the right to grant franchises from the Aldermen to the Board of Estimate. Some of the required franchises

were quickly obtained from that body, but the New York Connecting plan was held up for nearly two years before the railroad gave in to the exorbitant demand for a payment to the city, aggregating $1,210,000, simply for the right to cross a few streets overhead in the outlying districts. The Sunnyside yard plans were similarly obstructed and the company was assessed a large sum for the privilege of closing some projected streets through land which is now a swamp. The Municipal Art Commission, however, cannot be accused of using obstructive tactics in rejecting the bridge plans. It is a disinterested body appointed for the purpose of rendering just such a verdict, if deserved, and its objections are aimed only at the artistic features of the design, not the engineering features. Nevertheless, it must be discouraging to the Pennsylvania to see every step of its work, which is really more of a public than a private enterprise, thus hampered and delayed.

THE COSTLY MISTAKE OF STATE RAILROADS

The advocates of governmental railroad ownership and control have recently been presented with a considerable amount of evidence damaging to their cause. Witnesses before the Viceregal Commission on Irish Railways have been forced to admit, in spite of their preliminary panegyrics, that on the state railroads with which they have been connected, the average level of rates and fares is higher, and the facilities given to the public lower, both in regard to freight and passenger traffic, than in Great Britain. This condition of affairs exists notwithstanding the often asseverated contention on the part of the administrations that the railroads in question are operated, in the first instance, for the benefit of the community, the earning of profits being relegated to the background, and regarded as merely incidental.

Now that is a widespread idea with regard to the administration of state-owned railroads, and is especially entertained by people who are, fortunately for themselves, without practical experience as to what the operation of a railroad system by the state really means. Perhaps one reason for the existence in England of a body pledged to the nationalization of the railroads is just the absence of real knowledge in the matter. In many respects, belief in the natural superiority of state-owned and operated railroads appears to be a matter of faith rather than of experience or reason, since the more one compares the operation of typical state and company-owned railroads, the more the disadvantages of governmental interference emerge. In this respect, E. A. Pratt, in his "State Railways," has performed a signal service in giving in striking form some facts about the price paid by a country for the theoretical benefit to be obtained by entrusting its railroads to the tender care of a government, instead of allowing the healthy competition inseparable from private enterprise.

The greater part of this book is taken up with a translation of some excellent recent articles on the Belgian state railroad administration. Belgium is a country that at first sight would appear particularly suited for the development of a highly successful railroad system. It is small, compact and densely populated, manufactures and agriculture are alike highly flourishing, the distribution of the population is fairly even, and from the engineering standpoint the flatness of the country offers no great difficulties to the laying out of railroads, thus enabling them to be both cheaply built and worked. The upholders of the state railroad superstition have consequently always pointed to Belgium as a country in which government control was working admirably, and it has been regarded by these individuals, including many Englishmen, as a sort of railroad paradise. As a matter of fact, the system, without exception, is defective in every detail in which a state railroad theoretically excels.

The average standard of pay, both of the uniformed staff and of the higher officers, is very low, not only as compared with English standards, but in comparison with the rest of the Continent. In spite of this, an excessive amount is spent on wages and salaries, owing to the great overstaffing that takes place in every department, which, however, does not prevent the hours being enough to make the hair of the Board of Trade stand on end. The state railroads employ approximately half as many men again per mile as the private Belgian companies. This overstaffing has invariably been one of the evils of government departments, and an interesting sidelight on the matter is provided by the statement that the red-tape regulations of the Belgian service provide for the employment of the same number of men at stations of the same class, regardless of the respective traffic handled by them.

Apart from the question of wages and hours, the Belgian state, at any rate where its railroads are concerned, is a bad employer of labor. In the matter of pensions, and traveling facilities, such as privilege tickets, it is niggardly in the extreme. The administration has even gone to the length of repudiating obligations into which it has entered when taking over the private companies, whose employees had already been contributing to superannuation and pension funds, and who apparently lost their contributions when the state acquired the undertakings by which they had formerly been employed. Should an employee bring a claim against the administration for personal injuries, it will be resisted as much as possible, and in the event of the courts deciding in favor of the employee, a loophole by which the responsibility may be evaded is always sought. These conditions are the more striking when it is borne in mind that the Socialist party is numerically very strong in the Belgian parliament, and is continually ventilating the grievances of the staff.

After this description of the treatment of its men, no one will be surprised to learn of the cavalier attitude adopted by the administration towards the general public. The passenger fares may be low, but they have to be considered in the light of the low speed of the trains, the infrequency of the service, the inadequate accommodation given at many of the stations, and the general drawbacks to "passenger comfort." No new train is ever put on except under strong pressure, and until the Minister of Railroads has satisfied himself that it will be run at a profit. This latter condition is, of course, perfectly reasonable in itself, but it must often be incompatible with the theory that on a state railroad the convenience of the public is the first consideration, and the question of profit a secondary matter.

The freight service appears to be even worse than the passenger. The conveyance of merchandise is slow and uncertain, and the shortage of locomotives and wagons so chronic that it does not excite special remark, except at times of particularly heavy traffic, when traders and the country in general are put to worse inconvenience than usual. On occasion, the administration has even been obliged to resort to the desperate expedient of refusing to receive any fresh consignment whatsoever for a period of three days, until the existing congestion had been somewhat reduced. In this particular instance it is clear that the congestion was less due to abnormal and unexpected traffic than to general disorganization and failure to make provision for the acquisition of sufficient rolling stock. A general complaint is that the red-tape regulations of the service have produced a cast-iron system under which any concession that would lead to the encouragement of a particular industry or district is practically ignored.

Glib writers on the alleged defects of private railroads have held up the low Belgian freight rates as an admirable example. Now the truth about Belgian rates is that they are only low in the case of through joint rates with foreign countries, and for journeys, such as between England and the Continent, where a certain small proportion of the total transit is made across the Belgian lines. Here low rates are compulsory on account of the competition of other Continental railroads, German, French and Dutch, and of water transport. Local rates in Belgium itself, that is the rates vitally affecting the domestic commerce of the country, are high when judged by any standard. The coal rates for distances of 9¼ to 16¼ miles are, for example, 6.2 to 10.4 cents higher on the Belgian state railroads than on the Eastern of France. This fable of the low freight rates charged in Belgium deserves to be universally recognized as only a fable.

It might perhaps be imagined that the financial results of state operation are favorable, especially as every effort is made to earn as large a profit as possible. The actual financial position of the system, like that of practically every other Continental state railroad, it is impossible to know, but it has been proved within recent years that the net earnings are appreciably less than had been assumed. Accounts, in the real sense of the word, are non-existent, although their place is taken by voluminous statistics, containing pages of perfectly unnecessary details. The railroad accounts are distributed under five separate and distinct budgets, considerable sums being charged to general public expenditure. It may be doubted whether anyone, even the Minister of Railroads, knows exactly how much the railroads cost to work, or their value as a going concern. One definite fact has been brought out by a report which has recently been drawn up by M. Hubert, Deputy of the Right, at the request of the Belgian Chamber. This clearly shows one very disquieting feature, the constant rise in the ratio of expenditure, which appears to be gradually swallowing up the profits of the system, in spite of the way in which the roads are starved by lack of adequate rolling stock and station accommodations and

notwithstanding the high rates charged. The report shows that in 1905 while the traffic receipts increased by 15,170,000 francs ($3,034,000) the rise in expenditures amounted to 15,570,000 francs ($3,114,000). M. Hubert goes on to sound a warning with regard to the future by saying that in the event of a general trade depression, which would result in reduced traffic, the cost of operating the system could not be reduced and the result would be a heavy loss from operation. According to this report, the chief causes for the increased expenditure are the lack of unity in the management of the lines and the crushing out of all spirit of initiative among the staff by the uniformity of salaries, defects which characterize most forms of state enterprise.

Possibly the worst feature of the entire administration is the interference of politics with an undertaking that should be conducted on a purely commercial basis. A very large part of the time of the Belgian parliament is taken up by members' complaints or suggestions with regard to the railroad service; the railroad budget is discussed for weeks, and every trifling question affecting the railroads is unnecessarily ventilated in parliament. The loss of time involved by this proceeding is obvious, and in spite of the great attention given by the parliament to railroad matters, it appears to be only on very rare occasions that any tangible results are obtained. Favoritism, largely due to political considerations, is rampant in the service, and the employees are practically forbidden to join political or labor unions, although the constitution expressly gives them the right to do so, unless the organization is one in harmony with the views of the government for the time being, in which case the men's political activity is winked at.

The above brief analysis of some of the most outstanding defects of the Belgian state railroad administration could be carried to much greater length, without presenting a complete indictment of the system. What must be appreciated is, not that the administration of the Belgian railroads is too expensive, that the facilities given to the public are insufficient, that the status of the employees is worse than those working for private corporations, that political considerations tend to have greater weight than the social and industrial welfare of the country, and that the accounts are so juggled with as to be absolutely unreliable, but that all these defects are the logical outcome of state interference with an essentially commercial undertaking.

Per se, no commercial enterprise has ever failed to suffer on the state assuming control. The use of a government department for purposes of party politics, the cast-iron system evolved from red tape and the lack of initiative inseparable from the average government official, the political influence that can be exerted by its employees and by labor leaders agitating for their own benefit, the disregard of the public caused by assuming that the public exists for the benefit of the department instead of being its master, the ease with which accounts can be cooked and responsibility evaded for financial or administrative blunders, and the lack of healthy competition, can all be expected to characterize a system of railroads owned and controlled by the state. On the Belgian state railroads, so long upheld as a model, these conditions have been proved to underlie every branch of the administration. It is consequently a service of some value to make public the truth regarding this system of state railroads, which may be regarded as typical.

THE SETTLEMENT OF FREIGHT CLAIMS.

W. B. Biddle, Vice-President of the Chicago, Rock Island & Pacific, in a circular to the patrons of his road, warning them that nothing is gained by employing agents to collect claims against the road, says that he and his fellow officers are making an earnest effort to improve their treatment of both local and interline claims; that many subordinate traffic officers have authority to settle some classes of claims on presentation, and that the company intends to give as careful attention to claims against it as to cases where the company has claims against other people. He admits that the railroads have not done justice to the matter of settling claims, but the managing officers of the Rock Island are now taking a personal interest in the work and hope to establish a reputation for promptness and fair dealing. Colonel H. G. Prout, Vice-President of the Union Switch & Signal Co., in an address which was printed in the *Railroad Gazette* July 19, told the traffic men some plain truths, which indicate that on some railroads the conditions are bad. To Colonel Prout the claim department seems to be a highly efficient organization for obstruction. He evidently finds little disposition by claim agents to learn the truth by judicial process, or to take a kindly attitude toward claimants. He protests against being considered a swindler until at least given an opportunity to prove himself to be an honest man.

The settlement of freight claims on a large railroad is a heavy task at best, and the tendency of the freight claim office will always be [illegible]. A claim requiring three weeks to investigate [illegible] to the claimant [illegible] that he is surprised at the delay. The [illegible] agent who merely tells the consignee that the other road is to blame for the delay [illegible] that he ought to apologize [illegible] the other road as carefully as for his own, would [illegible] satisfaction if he were polite and explanatory and [illegible] the necessary time to settle interline claims. The question which will interest railroad officers is how fully can Mr. Biddle and [illegible] disposed railroad managers carry out their purpose to cure the causes of Colonel Prout's complaint?

The interesting paper by the Freight Claim Agent of the New York Central, which is reprinted in this issue, does not throw much light on the actual work of settling claims. Mr. Calkins tells of some of the things that cause damage and the original claims, and he reminds us that the competent claim agent will be able to make friends of claimants even if they do have to wait a long time for their money, but the means of expediting the machinery he hints at: (1) Thorough system, devoid of cumbersomeness; (2) prompt investigation; (3) uniformly business-like treatment of claimants; (4) avoidance of disputes about small claims where no important principle is involved. These hints, however, suggest a number of pertinent questions.

To take the last point first, there is little doubt that a railroad could make friends whose friendship would be valued in dollars, by paying many small claims, presented by reputable people, without standing on its full rights—just as the great fire insurance companies do. This is the frequent method of settling for injuries to passengers. Of course, if such policy were followed in the freight department the fact that rights were being waived with the reason should be distinctly stated and even advertised. It is to be remembered that when the owner of damaged or delayed freight receives his full legal claim he still suffers in many cases a further loss for which the law will not allow him to recover.

Uniformly business-like treatment of claimants implies a competent agent or clerk at every station, and this is only partially attainable. In this connection we recall the highly commendable suggestion of one claim agent that every large station should have a claim clerk who has been trained in the general claim department; who perhaps should report direct to the general claim agent. Such a clerk could handle the claims presented at other stations within say 50 miles and thus save some time and possibly much friction.

Steady uninterrupted progress, almost daily progress, toward settlement is the desideratum. It requires time, but time need not be wasted in careless reading of letters or delay in answering them. A wideawake claim agent needs not much instruction or exhortation concerning the design or construction of his office machinery; but evidently a great many claim agents need to learn how to make their machinery move continuously. Do you answer all possible letters on the day of receipt? Do you know that this is easier, takes less of your time, than to allow letters to accumulate?

Much of the delay complained of is due to the dulness or inattention of men who do not carefully read letters received, or intelligently compose letters sent. They answer questions not asked and ignore the intent of inquiries. This causes additional letter writing and more days of delay in settlement. Premiums for excellence in letter writing, properly advertised among the clerks, might produce an improvement. Besides accuracy and promptness, clerks may cultivate courtesy. "Politeness is a requirement," said General Devereaux in an address to trainmen when he was President of the Big Four. It is especially useful in dealing with customers whose claims must be rejected. Mr. Calkins speaks of inducing claimants to see the railroad's side of a case, even when they are feeling disgruntled. Extreme courtesy by the company's representative is the only means to this end.

Revised Signaling Rules of the Belgian State Railroads.

The Bulletin of the International Railway Congress for July contains an article on the Convertible Semaphore Signal which is the standard of the Belgian State Railroads, and the description is prefaced by an extract from the new general signal rules of the State railroads, which are now in press. The article is by L. Weis-

senbruch, editor of the *Bulletin*, who also is Chief Engineer of Signaling and Safety Appliances of the State railroads.

The standard semaphore is a box girder made up of four angles and stiffened with horizontal lattice members. The fittings are so designed as to make all parts interchangeable for use with one or more arms, and with arms on either side of the post. For the support of the lamp or lamps a wire rope is provided, controlled by a windlass near the bottom of the post. The foundation is of cast-iron set in concrete. Provision is made for the use of indicators to show by a letter or number the track for which a signal arm is cleared. The use of indicators seems to be regular standard practice. They are to be used for speed up to 25 miles an hour. The spectacles for the night color indicators are separate from the arm, and are controlled by stops on the arms. These stops are so arranged that the light shows "proceed" a little after the movement of the arm, while it returns to "stop" a little in advance of the arm.

The new signal regulations, which, it would appear, have to do chiefly with future installations, seem to be in some respects tentative. Signal arms are always on the left of the post and signals usually at the left of the track. At a station a home signal arm with a notched end, like our distant signal, indicates a full speed or main line route, while the ordinary square end (full size) is used for movements to diverging tracks. In all new work bracket signals—called there "candle stick" signals—are to be used for diverging routes, a separate post for each route. For distant signals the arm has a pointed end, like that which has been adopted on the New York Central and some other American roads for automatic stop signals. Where two or more arms are on one post the upper arm applies to the high speed route in every case. No dwarf posts are shown, but short arms are used for low-speed movements in the normal direction, while for "back up" movements the shape of the arm is that of two triangles joined at the vertices. The upward inclination is prescribed for new semaphores, but the old signals, having downward inclination, have not been changed as "experience has shown that this difference causes no trouble whatever to the enginemen."

Green has been adopted for the night "all clear" indication and the process of taking out the white lights, heretofore used, is now going on. Back lights will, in future, be made visible only when the arm is in the stop position, and they will be either a small white light or a violet light. Block signals are to be fitted with an arrangement for automatically placing a torpedo on the rail when the arm is horizontal, but it does not appear from the present description to what extent automatic torpedoes are or will be used. At stations, as before stated, a notched arm indicates a high-speed route and a square end arm a lower speed; this difference is indicated at night by showing a double green light for the notched arm (in the proceed position).

In distant signals at night, the signal when "on" will show a red light side by side with a green light, or it will show a yellowish orange light. Where the red-and-green is used the clearing of the arm will make two green lights visible; while with the orange light a single green light is used for "all clear." With this last arrangement (an orange light and a single green light) there will be provided a fixed audible warning 227 ft. in the rear; or a repeating light will be thus fixed, to be lit only in time of fog. This light will show orange and green the same as the regular distant signal. This arrangement appears to be subject to confirmation after further experiments shall have been made.

The standard rules have a provision for putting up white posts along the side of the track a short distance apart approaching a caution signal, this to seasonably attract the attention of the enginemen.

As a rule the number of arms on any one post must be limited to three. The State proposes to rearrange all junctions so that trains will not have to slacken speed, this done, the notched arm and the double green light can be done away with. At interlocklings where necessary or desirable a semaphore is fixed at the outgoing end of the section of track for which the interlocking signals give indications. This seems to be designed chiefly or wholly as a limit mark and not an independent starting signal.

As Belgian signal engineers are careful students of English, German and American practice this new code, of which we have given the salient features, may be taken as an instructive exhibit of what unprejudiced observers have found worth copying from the devices and practices of the different countries. We are unable to make out just how far the several innovations have been decided upon for permanent use, but even as tentative propositions they will be found of interest by American railroad officers. The free use of bracket signals is an English idea that most Americans will not accept, but some of the other changes have features well worthy of consideration. The use of both upward and downward inclinations on the same railroad should reassure some nervous Americans. The distant signal improvements evidently have been taken mostly from American practice; while in the use of double green lights, warning signals in the rear of distants, and white fence posts, Americans may well learn from Europe.

The order for distributing coal cars in Ohio recently issued by the Interstate Commerce Commission, and reported in our news columns to-day, looks like a fine example of Dutch justice; and readers will be interested to see the full report on the case and learn how Commissioner Clark makes this kind of justice match with that kind which is supposed to underlie the law that a railroad must furnish all the cars necessary to do the business offered by shippers along its lines and must treat all shippers alike. Quite likely, when cars are scarce, Mine *A*, receiving 25 Pennsylvania cars to load with coal for the Pennsylvania's locomotives, can get along without any Hocking Valley cars and suffer less than will Mine *B* even when 10 or 15 H. V. cars are delivered to it. Moreover, as the coal road—the Hocking Valley, for example—pays for its use of the private or specially assigned cars there is a semblance of fairness in compelling it to treat such cars for the purpose of distribution, as though they were its own. But the other view is equally plausible. Suppose Mine *A* concludes to double its capacity, and to use the increased capacity, not for Pennsylvania Company's coal, but for the general market. Should not the railroad company provide cars for this market coal the same as it furnishes them for market coal from any other mine? Does a coal operator who buys cars in which to ship his coal thereby relinquish his right to being served by all common carriers on an equality with every other shipper?

CONTRIBUTIONS

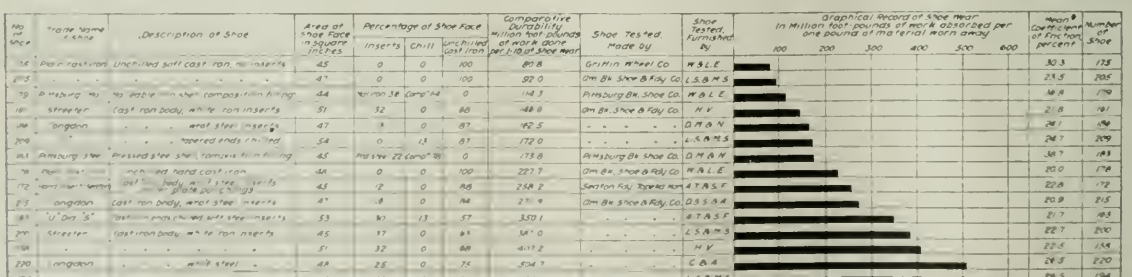
M. C. B. Tests of Brake Shoes.

Mahwah, N. J., July 30, 1907.

To the Editor of the Railroad Gazette:

The table and diagrams presented in the report of the standing committee on brake shoe tests of the M. C. B. Association at the last convention while clear to many of those who have followed closely the work and reports of the committee, do not, in the opinion of the writer, give sufficient information to enable comparisons to be made between the various shoes tested.

The table which I submit herewith is part of my discussion on the subject, and is intended to supply some information in detail to supplement the committee's report. I realize that the committee's report is in the nature of a preliminary one intended to show what the brake-shoe testing machine can do in regard to defining the relative durability and wearing qualities of brake-shoes. It is important in the study of the question to take into account not only the surface of insert and hard metal on the face of the shoe, but also the volume of each, realizing that the durability of the brake-shoe depends largely on the percentage of hard and tough material [illegible]



Comparative Composition and Durability of Brake Shoes.

the insert rather than on the surrounding body metal, which may be soft cast-iron acting as a holder for the inserts, and that 90 per cent. of the life of the shoe may be comprised within the period necessary to wear out the insert.

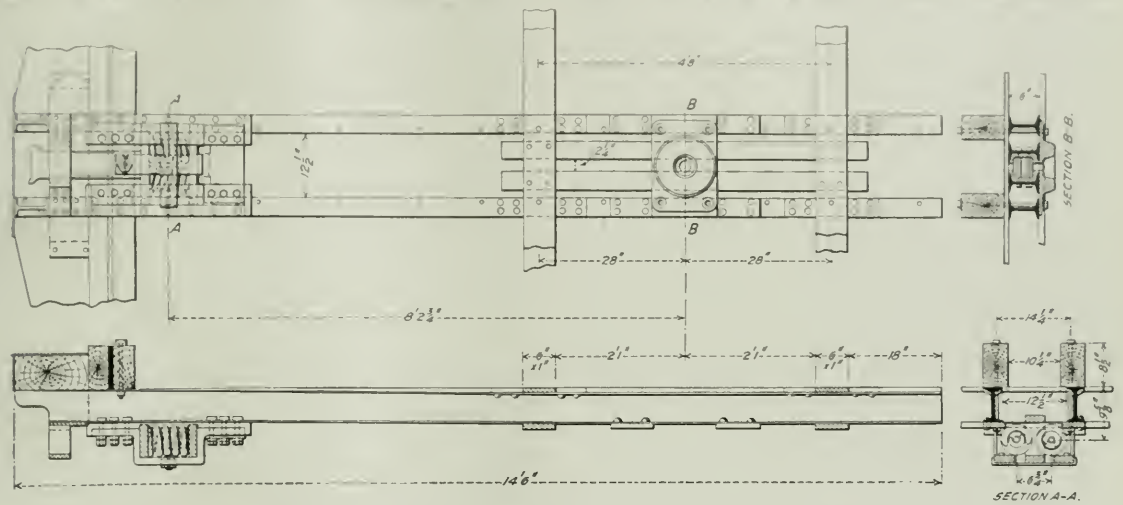
In the case of the records in question, some of the tests were made on shoes in which inserts had been worn through or had fallen out, and of course such records are not true indications of the performance of the original shoe, for that reason this new table has been prepared, which takes into consideration the actual conditions on the face of the shoe during the test. With this clearly understood, the column of comparative durability can be fairly considered.

Will you kindly publish this explanation and table for the information of those interested?

F. W. SARGENT,
Chief Engineer, American Blake Shoe & Foundry Co.

Draft Rigging for Stub-End Passenger Equipment.

The Seaboard Air Line is using a composite arrangement of steel beams for draft rigging on stub-end passenger equipment that is working well. The drawbar attachments themselves are of the twin-spring type and are riveted to and below the draft sills. The draft sills are directly below the wooden center sills of the car and are made of 6-in. I beams weighing 17¼ lbs. per foot. These beams run back 4 ft. 1 in. beyond the center plate and 1 ft. 9 in. beyond the center of the inner body bolster. There are two body bolsters of the plate type which are set 4 ft. 8 in. apart and equally spaced on each side of the center plate. The draft sills pass between the plates of the bolsters. In addition to the draft sills there are two 6-in. I beams set between them, as shown at the section on B B in the drawing, which are also riveted to the bolsters and which with the draft sills serve as a bearing for the center plate and so carry the car body. With this arrangement the end of the car framing is relieved of the buffing stresses which are carried back and distributed.



Draft Gear for Stub End Passenger Equipment; Seaboard Air Line.

Holding Power of Railroad Spikes.

BY ROY I. WEBBER, C. E.*

The determination of a proper fastening between the rail and the tie has become a matter of considerable importance. As long as the supply of suitable hard wood timber was sufficient, the ordinary spike satisfactorily fulfilled the requirements; but with increase in the amount of traffic handled and the heavier weights of cars and locomotives, and also with the use of soft deciduous and coniferous woods for ties, the common spike has proved deficient. Variations in the form of the ordinary spike have been developed, and new forms of spikes have been devised in an attempt to overcome the loss of efficiency attendant upon the use of inferior timbers. In view of these conditions, and the meager supply of published data on the holding power of spikes in ties, the writer has carried out a series of experiments to determine the resistance to withdrawal offered by the same type of spike in different timbers and by different forms of spikes in the same timber, and also to determine whether or not the preservative has any influence upon this resistance.

*Instructor in Civil Engineering at the University of Illinois. Published in Bulletin No. 6 of the University of Illinois Engineering Experiment Station.

The writer wishes to express his thanks for the hearty co-operation received from the various persons, firms and corporations mentioned in the text. He wishes also to express his indebtedness for personal aid, to Robert Trimble, Chief Engineer Maintenance of Way, Pennsylvania Lines West (Northwest System), George E. Boyd, Roadmaster of the Illinois Central; A. L. Kuehn, Superintendent of Maintenance of Way of the Cleveland, Cincinnati, Chicago & St. Louis; Dr. Octave Chanute, President of the Chicago Tie Preserving Company, Chicago, Ill., and to Prof. Ira O. Baker and Prof. C. H. Ilard, of the University of Illinois.

The ties used in these experiments were furnished gratuitously as follows: Nos. 1 to 11 and 16 to 30 by the Chicago Tie Preserving Company; Nos. 12 to 15 by the Illinois Central, Nos. 31 to 41 by the Cleveland, Cincinnati, Chicago & St. Louis. Table I gives a description of the several ties used. The ties were taken either from the stock pile of the railroad companies or from those of the treating plant. No attempt has been made to trace their history farther back than the place of growth and date of treatment. Treated ties were used in a majority of the experiments, since in the future as the inferior grades are pressed into service, the tendency will doubtless be toward the use of preserved timber.

TABLE I.—*Description of the Ties.*

No. of tie.	Kind of timber.	Kind of treatment.	Date treated.	Remarks.
1.	Blue ash.	Zinc-creosote.	1905.	Seasoned; sound.
2.	Blue ash.	Zinc-creosote.	1905.	Seasoned; sound.
3.	Sweet gum.	Zinc-creosote.	1904.	Seasoned; sound.
4.	Water oak.	Zinc-tannin.	1904.	Seasoned; sound.
5.	Water oak.	Zinc-tannin.	1904.	Seasoned; sound.
6.	Red oak.	Zinc-tannin.	1904.	Seasoned; sound.
7.	Red oak.	Zinc-creosote.	1905.	Seasoned; sound.
8.	Red oak.	Zinc-creosote.	1905.	Seasoned; sound.
9.	Red oak.	Zinc-tannin.	1904.	Seasoned; sound.
10.	Rock elm.	Zinc-creosote.	1905.	Seasoned; sound.
11.	Poplar.	Zinc-creosote.	1905.	Seasoned; sound.
12.	Elm.	.....	.....	Seasoned; sound.
13.	Elm.	.....	.....	Seasoned; sound.
14.	Beech.	.....	.....	Seasoned; sound.
15.	Elm.	.....	.....	Seasoned; sound.
16.	Black oak.	Zinc-creosote.	1902.	Seasoned.
17.	Red oak.	Zinc-creosote.	1902.	Seasoned.
18.	Black oak.	Zinc-creosote.	1902.	Seasoned.
19.	Poplar.	Zinc-creosote.	1902.	Seasoned.
20.	Loblolly pine.	Zinc-tannin.	1905.	Treated Dec., 1905; sound.
21.	Loblolly pine.	Zinc-tannin.	1905.	Treated Dec., '05; sound.
22.	Red oak.	Zinc-tannin.	1905.	Treated Dec., '05; split.
23.	Black oak.	Zinc-tannin.	1905.	Treated Dec., '05.
24.	Black oak.	Zinc-tannin.	1905.	Treated Dec., '05.
25.	Water oak.	Zinc-tannin.	1905.	Treated Dec., '05.
26.	Water oak.	Zinc-tannin.	1905.	Treated Dec., '05.
27.	Black oak.	Zinc-tannin.	1905.	Treated Dec., '05.
28.	Red oak.	Zinc-tannin.	1905.	Treated Dec., '05.
29.	Water oak.	Zinc-tannin.	1905.	Treated Dec., '05.
30.	Red oak.	Zinc-tannin.	1905.	Treated Dec., '05.
31.	White oak.	.....	.....	Seasoned; in track 2 years.
32.				Ind. oak; sap wood showed slight decay.
33.	White oak.	.....	.....	Ga. oak; seasoned; sound.
34.	Water oak.	Creosote.	1904.	Sound.
35.	Burr oak.	Creosote.	1904	Sound.
36.	Beech.	Creosote.	1904.	Sound.
37.	Elm.	Creosote.	1904.	Sound.
38.	Beech.	.....	.....	Sound.
39.	Loblolly pine.	.....	.....	Seasoned; sound.
40.	Chestnut.	.....	.....	Seasoned; sound.
41.	Red oak.	Creosote.	1904.	Showed tendency to split.
42.	Beech.	.....	.....	Sound.
43.	Beech.	.....	.....	Sound.
44.	Beech.	.....	.....	Sound.

Two distinct lines of experiments were undertaken: (1) Determination of the resistance to direct pull of several forms of spikes; and (2) Investigation of the resistance to lateral thrust.

Therefore, the paper naturally divides itself into two parts: Part I, Resistance to Direct Pull; Part II, Resistance to Lateral Displacement. All of the experiments were made in the Laboratory of Applied Mechanics, University of Illinois.

PART I—RESISTANCE TO DIRECT PULL.

The experiments were made with a Riehle 100,000-lb. testing machine. The pulling device for ordinary spikes was a Verona spike-puller threaded into a piece of steel gripped between the lower jaws of the machine; the pulling device for the screw spikes was of the same general pattern and was designed especially for these tests. A scale graduated to 1-16 of an inch was so set that the distance moved through by the lower head of the machine could be measured directly. A load of 500 lbs. was applied to insure the tie's having a good bearing before any records were taken. The machine was geared to move at the rate of $\frac{5}{8}$ in. per minute, which allowed time for carefully balancing the machine and for taking the readings of the scales. Five observations were usually taken, viz., when the lower head of the machine had moved through $\frac{1}{4}$, $\frac{1}{4}$, $\frac{1}{2}$ and $\frac{3}{4}$ of an inch, and also at the point at which the maximum fiber resistance was developed. No observations were made after the spike had been pulled $\frac{3}{4}$ in., as it would have lost its usefulness long before that point had been reached.

Further consideration of this part of the paper will be continued under the following heads: Holding Power of Ordinary Spikes; Holding Power of Screw Spikes Without Linings.

HOLDING POWER OF ORDINARY SPIKES.

The ordinary spikes were received from the following companies, the numbers in this list being the designations in the subsequent tables: Nos. 1 and 2 from the Pennsylvania Lines West; Nos. 3 and 4 from the American Iron and Steel Manufacturing Company, Scranton, Pa.; Nos. 5 to 10 from Dillworth, Porter & Co., Pittsburg; No. 11 from the W. A. Zelnicker Supply Company, St. Louis, and Nos. 12 to 14 from the Illinois Steel Company, Chicago.

The nominal dimensions of the four sizes of spikes are shown in Table II. The actual lengths varied considerably from the nominal lengths, usually being less. This was particularly true of the 6-in. spike. The actual cross sections were nearly the same as the nominal, the variation in thickness rarely being over 1-64 of an inch. As the range in thickness of the spikes was only 1-16 in., some experiments were made with plain, square and chisel-pointed bars $\frac{1}{2}$, $\frac{3}{4}$ and $\frac{7}{8}$ of an inch thick to determine the relation between the holding power and the cross section. The spikes had differently shaped points, as shown in Table II. Three spikes were used for each experiment, and these three were always of the same size and lot number. The spikes were driven by an experienced track foreman detailed for this purpose by the division engineer of the Big Four. Whole ties were used to insure freedom from splitting in driving the spikes, and care was exercised to avoid driving the spike into knots or cracks. The spikes were driven into the tie to a depth of 5 inches. In some instances, as shown in the record, holes were bored for the ordinary spikes, the hole being 1/16 or $\frac{1}{8}$ in. less in diameter than the cross sectional dimensions of the spike. The depth of the boring was not quite as great as the depth of insertion, so that the pointed end of the spike was forced into the undisturbed wood. Figures 1 and 2 show graphically the curves of average resistances of the different ties, as developed by the tests.

TABLE II.—*Description of the Ordinary Spikes.*

Record No.	Nominal length, ins.	Section, Ins. sq.	Area, Ins. sq.	Type of point.	Depth inserted.	Condtn of surface of spike.
1	6	$\frac{5}{8}$	0.372	Chisel.	5 ins.	Smooth.
2	$5\frac{1}{2}$	$\frac{5}{8}$	0.372	Chisel.	5 "	"
3	$5\frac{1}{2}$	$\frac{5}{8}$	0.372	Blunt.	5 "	"
4	$5\frac{1}{2}$	$\frac{5}{8}$	0.372	Blunt.	5 "	"
5	6	$\frac{5}{8}$	0.372	Sharp.	5 "	"
6	$5\frac{1}{2}$	$\frac{19}{32}$	0.352	Sharp.	5 "	"
7	$5\frac{1}{2}$	$\frac{19}{32}$	0.352	Chisel.	5 "	"
8	6	$\frac{5}{8}$	0.372	Blunt.	5 "	"
9	$5\frac{1}{2}$	$\frac{9}{16}$	0.316	Blunt.	5 "	"
10	$5\frac{1}{2}$	$\frac{9}{16}$	0.316	Sharp.	5 "	"
11	$5\frac{1}{2}$	$\frac{9}{16}$	0.316	Chisel.	5 "	"
12	$5\frac{1}{2}$	$\frac{9}{16}$	0.316	Sharp.	5 "	"
13	$5\frac{1}{2}$	$\frac{9}{16}$	0.316	Chisel.	5 "	"
14	6	$\frac{5}{8}$	0.372	Chisel.	5 "	"

A study of the results to determine: (A) Comparative holding power in untreated ties; (B) Comparative holding power in treated ties; (C) Comparative holding power of the same timber, treated and untreated; (D) Effect of preservatives on holding power; (E) Relation between cross section of the spike and holding power; (F) Relation between depth of penetration and holding power; (G) Effect of the point of the spike on holding power; (H) Effect upon holding power of re-driving the spike, follows in detail:

A—Comparative Holding Power in Untreated Ties.

Table III. shows the average holding power of different untreated ties.

TABLE III.—*Average Holding Power in Untreated Ties.*

Kind of tie.	No. of Tests.	No. of Spks.	Resistance in lbs. for a pull of— $\frac{1}{4}$ in.	Resistance in lbs. for a pull of— $\frac{1}{2}$ in.	Maximum resistance: Distance pulled.	Maximum resistance: Lbs.	Resistance in per cent. of that of white oak— Inch $\frac{1}{4}$ th.	Resistance in per cent. of that of white oak— Inch $\frac{1}{2}$ th.	Resistance in per cent. of that of white oak— Maximum.
White oak	10	30	3,510	3,950	7,870	7,870	100	100	100
Elm	11	33	2,310	5,290	7,290	7,290	66	136	93
Beech	3	9	2,240	3,790	8,180	8,180	64	96	104
Chestnut	4	12	2,900	4,070	5,190	5,190	86	103	66
Loblolly pine	2	6	2,920	3,190	3,630	3,630	85	81	46

This shows the comparative holding power of five kinds of timber. The last three columns show the holding power in terms of that of white oak. It is thought that a pull of $\frac{1}{4}$ in. gives results which are of more value in comparing the holding power of the different kinds of ties than the results for either greater or less distances, since the results for the $\frac{1}{4}$-in. pull represent the resistances of the various timbers to the withdrawal of the spike for a distance which should not be exceeded in practice, and since the maximum resistance and the results for a pull of $\frac{1}{2}$ in. represent the resistances for distances which are therefore not of so much consequence as the $\frac{1}{4}$-in. pull. It is noticeable that with chestnut and loblolly pine the maximum resistance occurs at $\frac{3}{16}$ in., which is a reason for comparing their maximum resistance with that of white oak at $\frac{1}{4}$ in. instead of with its maximum resistance as in the table. If this is done, the efficiencies of chestnut and loblolly pine for a $\frac{1}{4}$-in. pull or less are 131 and 85 per cent., respectively.

The fact that the maximum resistance did not occur until the spike had been pulled from $\frac{3}{16}$ to $\frac{5}{8}$ in. is interesting. While the spike is being driven the fibers of the wood are bent downward and are pressed outward, and as the spike is withdrawn the friction between the spike and the wood tends to draw the fibers into their original position, which causes them to crowd laterally against the spike and also toward the surface of the tie, until finally the external pull exceeds the internal resistance and the spike slips. When the fiber structure is open, there is considerable cellular space for the displaced fibers to occupy, and therefore the maximum resistance is low, and is quickly attained; but when the fiber structure is compact, the reverse is true. As the loblolly pine ties should always be preserved, the results for this timber are of doubtful value. For the best results elm ties also should be treated; but as some species of elm do not absolutely require treatment, elm is properly included. Arranging these timbers in the descending order of their resistances for a $\frac{1}{4}$-in. pull, we have elm, chestnut, white oak, beech and loblolly pine. The maximum holding power for the first three timbers in Table III. is satisfactory, but that for the last two is quite low. The last fact indicates that when timber of the softer varieties or timber having loose fiber structure is used for ties, some more efficient form of fastening should be devised.

B—Comparative Holding Power in Treated Ties.

Table IV. shows the average holding power obtained with various treated ties. The average results obtained with untreated white oak are also included so that comparisons can be made. The average for the resistances for all of the treated timbers is shown at the foot of the table. Excluding the last two timbers, the average resistance for the $\frac{1}{4}$-in. pull is 5,690 lbs. The maximum resistance of the last two timbers should be averaged with the resistances of the others for the $\frac{1}{4}$-in. pull, in which case the average resistance for all of the timbers for a $\frac{1}{4}$-in. pull or less is 5,400 lbs.

TABLE IV.—*Average Holding Power in Treated Ties.*

Kind of tie.	No. of Tests.	No. of Spks.	Resistance in lbs. for a pull of— $\frac{1}{4}$-in.	Resistance in lbs. for a pull of— $\frac{1}{2}$-in.	Maximum resistance.— Lbs.	Maximum resistance.— Distance pulled.	Resistance in per cent. of that of white oak— Inch $\frac{1}{4}$th.	Resistance in per cent. of that of white oak— Inch $\frac{1}{2}$th.	Resistance in per cent. of that of white oak— Maximum.
White oak*	10	30	3,510	3,950	7,870	$\frac{5}{16}$-in.	100	100	100
Water oak	16	48	2,870	5,730	6,780	$\frac{5}{16}$-in.	82	145	86
Black oak	13	39	2,910	5,890	7,230	$\frac{5}{16}$-in.	83	149	92
Red oak	20	60	2,950	5,350	7,730	$\frac{5}{16}$-in.	84	135	98
Burr oak	3	9	2,670	5,750	9,210	$\frac{3}{8}$-in.	76	145	117
Ash	2	6	3,570	5,200	7,730	$\frac{5}{16}$-in.	101	131	98
Elm	5	15	2,590	5,940	7,500	$\frac{5}{16}$-in.	74	150	96
Beech	3	9	2,950	6,190	8,900	$\frac{3}{8}$-in.	84	157	113
Poplar	4	12	2,830	5,290	5,670	$\frac{5}{16}$-in.	81	134	72
Loblolly pine	4	12	2,920	3,780	4,310	$\frac{1}{4}$-in.	83	109	55
Sweet gum	5	15	3,230	5,320	5,300	$\frac{5}{16}$-in.	92	96	67
Average	..	..	2,950	5,320	7,040	.....	84	135	89

*Untreated.

The resistances of the several timbers do not differ widely and the soft timbers give results which compare favorably with those obtained for the hard woods. This table also shows that the range for the maximum resistances is much greater than that for either the $\frac{1}{4}$-in. or the $\frac{1}{2}$-in. pull. The resistances for the different species of oak are very nearly the same, the mean for a $\frac{1}{4}$-in. pull being 2,850 lbs., for a $\frac{1}{2}$-in. pull 5,680 lbs. and for the maximum 7,740 lbs. With nearly all of the timbers the maximum resistance was obtained after the spike was pulled more than $\frac{1}{4}$ in., but there is no apparent relation between the amount of holding power and the distance through which the spike has been pulled. Comparing the resistances of treated timbers with that of untreated white oak, we see that the initial resistance of the white oak is higher than any of the other woods except one; while on the other hand, the resistance at $\frac{1}{2}$ in. in white oak is less than in any of the other woods save one. The maximum resistances of all but the last three timbers are practically the same. Considering the uniformity of the results obtained with a pull of $\frac{1}{4}$ in. in the few timbers which were available, there appears to be no strong reason for much discrimination between the different treated timbers.

C—Comparative Holding Power of the Same Timber, Treated and Untreated.

Table V. is given for the purpose of studying the effect of treatment on the holding power of a timber.

TABLE V.—*Relative Holding Power in Treated and Untreated Ties*

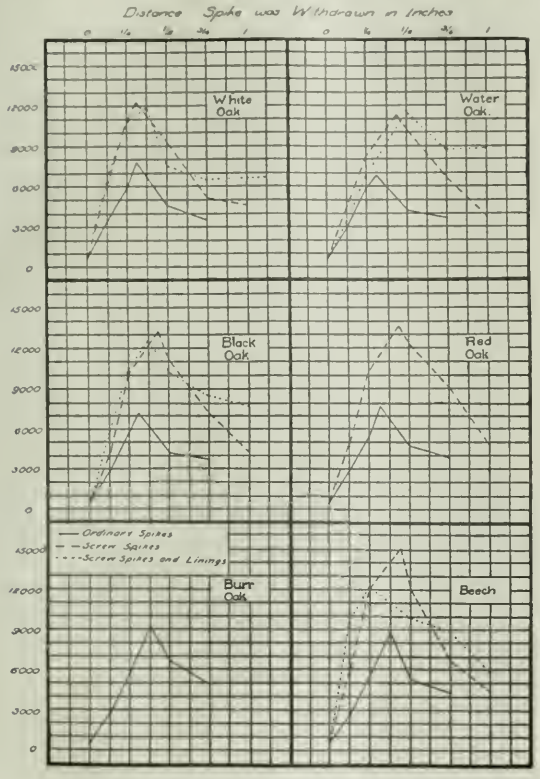
Kind of tie	No. of Ties	No. of Spikes	Condition of the	Resistance and gain in pounds due to treatment: ⅛ in pull	Gain	¼ in pull	Gain	Max resistance	Gain
Elm	3	27	Untreated	5,310		5,390		7,290	
Elm	2	15	Treated	5,500	580	5,940	550	7,500	210
Beech	1	9	Untreated	2,540		3,790		8,180	
Beech	1	9	Treated	2,950	710	6,190	2400	8,980	820
Loblolly pine	1	6	Untreated	2,820		3,190		3,650	
Loblolly pine	2	12	Treated	2,920	000	3,720	640	4,310	680
Red oak	3	15	Untreated					6,460	
Red oak	4	21	Treated					7,730	1270

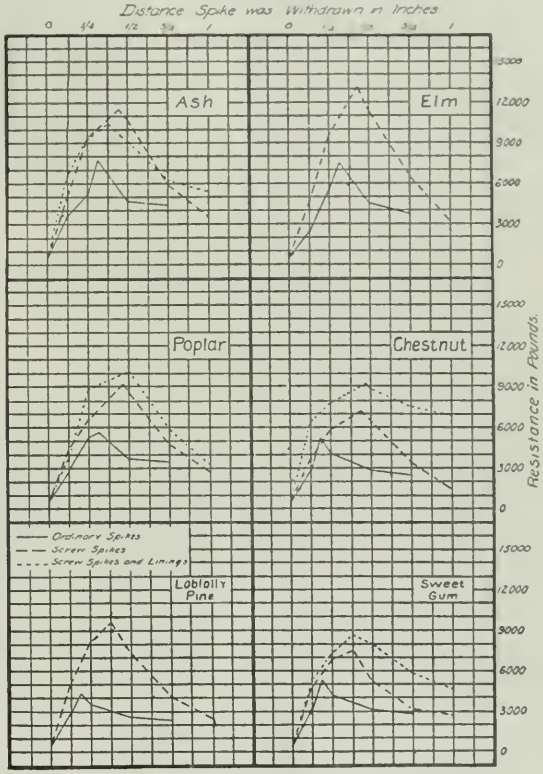
This shows that higher resistances are developed in treated than in untreated ties. The average increase due to treatment for a ⅛-in. pull was 330 lbs.; for a ¼ in pull, excluding the seemingly unreasonable increase in beech, 685 lbs., and for the maximum resistance 717 lbs. Considerable reliance is placed upon these conclusions, inasmuch as the methods of making the tests were exactly the same for the treated and untreated ties, and since the same

In those treated with zinc-creosote, but the maximum resistance is lower. If any rating were made in order of efficiency, it would appear about as follows: (1) creosote, (2) zinc-creosote and (3) zinc-tannin. However there are too many uncertain quantities involved to make such a rating reliable, and moreover the effect of the treating solution on the holding power is only one of the many elements which must be considered when choosing between the different treating solutions.

E—Relation between the Cross Section of the Spike and the Holding Power

The question to be answered here is, which size of spike will develop the highest holding power. To answer this question, Table VII. showing the relation between the cross section and the holding power has been compiled. From a study of these results it will be noticed that no general rating can be made for the various sized spikes in order of the resistances developed, since the spike which develops the lowest holding power for the ⅛ in. or the ¼ in. pull





Figs. 1 and 2—Diagrams of Resistance to Withdrawal of Different Kinds of Spikes in Different Kinds of Wood.

number of spikes, 57, was used in both cases, and also since the preserved ties were treated by different processes and at different plants.

The increased resistance due to treatment has two causes: (1) The presence of the preservative in the cells, thus reducing the space into which the fibers can crowd as the spike is withdrawn; and (2) the hardening of the fibers by the steaming, preparatory to treatment, which renders them less pliable. The movement which took place among the fibers near the surface of the tie is interesting. In the untreated ties there was a crumpling of the fibers close to the spike, while the fibers in the treated ties were torn out in deep slivers extending from the spike to the blocks which supported the tie.

D—Effect of Preservatives on Holding Power.

Three distinct kinds of preserving solutions were used in the ties tested—creosote, zinc-creosote and zinc-tannin.

Table VI. is given to show the effect produced by the treating solution on the holding power of the tie. It does not show any marked difference between resistances in ties treated with the different preservative solutions. For example, the maximum resistance of the red oak is lower when treated with zinc-tannin than when treated with zinc-creosote, but the reverse is true of the initial resistance of the red oak and also of the maximum resistance of black oak. With elm the initial resistance is higher in creosoted ties than seldom develops the highest maximum resistance. For example, in

TABLE VI.—*Effect of Different Preservatives on the Holding Power.*

Kind of tie.	Tie No.	Preservative.	Resistance in pounds for pull of ⅛ in.	Resistance in pounds for pull of ¼ in.	Max. resistance, lbs.
Comparison of Zinc-tannin and Creosote					
Water oak	4, 5, 25, 26, 29	Zinc tannin.	2,380	5,010	6,260
	34	Creosote	3,020	6,270	7,310
Red oak	6, 9, 22, 28, 30	Zinc tannin.	3,170	5,470	6,580
	11	Creosote	3,420	5,800	6,920
Comparison of Zinc Creosote and Creosote.					
Red oak	7, 8	Zinc-creosote.	2,350	4,940	8,500
	41	Creosote.	3,120	5,800	6,920
Elm.	10	Zinc creosote.	2,520	5,870	7,090
	37	Creosote.	2,600	6,350	7,210
Comparison of Zinc-tannin and Zinc creosote.					
Red oak	6, 7, 8, 9, 22	Zinc creosote.	2,350	4,940	8,500
	28, 30	Zinc tannin.	3,170	5,470	6,580
Black oak	16, 18	Zinc creosote.	2,850	5,620	7,010
	23, 24, 27	Zinc tannin.	2,830	5,620	7,550

white oak, the $\frac{13}{16}$-in. spike developed the highest resistance for the ⅛-in. pull, but the $\frac{9}{16}$-in. spike developed the highest resistance for the ¼-in. pull, and also the highest maximum resistance. In black oak the highest resistance for the ⅛-in. pull was developed by the $\frac{9}{16}$-in. spike, but that for the ¼-in. pull was developed by the $\frac{13}{32}$-in. size and the maximum resistance by the $\frac{5}{8}$-in. spike. Averaging all of the resistances for the ⅛-in. pull, the ¼-in. pull and the maximum resistance collectively, we see that the average

holding power of the $\frac{9}{16}$-in. spike is 4,990 lbs. for the $\frac{13}{32}$-in. spike 5,420 lbs. and for the $\frac{5}{8}$-in. spike 5,290 lbs. Because of the large number of spikes tested, seventy-two $\frac{9}{16}$-in., thirty-six $\frac{13}{32}$-in., and one hundred and two $\frac{5}{8}$-in., and the irregularity of the results, it was decided that no conclusions could be drawn from this table as to the relative holding power of the different sizes of spikes. However, the thickness of the spikes varied by only $\frac{1}{16}$-in. or about 10 per cent., and their areas by only 0.075 of a sq. in. or about 20 per cent.

TABLE VII.—*Relation Between the Cross-Section of the Spike and Its Holding Power.*

Kind of tie.	No. of Ties.	No. of Spikes.	Condition of tie.	Size of spike, inch.	Resistance to withdrawal, lbs. ⅛-in. pull.	¼-in. pull.	Max. resistance.
White oak	2	9	Seasoned	9/16	3,110	6,280	8,760
	2	6		13/32	3,750	5,380	7,620
	3	13		5/8	3,650	6,030	7,620
	4	13		9/16	2,910	5,340	6,530
Black oak	2	6	Treated	13/32	2,650	6,130	7,130
	4	18		5/8	2,550	5,710	7,240
	5	15		9/16	2,960	5,560	6,670
Water oak	6	18	Treated	13/32	2,970	5,310	6,910
	5	15		5/8	2,650	5,360	6,730
Red oak	7	21	Treated	9/16	2,300	4,760	7,650
	9	36		5/8	3,260	5,990	6,780
Beech	1	3	Seasoned	9/16	1,880	3,900	9,410
	1	3		13/32	2,550	5,400	7,660
	1	3		5/8	2,290	5,070	7,900
	1	3	Treated	9/16	2,480	5,490	9,410
Beech	1	3		13/32	3,530	6,990	8,250
	1	3		5/8	2,850	6,090	9,040
Sweet gum	1	6	Treated	9/16	2,190	3,770	4,610
	1	12		5/8	3,490	4,450	5,460

To test still further the relationship between the size of the spike and the holding power, a series of experiments was made with plain square rods with the results shown in Table VIII. Each result is the mean of 15 tests in a single kind of timber.

TABLE VIII.—*Experiments with Plain Square Rods in Beech Timber.*

Size of rod.		Area, sq. in.	Av. max. results, lbs.	Increase for each increment — Area, Sq. in.	Area, Per cent.	Resistance, Lbs.	Resistance, Per cent.
Successive increments in the size of the rod = ⅛-in.							
½-in.	square	0.250	6,280	.....	..	.....	..
⅝-in.	"	0.391	6,970	0.141	53	690	11
¾-in.	"	0.562	9,070	0.171	44	2,600	37
⅞-in.	"	0.765	9,380	0.203	35	310	3
Successive increments in the size of the rod = 1/16-in.							
8/16-in.	square	0.250	6,280	.....	.....	.....	..
9/16-in.	"	0.316	6,450	0.066	25	170	3
10/16-in.	"	0.391	6,970	0.075	23	520	8

It will be seen from these results that there is an irregular increase in the holding power as the size of the rod is increased. Notice that with increments of ⅛-in., the successive increments in the resistance are at first large, but with the last rod this increment suddenly falls to practically nothing. This drop in the increment is principally due to the tendency of the large rod to split the tie. The results with $\frac{1}{16}$-in. increments do not differ materially from those in the first part of the table. The deduction is that holding power will be increased as the size of the rod is increased, but that it is not expedient to use rods (or spikes) larger than ¾ in. unless holes are bored for them.

F—Relation between the Depth of Penetration and Holding Power.

A series of experiments was made to determine the relation between the depth of penetration and the holding power. The results are given in Table IX.

TABLE IX.—*Holding Power in a White Oak Tie with Varying Depths of Penetration.*

Depth of penetration.	Resistance, lbs. Test No. 1.	2.	3.	4.	5.	Average.
½ in.	150	150	140	160	170	150
1 in.	480	.....	500	510	490	500
1½ in.	1,440	1,000	1,760	1,320	950	1,290
2 in.	2,250	2,250	2,050	2,900	2,760	2,450
2½ in.	3,430	3,840	3,050	2,940	3,570	3,360
3 in.	3,710	3,800	4,200	4,220	4,810	4,210
3½ in.	4,760	5,980	4,210	4,500	5,860	5,060
4 in.	5,950	7,190	6,310	5,850	6,080	6,270
4½ in.	7,510	7,510	7,720	7,310	.....	7,520
5 in.	8,380	9,070	8,540	7,790	7,900	8,340

The spikes had a taper point approximately 1 in. long. Fig. 3 shows that the holding power varies directly with the penetration, not counting the taper point. It is impracticable to use a spike longer than 5½ in. in a 6-in. tie, since a longer spike would either pass entirely through the tie or sliver it on the under side. In either case the fiber adjacent to the spike would quickly decay owing to the access of water. In a thicker tie, however, a longer spike could be used advantageously. The main precaution is to keep the spike from damaging the under surface of the tie, otherwise the longer the spike the greater the holding power.

G—Effect of the Point of the Spike on the Holding Power.

There were three distinct types of points on the spikes: blunt-point, chisel-point and bevel-point, as shown in Fig. 4.

The average results obtained with spikes having these types of points are shown in Table X. The average and relative resistances of each type of spike for all timbers are shown at the foot of the table. These averages show that both the blunt-pointed and the bevel-pointed spike are higher in holding power than the chisel-pointed spike. Since the average resistances of the blunt and the bevel-pointed spikes are practically the same, and since the blunt-pointed spike develops the highest resistance for the ⅛-in. and the ¼-in. pull the greatest number of times, the blunt-pointed spike is first in point of efficiency, although the bevel-pointed spike is a close competitor under all conditions. The chisel-pointed spike is last.

The two upper figures of Fig. 5 are the two halves of a red-oak tie showing the position of the fibers adjacent to the spike; and the lower figure is a portion of the other end of the same tie split after the spikes had been pulled out. The photograph was taken immediately after the tie had been split. The figures are too small to show details clearly, but an examination of the tie showed that the blunt-pointed spike disturbed more fiber than either the chisel or the bevel-pointed spikes, the last two disturbing about the same amount. The examination also showed that the blunt-pointed spike tore rather than cut the fibers, and deposited them in unequal bundles along its faces, while the chisel-pointed spike cut the fibers and deposited them quite uniformly both across and in front of each face. The bevel-pointed spike forced a majority of the fibers to the front face and toward the corners. The relatively high holding power of both the blunt and the bevel-pointed spikes is due to this unequal concentration of the fibers.

TABLE X.—*Effect of the Form of the Point, of the Spike on the Holding Power.*

Kind of tie.	No. of spikes.	Type of point.	Resistance in lbs. for ⅛-in pull — Lbs.	Rel-ative.	¼-in. pull — Lbs.	Rel-ative.	Maximum resistance. — Lbs.	Rel-ative.
Water oak	33	Chisel.	2,780	100	5,250	100	6,540	100
Water oak	15	Bevel.	3,050	110	5,440	98	6,330	97
Black oak	9	Blunt.	3,020	106	6,890	121	8,280	119
" "	18	Chisel.	2,850	100	5,690	100	6,930	100
" "	12	Bevel.	2,680	91	5,560	98	6,800	98
Red oak	18	Blunt.	2,220	77	4,400	82	5,760	76
" "	21	Chisel.	2,880	100	5,350	100	7,630	100
" "	21	Bevel.	3,100	107	5,580	104	7,370	97
White oak	10	Blunt.	4,080	117	7,040	135	8,760	123
" "	12	Chisel.	3,490	100	5,190	100	7,090	100
" "	6	Bevel.	2,990	86	5,610	108	8,010	113
Elm	21	Chisel.	2,150	100	5,240	100	7,710	100
"	21	Bevel.	2,500	116	5,740	109	7,050	92
Beech	6	Blunt.	2,180	85	4,670	84	9,250	109
"	6	Chisel.	2,570	100	5,580	100	8,470	100
"	6	Bevel.	3,040	118	6,190	111	7,900	93
Chestnut	3	Blunt.	2,850	114	4,950	162	5,690	127
"	3	Chisel.	2,490	100	3,060	100	4,470	100
"	6	Bevel.	3,320	133	4,130	135	5,310	119
Loblolly pine	3	Blunt.	2,860	84	3,650	118	4,020	97
" "	6	Chisel.	3,420	100	3,390	100	4,120	100
" "	9	Bevel.	2,800	82	5,010	148	5,520	134
Av'g for all timbers		Blunt.	2,870	101	5,340	113	6,960	105
		Chisel.	2,840	100	4,810	100	6,610	100
		Bevel.	2,930	103	5,490	114	6,800	103

H—Effect on Holding Power of Re-driving the Spike.

In practice, when the spike is pulled out of the tie a moderate distance, it is driven back, provided the hole is not greatly enlarged. If the hole is much enlarged the spike is driven at another point. This constant re-spiking rapidly ruins the tie. A series of tests was made to determine the effect upon the holding power of re-driving the spike. The average maximum holding power of the re-driven spikes is shown in Table XI. along with the original

TABLE XI.—*Relative Holding Power of Newly-driven and Re-driven Spikes.*

Kind of tie.	No. of spikes.	Av. max. resistance, lbs. Original.	After re-driving.	Per cent. of original.
Ash	6	8,640	6,490	75
Water oak	6	8,020	5,760	72
Red oak	6	8,030	5,230	65
Elm	6	7,910	4,840	61
Poplar	6	4,920	3,980	81
Sweet gum	6	5,040	4,150	82

maximum holding power of the same spike. It will be seen that the holding power of the re-driven spike is much less than that of the newly-driven spike. The resistance is affected so much in some woods as to make the practice of re-driving the spike a questionable procedure if the holding power alone is considered; but as the practice of re-driving the spike helps to lengthen the life of the tie, the practice cannot be justly condemned so long as the holding power is not excessively reduced.

HOLDING POWER OF SCREW SPIKES WITHOUT LININGS.

A series of tests was made to determine the holding power of screw spikes. The tests were conducted in the same manner as those with the ordinary spikes. The screw spikes were received from the following companies: No. 1 from the Illinois Central; No. 2 from the American Iron and Steel Manufacturing Company, Scranton; No. 3 from the South Side Elevated, Chicago; No. 4 from the Oliver Steel & Iron Company, Pittsburg, and No. 5 from the Pennsylvania Lines West.

A description of the different spikes is given in Table XII.

TABLE XII.—*Description of Screw Spikes.*

Spike No.	Length.	Diameter of core.	Projection of thread.	Pitch.	Depth of insertion.	Diam. of bored hole.
1.	5 in.	21/32-in.	9/16-in.	½-in.	4½ in.	11/16-in.
2.	5 in.	11/16-in.	⅛-in.	½-in.	4½ in.	11/16-in.
3.	5¼ in.	11/16-in.	⅛-in.	½-in.	4¾ in.	11/16-in.
4.	5½ in.	11/16-in.	⅛-in.	½-in.	5 in.	11/16 in.
5.	5 in.	21/32-in.	9/16-in.	½-in.	4½ in.	11/16-in.

The shank or threaded portion of the spike was usually ⅞ in. in diameter, and approximately 1 in. of the upper portion of the core tapered from the diameter of the core to that of the shank. The hole bored for the spike was not reamed, and the result was a

tight fit between the wood and the spike. This tight contact is gained in practice by the head of the spike bearing against the base of the rail. The spike was driven by means of a wrench, the thread cutting its own path. The number of screw spikes obtainable was not sufficient to make as long a series of tests as with the ordinary spikes.

A study of the results with this spike has been made to determine: (A) Relation between the depth of penetration and the holding power, (B) Relation between the holding power of the screw and of the ordinary spikes, and (C) Influence of certain details of the screw spike upon its holding power.

The average results of the tests with screw spikes are shown in Figs. 1 and 2.

A—Relation between Depth of Penetration and the Holding Power.

A series of tests was made to determine the relation between depth of penetration and holding power of the screw spikes. The experiments consisted of pulling spikes driven to depths of 1, 2, 3, 4 and 5 in. into a beech tie, three spikes being used for each depth. The numerical results are shown in Table XIII., and their averages are shown graphically in Fig. 6 together with some additional matter which is shown for the sake of comparison.

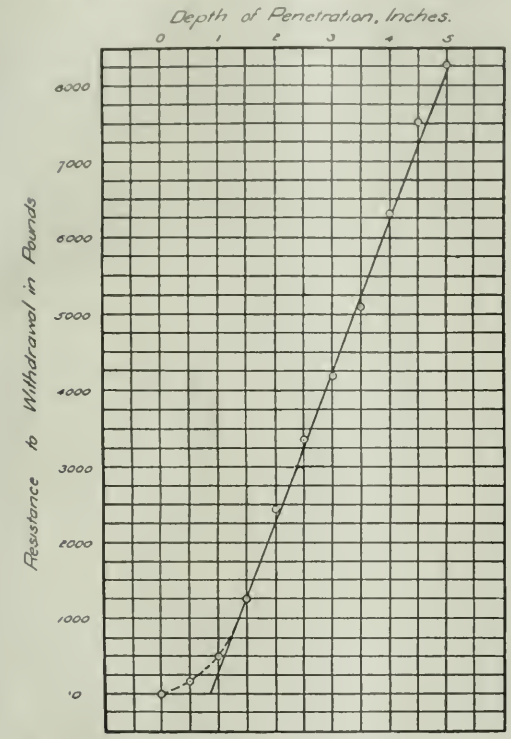


Fig. 3—Diagram of Resistance to Withdrawal of Ordinary Spikes for Various Depths of Penetration.

TABLE XIII.—*Results Obtained from Experiments on Depth of Penetration.*

	Resistance in pounds for penetration of—				
	1 in.	2 in.	3 in.	4 in.	5 in.
Test No. 1	2,770	4,560	9,610	13,100	17,360
" " 2	2,760	6,000	10,000	14,330	17,300
" " 3	2,790	4,940	8,490	13,330	16,840
Average	2,770	5,170	9,360	13,590	17,230

The results in Fig. 6 can be quite closely represented by two intersecting straight lines. The probabilities are that the actual resistances would be more nearly represented if the two straight lines were joined by a short curve near their intersection. Only the upper portion of the diagram is of interest, since penetrations of less than four inches should never be used, at least on heavy traffic railroads, the only roads likely to use screw spikes. The diagram shows that the resistance varies directly with the depth of penetration.

B—Relative Holding Power of Screw Spikes and Ordinary Spikes.

Table XIV. has been prepared to determine the relation between the holding power of the screw spike and that of the ordinary spike. As previously stated, the ordinary spikes were driven into the tie to a uniform depth of 5 in., while the screw spikes, being of different lengths, necessarily were inserted to unequal depths. On account of the relation existing between the depth of penetration and the holding power, the resistance for the screw spikes is based upon a penetration of 5 inches.

TABLE XIV.—*Relative Holding Power of the Screw Spike and of the Ordinary Spike in Several Timbers.*

Kind of tie	Kind of spike	Resistance in lbs. for			Relative resistances		
		¼ in.	½ in.	Max.	¼ in.	½ in.	Max. result.
White oak	Ordinary	2,850	5,700	6,780	100	100	100
White oak	Screw.	4,888	8,180	12,000	170	144	177
Black oak	Ordinary	2,910	5,800	7,200	100	100	100
Black oak	Screw.	4,760	10,420	14,111	164	177	203
Red oak	Ordinary	2,450	5,300	7,700	100	100	100
Red oak	Screw.	4,900	10,400	13,500	105	194	176
White oak	Ordinary	3,814	5,695	7,870	100	100	100
White oak	Screw.	6,240	11,900	12,900	178	209	185
Ash	Ordinary	3,570	5,200	7,750	100	100	100
Ash	Screw.	5,700	10,450	12,700	162	200	165
Beech	Ordinary.	2,600	5,400	8,840	100	100	100
Beech	Screw.	6,440	13,440	16,240	248	221	238
Elm	Ordinary	2,850	5,580	7,700	100	100	100
Elm	Screw.	5,120	10,060	13,000	215	181	183
Poplar	Ordinary	2,850	5,200	5,670	100	100	100
Poplar	Screw.	3,880	6,210	7,490	137	117	132
Chestnut	Ordinary.	2,850	4,970	5,200	100	100	100
Chestnut	Screw.	3,690	6,340	8,760	129	155	167
Loblolly pine	Ordinary.	2,920	3,500	4,500	100	100	100
Sweet gum	Screw.	5,430	7,710	8,280	167	162	156
Sweet gum	Ordinary.	3,230	4,120	5,300	100	100	100
Loblolly pine	Screw.	5,750	9,050	10,620	197	258	247

From Table XIV. it will be seen that the holding power of the screw spike is always greater than that of the ordinary spike, and that the relation between the two varies in the several timbers. For a pull of ¼ in. in the hard woods the holding power of the screw spike is from 167 to 221 per cent. of that of the ordinary spike, and in the soft woods the range is from 117 to 258 per cent.; or the average gain in the hard woods is 76 per cent., and in the soft woods 98 per cent. It is interesting to note that the resistances in the several timbers for the ½-in. pull with the screw spike are in eight out of eleven instances nearly the same as, or greater than, the resistances for the ¼-in. pull with the ordinary spike. This signifies that the screw spike is about twice as efficient as the ordinary spike for a pull of ¼ in. or less. The curves in Figs. 1 and 2 show graphically the relative efficiency of the two forms of spikes with some information to be referred to later.

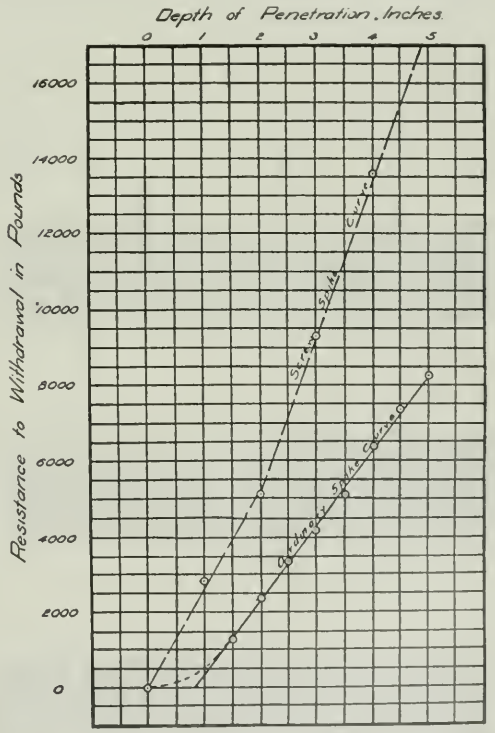


Fig. 6—Diagram of Resistance to Withdrawal of Screw Spikes and Ordinary Spikes for Various Depths of Penetration.

C—Effect of Details of the Screw Spike on Its Holding Power.

In countries where the screw spike is extensively used it has been perfected in detail until it nearly fulfills the requirements of practice. In North America the screw spike will probably be the

successor to the ordinary spike, and it may again be necessary to adjust the details to suit local conditions. Therefore, a few observations on the relation of some of the details of this spike to its holding power come within the scope of this paper. The details to be discussed are the diameter of the core, the projection and pitch of the thread and the length of the thread.

The soft steel from which the screw spike is made has an ultimate strength of about 66,000 lbs. per sq. in., so that the tensile strength of a spike $\frac{11}{16}$ in. in diameter is approximately 24,000 lbs. The ultimate compressive resistance across the grain of well-seasoned white oak is about 4,000 lbs. per sq. in., and experiments demonstrate that the thread of the spike in compacting the wood

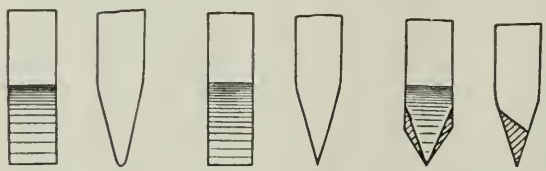


Fig. 4—Forms of Spike Points.

fibers increases the resistance about 40 per cent.* Therefore, taking 5,600 lbs. as the ultimate compressive strength of compacted white oak, and taking $17\frac{3}{4}$ in. and $\frac{1}{4}$ in. respectively as the length and projection of the thread on the 5-in. spike, and making no allowance for frictional resistance between the core of the spike and the wood, the theoretical resistance would be

$$5{,}600 \times 17\tfrac{3}{4} \text{ in.} \times \tfrac{1}{8}\text{-in.} = 12{,}430 \text{ lbs.}$$

The average actual resistance obtained in white oak ties as shown in Table XIV. is 12,630 lbs., which agrees closely with the theoretical resistance. The tensile strength of the screw spike is about 12,000 lbs. greater than the maximum resistance of white oak, which difference is greater than necessary and indicates an uneconomical use of metal in the spike. Since the ties tested are representative of

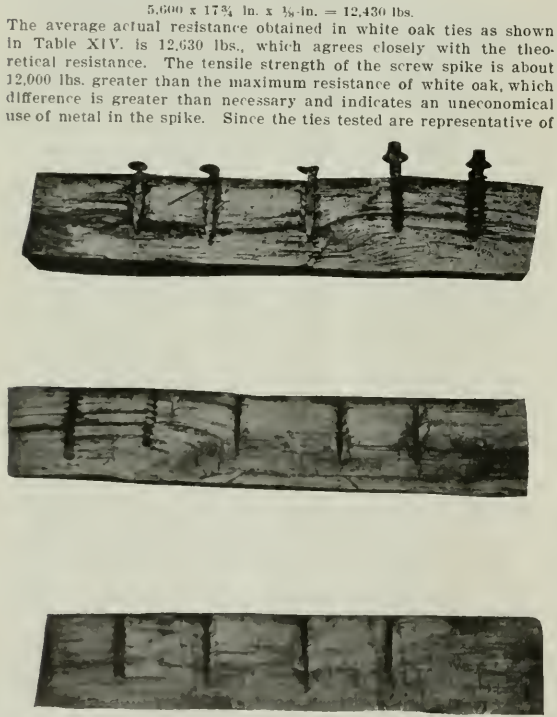


Fig. 5—Effect of Spikes in Displacing the Fibres of the Tie.

American practice, there is no apparent reason for not having the ultimate strength of the two materials in contact more nearly equal than at present, and by some slight change in the detail of the spike this could readily be accomplished. Three ways in which the ultimate strength of the materials may be made more nearly equal are: (1) increase in length of threaded portion; (2) increase in projection of thread, the length and the diameter of the core remaining the same; (3) increase in projection of thread at the expense of the core, the length remaining the same. The pitch is assumed to be $\frac{1}{2}$ in. in all cases, since it has been found in practice that this pitch gives better results than either a greater or smaller pitch.*

*Bulletin No. 50, U. S. Department of Agriculture.

(1) The length of the thread on the 5-in. spike is $17\frac{3}{4}$ in. and the width is $\frac{1}{8}$ in.; therefore, the bearing is 2.22 sq. in. If the spike is made 6 in. long two convolutions of the thread will be added, the bearing area will become 2.71 sq. in., and the holding power will be increased from 12,630 lbs. to 15,180 lbs. This leaves a difference of only 8,900 lbs. between the ultimate strength of the wood and that of the spike.

(2) If the length of the spike and the diameter of the core are not changed, and if the projection of the thread is increased $\frac{1}{8}$ in., the total resistance would amount to 15,510 lbs., leaving an ultimate strength of the spike only 8,500 lbs. greater than that of the wood.

(3) If the length of the threaded portion of the spike remains unchanged and if the projection of the thread is increased $\frac{1}{8}$ in. at the expense of the core, the maximum resistance would amount to 15,510 lbs., while the ultimate strength of the spike would be reduced to 20,200 lbs.

The diameter of the shank of the spike would have to be increased with some of the changes in the detail of the lower portion, and when the resistance to lateral displacement is taken into account, we see that this change also would be beneficial. The conclusion is that the screw spike in its present form is about twice as efficient as the ordinary spike; and that this efficiency could be increased by some slight change in the detail of the screw spike.

The following table shows the relative holding power of the ordinary spike, the screw spike, and the screw spike with helical lining in several timbers:

Table XV.—*Shows the Relative Holding Power of the Ordinary Spike, the Screw Spike, and the Screw Spike with Helical Lining in Several Timbers.*

Kind of tie.	Kind of spike.	Resistance in lbs. for ⅝-in. pull.	Resistance in lbs. for ¾-in. pull.	Resistance in lbs. for Max. resist.	Relative resistance. ⅝-in. pull.	Relative resistance. ¾-in. pull.	Relative resistance. Max. resist.
White oak	Ordinary.	3,510	5,950	7,870	100	100	100
" "	Screw.	6,250	11,900	12,630	178	200	188
" "	Lining.*	6,440	10,880	11,960	183	183	152
Water oak	Ordinary.	2,870	5,730	6,780	100	100	100
" "	Screw.	4,880	9,180	12,190	170	160	179
" "	Lining.*	3,190	6,780	11,580	111	118	171
Black oak	Ordinary.	2,910	5,890	7,230	100	100	100
" "	Screw.	4,760	10,420	14,110	164	177	203
" "	Lining.*	5,690	10,420	12,500	195	177	173
Ash	Ordinary.	3,570	5,200	7,730	100	100	100
"	Screw.	5,700	10,470	12,760	162	200	165
"	Lining.*	6,640	9,370	10,470	186	180	135
Beech.	Ordinary.	2,600	5,490	8,840	100	100	100
"	Screw.	6,450	13,140	16,230	248	221	238
"	Lining.*	9,720	10,860	12,150	373	198	138
Poplar	Ordinary.	2,830	5,290	5,670	100	100	100
"	Screw.	3,850	6,210	7,490	137	117	132
"	Lining.*	3,910	8,860	10,320	138	162	182
Chestnut	Ordinary.	2,850	4,070	5,200	100	100	100
"	Screw.	3,660	6,340	8,700	129	155	167
"	Lining.*	6,390	7,950	9,150	224	195	176
Sweet gum ...	Ordinary.	3,230	4,120	5,300	100	100	100
" " ...	Screw.	5,430	7,710	8,280	167	162	156
" " ...	Lining.*	5,030	7,260	8,690	130	176	164

*Screw spike with helical lining.

PART II.—RESISTANCE TO LATERAL DISPLACEMENT.

The railroad spike is subjected not only to a direct pull by the undulation of the rail, but also to a horizontal thrust due to the lateral movement of the rail. On roads having a large amount of curvature the lateral resistance is of more importance than that of direct pull. To determine the amount of the resistance to lateral displacement which is developed by various forms of spikes the writer made a series of tests in which the lateral thrust was produced by the blows of a heavy hammer. The hammer consisted of a cast-iron weight suspended by a wooden rod from the joists of the floor above. Fastened to the joists were metal strips upon which the knife edges of the rocking arm rested. These strips were 6 ft. long, and were notched along the entire upper edge to permit the placing of the rocking arm in different positions. The length of the suspending rod was 9 ft. The weight of the hammer was 100 lbs. and the distance through which it was allowed to fall was $1\frac{1}{2}$ ft., so that the amount of the impact for each blow was 150 ft.-lbs. The hammer delivered its blow on the end of a tool-steel bar which projected beyond the end of the tie, the other end of the bar being shaped to fit under the head of the spike.

The spikes used in this series of tests were $\frac{7}{16}$ in. and $\frac{5}{8}$ in. ordinary spikes and screw spikes. Each spike was subjected to five blows and the displacement produced by each blow was carefully measured. Usually four or five spikes of each kind were tested, but when there was much lack of uniformity in the results a larger number were tested. All of the spikes were bent to a curve, the central point of which was about $1\frac{1}{2}$ in. below the surface of the tie. The ordinary spikes were pulled from the tie a short distance, but the thread of the screw spikes gripped the wood so as to prevent the spike from being pulled out even a perceptible amount.

LATERAL RESISTANCE OF ORDINARY SPIKES.

The average movement of ordinary spikes for each of the several blows is shown in Table XVI. The average total movement of the $\frac{5}{8}$ in. spikes in the first seven timbers was 0.65 in., and that of the $\frac{7}{16}$ in. spikes was 0.75 in. In the last four timbers the average total movement of the $\frac{5}{8}$ in. spikes was 0.74 in., and that of the

$\frac{9}{16}$ in spikes was 0.94 in. The total deflection of the $\frac{9}{16}$ in. spikes was usually sufficient to allow a rail to clear the head of the spike if it were overturned. The corresponding movement of the $\frac{5}{8}$ in. spikes was not usually sufficient to allow a like clearance, although it was considerably more than would be allowed in practice. The first blow is of more importance than the succeeding blows in testing the efficiency of a spike. While the distances through which the different sized spikes were deflected by the first blow differ but a small amount, the difference is sufficient to show that the deflection is less for the $\frac{5}{8}$ in. spikes than for the $\frac{9}{16}$ in. These results, together with the fact that the $\frac{5}{8}$ in. spikes were bent less by the impact than the $\frac{9}{16}$ in. spikes indicate that the $\frac{5}{8}$ in. spike is more efficient in resisting lateral displacement than the $\frac{9}{16}$ in. spike.

LATERAL RESISTANCE OF SCREW SPIKES.

The method of determining the lateral resistance of screw spikes was the same as that used for ordinary spikes. The screw spikes used were all practically alike except that they were of various lengths. In making the tests the spikes were used indiscriminately, but since they were not all of the same length some tests were made to determine the effect of impact upon spikes which were driven into the tie to different depths. The spikes used for the latter tests were all of the same make, and were cut to lengths of 3, 3½, 4, 4½ and 5 in., and were all driven into a single kind of timber. The results of these tests are shown in Table XVII. While the results for the 4- and 4½-in. spikes are the same, the averages in the last column of the table show that the amount of the lateral movement decreases as the depth of penetration increases. Also, the difference between the deflections of the 4, 4½ and 5-in. spikes is practically negligible, but for shorter lengths the difference in the deflections becomes greater. Table XVIII gives the lateral movement of the screw spikes for each blow. The number of spikes used in each kind of timber was usually three; but in case there was considerable variation in the results, more spikes were tested.

TABLE XVI.—*Lateral Movement of Ordinary Spikes for Each Blow.*

Kind of tie.	Size of spike.	Movement for each of the several blows: 1-in.	2 in.	3-in.	4 in.	5-in.	Average movement.
White oak	$\frac{9}{16}$ sq. in.	0.21	0.11	0.17	0.12	0.09	0.136 in.
White oak	$\frac{5}{8}$ sq. in.	0.17	0.14	0.11	0.09	0.08	0.118 in.
Water oak	$\frac{9}{16}$-sq. in.	0.19	0.18	0.17	0.11	0.11	0.152-in.
Water oak	$\frac{5}{8}$ sq. in.	0.17	0.13	0.13	0.10	0.08	0.122-in.
Black oak	$\frac{9}{16}$-sq. in.	0.21	0.16	0.17	0.11	0.06	0.142-in.
Black oak	$\frac{5}{8}$ sq. in.	0.17	0.16	0.12	0.08	0.09	0.124-in.
Red oak	$\frac{9}{16}$ sq. in.	0.21	0.15	0.14	0.11	0.13	0.148-in.
Red oak	$\frac{5}{8}$ sq. in.	0.14	0.14	0.11	0.14	0.08	0.122 in.
Ash	$\frac{9}{16}$-sq. in.	0.23	0.18	0.15	0.12	0.10	0.156-in.
Ash	$\frac{5}{8}$-sq. in.	0.18	0.15	0.14	0.16	0.10	0.146-in.
Elm	$\frac{9}{16}$-sq. in.	0.22	0.11	0.12	0.13	0.11	0.138-in.
Elm	$\frac{5}{8}$-sq. in.	0.21	0.14	0.13	0.11	0.11	0.140 in.
Beech	$\frac{9}{16}$-sq. in.	0.25	0.16	0.17	0.13	0.13	0.168-in.
Beech	$\frac{5}{8}$ sq. in.	0.14	0.11	0.10	0.10	0.10	0.110-in.
Poplar	$\frac{9}{16}$-sq. in.	0.27	0.14	0.15	0.14	0.12	0.164-in.
Poplar	$\frac{5}{8}$ sq. in.	0.16	0.18	0.09	0.10	0.11	0.128-in.
Chestnut	$\frac{9}{16}$-sq. in.	0.32	0.26	0.25	0.17	0.23	0.246-in.
Chestnut	$\frac{5}{8}$-sq. in.	0.22	0.19	0.20	0.18	0.14	0.186-in.
Sweet gum	$\frac{9}{16}$-sq. in.	0.28	0.21	0.17	0.15	0.15	0.192-in.
Sweet gum	$\frac{5}{8}$-sq. in.	0.16	0.18	0.13	0.12	0.12	0.142-in.
Loblolly pine	$\frac{9}{16}$-sq. in.	0.22	0.14	0.18	0.11	0.04	0.148-in.
Loblolly pine	$\frac{5}{8}$ sq. in.	0.18	0.12	0.13	0.13	0.09	0.128-in.

Table XIX. is given to facilitate comparison of the relative lateral resistance of ordinary and screw spikes. The data was collected from Tables XVI. and XVIII. The average total deflection of the screw spike in the first seven timbers is 0.50 in., which is 0.15 in. less than that of the $\frac{5}{8}$-in. ordinary spike and 0.25 in. less

TABLE XVII.—*Relation Between the Depth of Penetration and the Resistance to Lateral Displacement.*

Depth of insertion.	Deflection in Inches—No. of blows. 1.	2.	3.	4.	5.	Av. for five blows.
3 in.	0.24	0.46	0.64	0.78	0.87	
	.22	.41	.55	.69	.84	
	.21	.43	.67	.76	.98	
Average	0.23	0.43	0.62	0.73	0.90	0.582
3½ in.	0.24	0.46	0.62	0.77	0.80	
	.21	.39	.53	.69	.80	
	.19	.34	.49	.63	.74	
Average	0.22	0.40	0.55	0.70	0.78	0.530
4 in.	0.20	0.39	0.49	0.60	0.71	
	.21	.40	.57	.63	.77	
	.23	.33	.57	.62	.72	
Average	0.21	0.37	0.54	0.62	0.73	0.494
4½-in.	0.24	0.30	0.50	0.65	0.74	
	.20	.34	.53	.68	.73	
	.22	.36	.54	.62	.79	
Average	0.22	0.33	0.52	0.65	0.75	0.494
5 in.	0.22	0.38	0.49	0.61	0.71	
	.23	.40	.55	.67	.75	
	.15	.34	.48	.57	.69	
Average	0.20	0.34	0.51	0.62	0.72	0.478

than that of the $\frac{9}{16}$ in. ordinary spike. In the last four kinds of timber the average total deflection of the screw spike was 0.70 in., which is practically the same as that of the $\frac{5}{8}$-in. ordinary spike, but which is 0.24 in. less than that of $\frac{9}{16}$-in. common spike. The results in the last two columns of Table XIX. show that the screw spike is superior to the $\frac{9}{16}$-in. ordinary spike in all but two kinds of timber, and that the screw spike has a higher efficiency than the $\frac{5}{8}$ in. ordinary spike in all but three kinds of timber.

TABLE XVIII.—*Lateral Movement of the Screw Spikes for Each Blow.*

Kind of tie.	Movement for each of the several blows: 1.	2.	3.	4.	5.	Average movement.
White oak	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Black oak	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Water oak	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Red oak	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Ash	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Elm	0.17	0.16	[illegible]	[illegible]	[illegible]	[illegible]
Beech	0.14	[illegible]	[illegible]	0.07	[illegible]	[illegible]
Poplar	0.17	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Chestnut	0.13	0.10	0.11	[illegible]	[illegible]	[illegible]
Sweet gum	0.21	0.16	[illegible]	0.14	[illegible]	[illegible]
Loblolly pine	0.21	[illegible]	[illegible]	0.12	0.14	[illegible]

The last two columns in Table XIX. show that the ordinary spike was usually displaced more than the screw spike by each blow. This should be expected since the common spike was smaller in cross section than the screw spike, and also since the latter had better bond with the wood. While the use of the screw spike is recommended to the American railroads, it is thought that the practice of Bavarian railroads could be followed to advantage. These roads have adopted the use of the screw spike on the gage side of the rail to resist overturning, but use two square spikes on the outside to resist lateral movement. This practice has been found to give very beneficial results. The figures in the last two columns show that the lateral resistance of two ordinary spikes is considerably more than that of one screw spike, and therefore if two spikes are considered as resisting the impact instead of one, the results will be in favor of the ordinary spikes. Not only is this true, but the first cost for spikes would be reduced, since the screw spike costs about 4 cents at the present time, whereas the ordinary spike costs much less. The maintenance cost of either form of spike is almost negligible.

TABLE XIX.—*Relative Lateral Displacement of Ordinary and Screw Spikes.*

Kind of tie.	Movement of ordinary spikes: $\frac{9}{16}$ in.	$\frac{5}{8}$-in.	Average movement of screw spike.	Average movement ordinary spikes in terms of per cent. of movement of screw spike: $\frac{9}{16}$-in.	$\frac{5}{8}$ in.
White oak	0.136	0.118	0.078-in.	175	152
Black oak	0.152	0.122	0.082-in.	186	149
Water oak	0.142	0.124	0.086-in.	165	145
Red oak	0.148	0.122	0.108-in.	137	115
Ash	0.156	0.146	0.108-in.	144	135
Elm	0.138	0.140	0.140-in.	99	100
Beech	0.168	0.110	0.102-in.	165	108
Poplar	0.164	0.128	0.130-in.	126	99
Chestnut	0.246	0.186	0.132 in.	186	141
Sweet gum	0.192	0.142	0.148-in.	129	96
Loblolly pine	0.148	0.128	0.154 in.	96	83

An item of interest which is properly beyond the limits of this article is that of the 90 screw spikes used in making these tests only two were broken. One was broken under a tension of 14,000 lbs., the break being caused by an incipient crack just under the head of the spike. The other spike broke under the fourth blow of the hammer, this break being due to uncombined graphite in the metal. As the spikes were obtained from different sources, and were of different manufacture, it is thought that the test was sufficiently severe to show that the screw spike, as manufactured at present, will successfully withstand the shocks of passing trains. As the spikes were used several time during the tests, the percentage of spikes broken is very low.

SUMMARY OF RESULTS.

(1) The maximum resistance to direct pull varies from 6,000 to 14,000 lbs. for screw spikes, from 3,000 to 8,000 lbs. for ordinary spikes when driven into untreated timbers, and from 4,000 to 9,000 lbs. for ordinary spikes when driven into treated timbers.

(2) The direct pull required to withdraw ordinary spikes $\frac{1}{8}$-in. varies from 2,000 to 3,500 lbs. for untreated timbers, and from 2,500 to 3,500 lbs. for treated timbers.

(3) The direct pull required to withdraw ordinary spikes $\frac{1}{4}$-in. varies from 3,000 to 5,400 lbs. for untreated timbers and from 3,800 to 5,900 lbs. for treated timbers.

(4) Timbers having loose fiber structures have lower resistances to direct pull than timbers having compact fiber structures.

(5) The amount of withdrawal which must occur for ordinary spikes to develop the maximum resistance is less for soft woods than for hard woods.

(6) Spikes driven into treated timber offer a greater resistance to direct pull than spikes in untreated timbers, and the difference between this resistance for treated and untreated timbers is greater for soft woods than for hard woods.

(7) The difference in the resistance to direct pull for the different sized spikes in use ($\frac{9}{16}$ in., $\frac{19}{32}$ in and $\frac{5}{8}$ in.) is very small.

(8) The resistance of ordinary spikes to direct pull varies directly as the depth of penetration, neglecting the tapering point.

(9) Blunt-pointed and bevel-pointed spikes have a slightly greater resistance to direct pull than chisel-pointed spikes.

(10) For withdrawals less than $\frac{1}{4}$ in., ordinary spikes which are driven into bored holes have a little greater resistance to direct pull than spikes driven in the ordinary way.

(11) The resistance to direct pull for re-driven spikes is from

60 to 80 per cent. of the resistance of newly driven spikes.

(12) The efficiency of screw spikes to resist withdrawal is nearly twice as great as that of common spikes.

(13) The resistance of $\frac{5}{8}$-in. spikes to lateral displacement is slightly greater than that of $\frac{1}{16}$-in. spikes.

(14) The resistance to lateral displacement increases with the depth of penetration, but the increase is negligible for depths of penetration greater than 4 in.

(15) Screw spikes are more efficient than ordinary spikes in resisting lateral displacement.

Loss and Damage to Freight.*

My experience as an adjuster of freight claims has thoroughly shown that a very large percentage of the claims made against carriers have real merit and deserve expeditious adjustment. It is also my experience that the average claimant is quite as ready to consider the carrier's side of any cases which appear in doubt as we are to view theirs and, notwithstanding that the claim agent generally meets shippers and consignees at a time when they are not feeling particularly friendly toward the road, if he is desirous of establishing a reputation for fair and courteous dealing it is possible for him to make many friends, improve the standard of his profession and make known to claimants the true policy of his company.

The most frequent criticism of claim departments is for their tardiness in making claim settlements, and these complaints are not only made by claimants, but by representatives of the traffic department who are interested in making the service as satisfactory to the shipper as possible.

Wisely and progressively managed, the freight claim department may become an important factor in securing and retaining traffic, but to accomplish this it must possess a thorough system, devoid of circumlocution, for promptly investigating all claims and complaints, and in particular for treating with claimants in a uniformly businesslike manner. While carefully guarding the carriers' rights and interests it should be liberal in its consideration of claimants, avoiding a narrow policy or insistence on technicalities where important principles are not involved.

Many claim officers are to-day so equipped that they can and do promptly settle all claims in which their road alone is interested. Their efforts, however, are not appreciated by their company or its patrons, for the sole reason that claims in which other carriers are involved are delayed indefinitely because of an ill-advised and unfair practice of giving preference to the claims originating with them, inefficiency of the claim agent or an indifferent claim policy.

It is true the average interline claim cannot be adjusted as expeditiously as those in which but one road or system is interested, but that months should be consumed in the investigation of claims involving several carriers should only be necessary in exceptional cases. Both the Freight Claim Association and committees composed of progressive claim officers, are giving consideration to interline claim settlements, and several plans have been suggested from which it is expected substantial improvements will result; yet those roads which are indifferent to the need of a thoroughly effective and business-like claim policy will, to a greater or less extent, impede the operation of any improvements in this direction until they are fully awakened to a sense of their obligations to other lines.

During the past 10 years the claims which carriers have been called upon to entertain for loss and damage to freight have increased far beyond the growth of traffic, making serious inroads upon the revenues and doubling the forces employed in claim offices and elsewhere. This condition can be traced to many causes, principal among which are: Acceptance of package freight without adequate marks to insure its safe carriage and delivery; acceptance of many classes of freight when not sufficiently protected to prevent injury from the ordinary handlings it must receive; acceptance of valuable dry goods, plated ware, liquors, boots and shoes, etc., in frail boxes fastened with a few wire nails, which invite stealing by dishonest truckmen and freight handlers; shipment of perishable freight when not in prime condition, or when weather conditions make safe and prompt deliveries doubtful.

These are a few of the causes for claims which shippers make possible through reasons of economy, or lack of regard for the safety of their goods and the interests of their consignees.

Frail and second-hand boxes of uncertain strength and without erasure of old marks are used for the shipment of goods of all values, fragile articles are shipped with hardly sufficient protection to insure safety in carting to the carrier, and for the loss or injury resulting from these practices we are held accountable. If objection is made before receipt, we are informed that other lines are ready to take the goods, and if we question claims which arise from improper conditioning of goods attention is directed to our obligations as common carriers.

In opening packages which have been delivered in apparently perfect condition the consignee discovers part of his order missing, or some fragile article broken. Does the claimant say probably this is due to a mistake or accident of shippers or to theft or carelessness of their truckmen? Generally he does not. He finds it much easier to place the responsibility on the carrier, who being unable to certify to quantity or condition of contents of packages finds the claim difficult to defend. What will correct these conditions is the earnest co-operation of shippers and receivers of freight with the transportation lines in careful marking of freight shipped in small quantities and the securing of merchandise packages so that their contents cannot be readily removed, or, at least, without leaving some evidence or indication of the loss.

As to losses and damages to freight for which transportation lines are wholly responsible, the causes are without number, but for the purpose of consideration here, we will divide them into two general classes, avoidable and unavoidable; avoidable when caused by carelessness or negligence of employees, and unavoidable when ordinary and reasonable care is exercised.

As is true in respect to many other great business enterprises where large forces are employed, the negligent acts of indifferent or incompetent employees result in both direct and indirect losses, direct when the company is called on to pay the claims, and indirect when traffic is diverted to other routes because of unsatisfactory service.

Whether the average railroad employee is less regardful of his company's interests than those of large industrial concerns, or whether the growing demand for labor has influenced employees to feel less concern in the affairs of those whom they serve, are questions I will not undertake to decide, but losses clearly chargeable to avoidable causes have, during the past few years, increased alarmingly. Perhaps this can be largely attributed to the enormous increase in traffic which often taxes cars, terminal and station facilities to their utmost, requiring constant pressure on those directly concerned, as well as hurried discharge of duties; but the conclusions reached after investigating causes for loss too often remind me of the old story of the car inspector, who, being asked why he was tapping the car wheels with his hammer, replied, "D—— if I know, but thems the orders."

Enough has been said to illustrate my principal point, the development of closer relationship and co-operation between the different interests involved which will aid in removing many causes for avoiding losses and damages to freight.

In regard to overcharges the following, which is quoted from the *American Railway Journal*, published in the year 1839, may be of interest as indicating the possible origin of that class of claims in this country:

> I hope in granting charters hereafter the legislature will look closely into the question of what provisions are necessary to guard the citizen from imposition. From Philadelphia to New York the fare is $5 per head. Fifteen passengers on an average make a ton, therefore the charge is equal to $75 a ton for 100 miles. According to report, the cost of transporting coals on the road for 100 miles is 53 cents a ton. Now deduct the cost of transporting a ton of coals from the cost of transporting a ton of passengers, and it will be seen that the railroad clearly gains. Possibly some allowance should be made for the difference between the cost of passenger cars and burden cars, but it cannot be much. I hope that in any new charters which may be granted the legislature will correct this error, as it is very material to travelers.

*An address by Robert L. Calkins, Freight Claim Agent of the New York Central & Hudson River Railroad, before the New York Traffic Club.

Foreign Railroad Notes.

The locomotive works of J. A. Maffei in Munich have built for the Bavarian State Railroads a locomotive capable of hauling a train weighing 165 tons at a speed of 93 miles an hour. This engine was tested July 1 and 2, and maintained for a prolonged time a speed of 96 miles an hour, which is declared to be the greatest speed ever made in Europe by a steam locomotive. It is a four-cylinder compound with 6-ft. drivers, Schmidt superheater and Westinghouse high-speed brakes.

Freight trains on the Prussian State Railroads have heretofore been limited to a prescribed number of "car axles," for the various grades, curves, etc. The Minister in charge has now ordered that three of the directories keep accurate records of the weights of cars and loads behind tenders during the month of July as data for prescribing tonnage instead of axles as the basis of the limits of trains.

The Italian State Railroads have declined to take over the steamboat service on the lakes of north Italy. This service is something like that on Lake George, N. Y., only much more important, as the country on these lakes is thickly peopled and very productive. On the other hand, they are to maintain steamer lines between Naples and Palermo, which is the quickest route to the larger part of Sicily, and another steamer line from Civita Vecchia, the port of Rome.

Decapod Locomotive for the Buffalo, Rochester & Pittsburg.

The American Locomotive Company has recently built six decapod (2-10-0) locomotives at the Brooks works for the Buffalo, Rochester & Pittsburg. These engines have been built for pusher service between Clarion Junction, Pa. and Freeman 17 miles, with a grade of 58 ft. to the mile which is the controlling grade on northbound traffic. In addition to the wheel arrangement which, though not novel, is by no means common the engines are interesting for their great weight and high tractive power. They are the heaviest simple engines ever built by the company and have a total weight in working order of 268,000 lbs., of which 243,000 lbs. is on the driving wheels. The maximum tractive power is 55,350 lbs. Up to the present time trains on this grade, which has numerous curves up to 8 deg., are moved by two consolidation locomotives having

Decapod Locomotive; Buffalo, Rochester & Pittsburg.

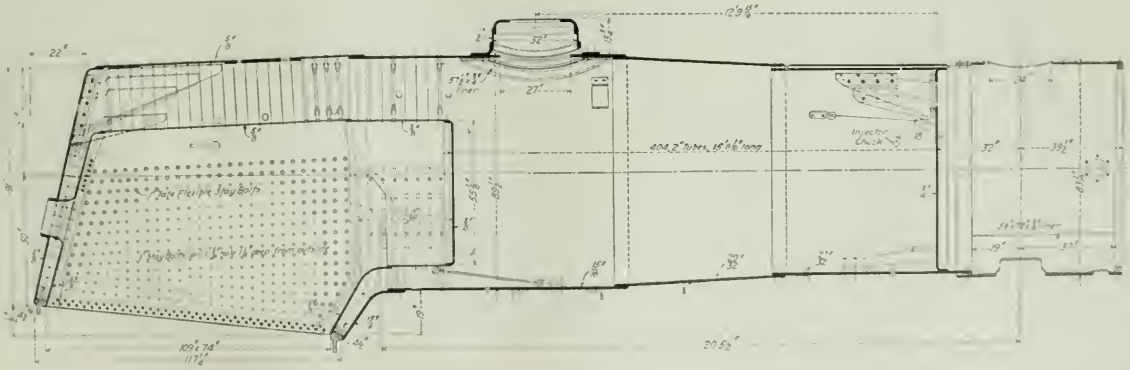
a tractive power of 38,000 lbs. each. The rated train load for the two is 3,350 tons, with one engine at the rear pushing. The rating of the same class of power (one engine) from Punxsutawney, Ernest or Dubois to the foot of the grade is 3,500 tons. With the track improvements completed, that are now in hand, it is expected that these consolidation locomotives will be able to haul 4,000 tons to the foot of Clarion Hill grade from either Punxsutawney, Ernest or Du Bois, and the decapod engines have been built to handle a train of 4,000 tons up the grade with a consolidation in the lead.

With cylinders of the size used in these engines high steaming capacity is essential, and in this case the example of the Northern Pacific has been followed and the length of the tubes cut down to 15 ft. 6 in. by the introduction of a combustion chamber. About a year ago some engines of the Mikado type were designed for the Northern Pacific with combustion chambers 3 ft. long and tubes 16 ft. 9 in. long, which were 1 ft. 9 in. shorter than the tubes in similar engines without the combustion chamber. This caused a reduction in tube heating surface from 3,339 sq. ft. to 2,737 ft., and only increased the total firebox heating surface, including the arch tubes, from 189 sq. ft. to 242 sq. ft. Equating the tube heating surface to firebox heating surface of these Northern Pacific engines by the Vaughan formula, gives 965 sq. ft. of total equated heating surface for the engine without the combustion chamber and 911 sq. ft. for the engine with it.

At the time the Northern Pacific engines were built some considered it doubtful practice to make such a reduction in tube heating surface, but the results seem to have justified it, for the work on the Northern Pacific has been quite satisfactory. The adoption of the combustion chamber on these B., R. & P. decapod engines

combustion chamber and the shell to insure a free circulation, and this is tapered down to 4½ in. at the foundation ring, which is only 19 in. below the shell. At the back, the top of the foundation ring is but 3½ in. below the same point, so that the supply of water coming back into the water legs to take the place of that evaporated has very little drop in order to reach the lowest point.

The boiler is of the wagon-top type 80 in. in diameter, and contains 3,535.5 sq. ft. of heating surface, with 404 tubes 15 ft. 6 in. long. The introduction of the combustion chamber, of course, reduces the amount of tube heating surface, but experience on the Northern Pacific has proven that the increase of firebox heating surface more than offsets this loss, and that engines with a combustion chamber and less actual or even equated heating surface, steam fully as well as those without the combustion chamber and



Boiler of Decapod Locomotive; Buffalo, Rochester & Pittsburg.

more heating surface. Assuming the Vaughan formula to be correct, the larger firebox, by causing a better rate of combustion, delivers more heat to the tubes proportionately than the ordinary firebox can do, and so raises their efficiency per foot of length.

The back head has a slope of 22 in. and the fire door is formed by the outward flanging of the two sheets and the use of a welded plate ring to connect them. The large diameter of the shell and the high steam pressure (210 lbs.) require the use of very heavy sheets, which are [illegible] in., [illegible] in. and [illegible] in. thick. In the staying of the firebox the distribution of the flexible stays is somewhat different from that used in other engines recently illustrated in the *Railroad Gazette*. The usual arrangement is a single row of flexible stays up the front and back of the side sheets, with another across the top and clusters in the upper corners. In this case, with a firebox of nearly the same dimensions, there are three rows at

the front, and two at the back and top, with a clustering in the corners. This difference may be due to a variety of causes, but it serves to show that there is, as yet, no standard of practice in this detail.

The cylinders are 24 in. in diameter, with a piston stroke of 28 in. The slide valves are outside admission, operated by the Walschaert gear. The link is supported by a casting of special shape secured to the back of the guide yoke and the reverse shaft is carried in bearings bolted to the top of a cast steel cross-tie located between the second and third pair of driving wheels by which a direct connection of the reverse shaft arm with the radius bar is made possible. This arrangement of the Walschaert gear emphasizes again the facility which it affords for the cross bracing of the frames. In this case there are five points between the cylinders and the firebox where braces are put in.

The equalization is in two groups; the front group includes the truck and the first two pairs of drivers, and the rear group includes the three last pairs. It is arranged with flat yokes over the driving boxes and semi-elliptic springs under the upper rail of the frame taking the place of equalizing levers.

Another interesting feature of these engines is the unusually large capacity of the tender. The tank is of the water bottom type and has a capacity of 9,000 gallons, which is probably the largest water capacity ever provided in a locomotive tender.

In comparing the dimensions and ratios of these engines that follow, with those of other or similar types, it must be borne in mind that the introduction of the combustion chamber introduces a wide variation in all those ratios where either tube, firebox or total heating surface is considered, as compared with engines having no combustion chamber. In order to make such comparisons, the equated heating surfaces should be used.

The principal dimensions and ratios of these engines are:

Cylinder diameter	24 in.
Piston stroke	28 "
Wheel base, driving	19 ft. 0 "
" " total engine	28 " 4 "
" " total engine and tender	65 " 3¼ "
Weight on drivers	243,000 lbs.
" total engine in working order	268,000 "
" total engine and tender	432,000 "
Heating surface, tube	3,280.0 sq. ft.
" " firebox	255.5 "
" " total	3,535.5 "
Grate area	55.5 "
Journals, main driving	10½ in. x 13 in.
" trailing driving	10 " x 13 "
" truck	6½ " x 12 "
" tender	5½ " x 10 "
Boiler, diameter, first ring	80 "
Firebox, length	108 "
" width	73¼ "
" thickness, crown, side and back sheets	⅜ in.
" thickness tube sheet	⅝ in.
" water space	4½ in.
Steam pressure	210 lbs.
Tubes, number	404
" diameter	2 in.
" gage	No. 11
" length	15 ft. 6 1/16 in
Tank capacity, water	9,000 gals.
Tank capacity, fuel	14 tons
Valves, travel	6¼ in.
" lap	1 "
" lead	3/16 in.
Wheels, diameter, driving	52 in.
" " truck	30 "
" " tender	33 "
Tractive power	55,350 lbs.

Weight on drivers / Total weight	0.90
Weight on drivers / Tractive power	4.5
Total weight / Tractive power	4.84
Tractive power x diameter drivers / Heating surface	815.0
Heating surface / Grate area	63.6
Firebox heating surface / Total heating surface	7.79 per ct.
Weight on drivers / Total heating surface	70.3
Total weight / Total heating surface	81.7
Volume of 2 cylinders = 14.62 cu. ft. / Total heating surface	211.5
Volume of 2 cylinders / Grate area	3.8
Volume of 2 cylinders	

Tube heating surface, equated to firebox heating surface (Vaughan's formula) = 830.5 sq. ft.
Total equated firebox heating surface = 1,086.0 "
Ratio of equated firebox to total actual heating surface..1:3.02

New Feed-Water Heater for Locomotives.

F. H. Trevethick, General Manager of the Egyptian State Railroads, has adopted a new method of heating the feed-water for locomotives working between Cairo and Alexandria, which is described in a recent issue of the *Revue Industrielle*. The water is heated by the exhaust steam in combination with the waste heat of the smokebox gases.

The feed water is forced into the boiler by a horizontal motor pump placed on the left-hand side of the firebox, and using steam at full boiler pressure. The water passes from the pump through the first heater which is formed of a cylinder set vertically between the frames below the feed pump. It is 36 in. high and contains 90 steel tubes 7/16 in. in diameter, about which the exhaust steam is made to circulate. The steam condensed by the cold feed water is collected in the bottom of the cylinder and is removed by a pipe and cock. The feed water is taken from this first heater and sent on through a pipe 2½ in. in diameter to second and third heaters which are set horizontally outside the cylinders in such a way as to receive a part of the exhaust steam on its way to the stack. The condensing surface, which is the same in the three, is formed of 42 tubes 7/16 in. in diameter and 5 ft. 6 in. long, set in a cylindrical box. The second heater, which is on the right-hand side, is divided by a partition in such a way that the water traverses it twice in going through; in the third heater there is no such partition. The water passes from the third heater into a fourth heater, formed of an annular chamber placed in the smokebox and containing 265 water tubes of 1 in. inside diameter and 18 in. long, arranged in three concentric rings, which finally deliver to the boiler on its center line directly back of the smokebox.

The successive temperatures attained by the water in the course of its circulation through the four heaters are as follows:

Initial temperature on leaving tender	68 deg. F.
Temperature on leaving first heater	82 "
" " " second heater	171 "
" " " third heater	203 "
" " " fourth heater	280 "

The estimated saving of fuel, under ordinary working conditions, is about 16 per cent.; but compared with the ordinary methods of operation, using injectors, the saving is more than 17 per cent. The averages of the results obtained in eight runs with heaters and eight without the heaters are given in the following table:

Heaters.	No. of trips.	Coal.	Weight of train (net).	Speed per hour.	Temperature of feedwater.	Point of cut-off of stroke.
Used	8	2,887.5 lbs.	251.08 tons	48.11 miles	252 deg. F.	23.6 per ct.
Not used	8	3,722.4 "	254.10 "	46.62 "	...	25.1 " "

The distance from Cairo to Alexandria is about 129 miles, and is covered by express trains making four stops in 3 hrs. 5 min.; the longest run without a stop being 74.4 miles. The coal consumption on the run from Cairo to Alexandria is about 12 per cent. more than in the opposite direction, during the summer months, because of the continual northwest winds that prevail and to which the line is especially exposed. This increase is quite marked in the detailed record of coal consumption for the several trips of the test and obtains both with and without the use of the heaters.

The consumption of coal per net ton of weight hauled was 10.45 lbs. when the heaters were used and 13.30 lbs. when they were cut out, showing that the heaters effected a saving of 21.4 per cent., or that it was necessary to burn 27.3 per cent. more coal when they were not in use. The price of coal in Alexandria is about $5 per net ton, and the cost of installing the heaters was about $1,250 per engine, representing an annual charge of about $187.50 for interest and depreciation, while the annual saving effected in 720 trips would be about 300 tons, or a net gain of about $1,300, which would be more than sufficient to pay for the equipment in a year. In an engine of this character exhibited at Milan especial provision was made in the arrangement of the smokebox heater, so that it could be used as a superheater for the steam, in case it should be desired either to cut out the heaters or use an injector instead of the pump.

Manganese Bronze Staybolts.*

The *Revue Generale* published in March, 1901, a note regarding an attempt being made by the Northern Railway of France to do away with the grave troubles due to the breakage of copper staybolts in high-pressure locomotive boilers.

Since this time the experiments have been continued, and although they have not been extended to any large number of boilers they have sufficed to justify the step, taken in May, 1904, of using manganese bronze staybolts for all locomotive boilers with a pressure of more than 185 lbs. per sq. in. One of the tests was carried out with a series of 15 locomotives, of the compound 10-wheeled type (4.6.0) designed under the direction of Mr. du Bousquet, and built in the shops of the Northern Railway for the Ceinture Railway of Paris. Mr. Koechlin, who carried out the designs of these

*Translated from a paper by M. Rodrigue, Chief Engineer of Central Service, Northern Ry. of France, printed in the *Revue Generale des Chemins de Fer*, July, 1901.

engines, described them in the *Revue Générale* of May, 1904. We will only recall at present that the boiler pressure was 227 lbs. per sq. in.

As soon as these engines went into service there were a large number of failures of the copper staybolts, and it was decided to keep a special record of this trouble. As built, the boilers were equipped with manganese bronze staybolts in the three upper rows and in the corners of the fireboxes, and on account of the large number of failures of the copper stays when the engines first went into service, Mr. du Bousquet decided to equip two of the locomotives with manganese bronze staybolts throughout.

The 15 engines were delivered during the latter half of 1902 and a careful record kept of all staybolt failures. The results are given in the accompanying table, which has been drawn up to show for each engine and for the whole series the number of staybolts replaced during each half yearly period after going into service.

It will be seen from this table that on engines 60 and 65 which were equipped throughout with manganese bronze staybolts, not a single staybolt was replaced during three years service, and that at the end of 4½ years there had been replaced only 58 staybolts of which the heads had worn down. On the other 13 engines during the same period of 4½ years the number of broken staybolts replaced was 3,978 of copper and three of manganese bronze, while 376 bronze staybolts were replaced on account of worn heads. That is to say, it was necessary to replace nearly 10 times as many copper as bronze staybolts.

This is extremely interesting from the point of view of the cost, and of the inconveniences of all sorts which attend the replacing of staybolts, but it is still more striking if one considers the breakage of the staybolts which is the most important consideration from the point of view of safety. During the period of 4½ years only three bronze staybolts broke as against 3,978 of copper.

This result would have been even more strikingly in favor of the bronze bolts if the broken copper staybolts had not been replaced by bronze. It will be seen that the number of breakages of the copper bolts, which was 983 in the first six months, fell off rapidly. If the same rate of breakage had been maintained it would have been necessary in the 4½ years to replace practically all of the copper staybolts in the 13 engines.

These figures show clearly that manganeze bronze is superior to copper for staybolts for locomotive boilers with high pressure. If the initial cost is higher it is largely offset by the savings effected during the first few months in service.

TABLE SHOWING THE NUMBER OF FIREBOX STAYS REPLACED IN HALF YEARLY PERIODS ON EACH OF 15 LOCOMOTIVES, FROM JUNE, 1902, TO DEC. 31, 1906.

No. half yearly period	1.		2.		3.		4.		5.		6.		7.		8.		9.		Total No. of staybolts replaced on each engine.	
Age loco. at end each period	6 mos.		12 mos.		18 mos.		2 years		2½ yrs.		3 yrs.		3½ yrs.		4 yrs.		4½ yrs.			
Stays replaced	C.	B.	C.	B.	C.	B.	C.	B.	C.	B.	C.	B.	C.	B.	C.	B.	C.	B.	C.	B.
Engine No. 51	138	...	54	...	70	...	49	...	19	...	13	...	21	...	78	...	18	34	460	34
" " 52	160	...	76	...	68	...	41	...	27	...	24	...	3	...	45	...	15	9	457	9
" " 53	175	...	94	...	62	...	30	...	19	...	16	...	7	...	15	27	7	11	425	38
" " 54	87	...	58	...	29	...	45	...	28	...	37	...	4	...	28	25	19	1[1]	338	26
" " 55	14	...	20	...	16	...	5	...	11	...	21	...	15	...	49	2	23	1[2]	171	3
" " 56	18	...	17	...	31	...	23	...	13	...	14	...	103	...	15	...	28	27	262	27
" " 57	59	...	26	...	28	...	26	...	22	...	2	...	24	...	8	19	7	...	202	19
" " 58	41	...	21	...	13	...	15	...	15	...	11	...	38	...	3	...	..	...	157	...
" " 59	26	...	38	...	29	...	23	...	13	...	31	...	61	20	8	...	..	...	229	20
" " 60	...	...	...	...	...	...	...	...	...	...	...	...	...	...	..	28	..	...	...	28
" " 61	164	...	124	...	44	...	58	...	18	...	4	...	31	...	21	...	3	40[3]	464	40
" " 62	14	...	53	...	51	...	46	...	25	...	17	...	2	...	44	...	102	82	354	82
" " 63	35	...	18	...	21	...	16	...	7	...	10	...	8	...	49	8	17	...	182	8
" " 64	51	...	33	...	54	...	9	...	10	...	40	...	39	...	35	15	..	...	274	15
" " 65	..	...	..	...	..	...	..	...	..	...	..	...	..	...	..	30	..	...	...	30
Totals	983	...	629	...	519	...	396	...	227	...	240	...	359	20	396	154	239	205	3,978[4]	379[5]

Each firebox had originally 708 (C.) copper, 176 (B.) manganese bronze, a total of 884 stays, except on Engines 60 and 65, where all the firebox stays were of manganese bronze.

[1] Manganese bronze staybolt applied Jan. 17, 1903, and broken in September, 1906.
[2] Manganese bronze staybolt applied May 3, 1903, and broken in October, 1906.
[3] Of these, one manganese bronze staybolt was applied Nov. 14, 1902, and broken in September, 1906.
[4] These 3,978 copper staybolts were replaced because of breakage.
[5] Of these, 376 were replaced because the heads were worn, and 3 because of breakage. The 376 of which the heads were worn were all in the zone below the firebrick arch.

Standard Oil Company Fined $29,240,000.

In the United States District Court in Chicago, August 3, Judge K. M. Landis imposed on the Standard Oil Company of Indiana, as the penalty for accepting unpublished rates on 1,462 shipments of oil from Whiting, Ind., to East St. Louis, fines aggregating $29,240,000, or a $20,000 fine for each offense. The Judge at the same time recommended that a special grand jury be convened to consider the question of the guilt of the Chicago & Alton Railroad, which was the other party to these offenses, and this is being done.

The trial of these cases was begun in Chicago, March 4, and was finished April 13. Arguments for a new trial were heard but were denied, and Judge Landis then called John D. Rockefeller and other officials to testify as to the relations of the Standard Oil Company of Indiana to the Standard Oil Company of New Jersey. It was found that the Indiana corporation was owned by the other. It appears that the total of the assets of the Indiana company is far less than the amount of the fines.

The offense in this case was that of accepting from the Chicago & Alton a rate of 6 cents per 100 lbs. on oil in carload lots from Whiting, Ind., to East St. Louis, Ill., when the published tariff rate was 18 cents per 100 lbs. The oil company claimed that the railroad had misled it into the belief that 6 cents was the legal rate, and that tariffs showing it had been filed with the Interstate Commerce Commission, but the court held that, as the law required freight tariffs to be posted in the freight offices for public inspection, it was the oil company's duty to know whether or not the rate given to it was lawful.

The President of the Standard Oil Company of Indiana in a statement given to the newspapers, says that the 18-cent rate was a class and not a commodity rate, and that the chairman of the Chicago and St. Louis Traffic Association, the association issuing the 18-cent class rate, under oath testified that it was never applied and was never intended to apply to oil. Continuing, he says: "Thousands of tons of freight have been shipped from these points during the past 15 years under the same circumstances as the Standard shipments, and if the Standard is guilty in this case, so is practically every other shipper in this great manufacturing territory.

"The Standard Oil Company shipped about one-third of all the oil that went from Whiting to East St. Louis over the Eastern Illinois, the other two-thirds going over the Alton and the Burlington. On the trial of the case the defendant offered to show by witnesses who were on the stand that not only during the period of time covered by the indictment, but continuously from 1895, the Eastern Illinois had a lawful published and filed rate between Whiting and East St. Louis on oil of 6 cents per 100 lbs., and that the Standard Oil Company shipped at such rate over the Eastern Illinois more than 2,000 cars of oil each year during said period. To this offer the Government through its attorneys strenuously objected, and the court sustained such objection. The defendant contended, and still does contend, that this proof would have conclusively shown that the Standard Oil Company had no possible motive in shipping over the Alton, and thereby violating the law, when it might just as readily and conveniently have shipped all of its oil over the Eastern Illinois, and not have violated any law.

"Under such circumstances, and in view of the fact that petroleum had been openly carried over the three roads from Whiting to East St. Louis for from 10 to 14 years for 6 cents, it is a severe draft on human credulity for the prosecution to assert that 18 cents was the only possible lawful rate. The uncontradicted evidence also showed the Standard Oil Company was advised by the rate clerk of the Chicago & Alton that this 6-cent rate was filed with the Interstate Commerce Commission.

"The court, however, instructed the jury that the shipper must know not only what the rate was, but also that such rate was actually filed with the Interstate Commerce Commission. That is to say, the view of the court was that a shipper must know absolutely what was the legal rate, at the risk of suffering enormous penalties, in the event either that he was misinformed by the railroad company, or in the event that he did not exercise as much diligence as, in the judgment of the court, he should have exercised in ascertaining what the rate really was.

"Knowing that the rate on the Eastern Illinois was but 6 cents, having no reason for shipping over the Alton in preference to the Eastern Illinois, and able to ship all of its oil over the latter road, we insist that the facts, many of which the court did not permit us to show, not alone demonstrate innocence, but inherently forbid the idea of guilt."

The Railroads of Mexico.*

BY ERDIS G. ROBINSON, C.E.
Formerly of the Engineering Department of the Mexican Central.

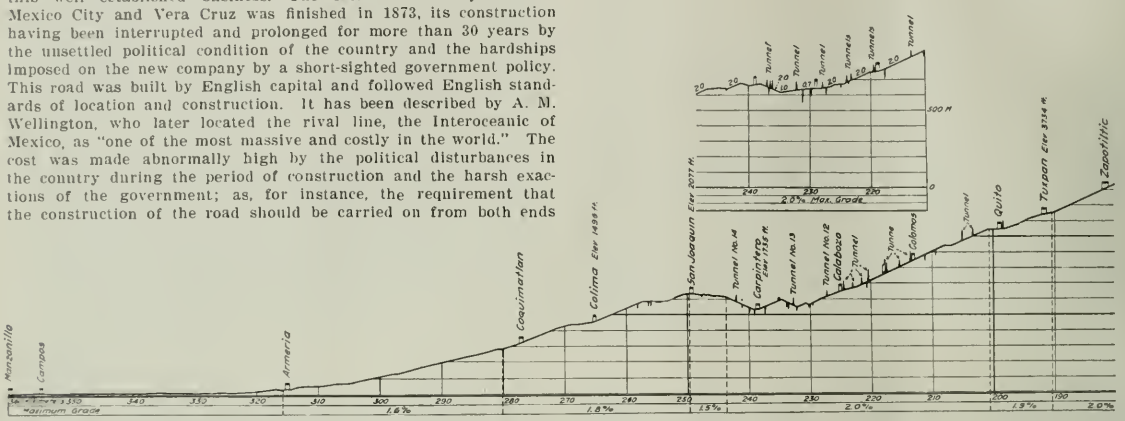
II.

THE PRINCIPAL RAILROADS.

Vera Cruz had early become the main Atlantic seaport of Mexico; even before the advent of the railroad a considerable business was handled at that port. The town was connected with the City of Mexico by an excellent road which became established as a regular traffic route. Therefore it was to be expected that the first line of railroad to be built in the country should be one to handle this well established business. The Mexican Railway between Mexico City and Vera Cruz was finished in 1873, its construction having been interrupted and prolonged for more than 30 years by the unsettled political condition of the country and the hardships imposed on the new company by a short-sighted government policy. This road was built by English capital and followed English standards of location and construction. It has been described by A. M. Wellington, who later located the rival line, the Interoceanic of Mexico, as "one of the most massive and costly in the world." The cost was made abnormally high by the political disturbances in the country during the period of construction and the harsh exactions of the government; as, for instance, the requirement that the construction of the road should be carried on from both ends simultaneously, which entailed extremely heavy transportation expenses on construction materials. Mr. Wellington has estimated that the cost of construction was doubled by such hindrances. Therefore, dividing the actual cost by two, he estimated that the 223 miles of comparatively light work cost about $40,000 a mile, while the 60 miles of heavy work cost about $185,000 a mile, thus making an average for the whole road of $70,670 a mile. Notwithstanding this heavy cost of construction, the grades and curves are more severe than those of any other line in Mexico. On the mountain section there are uncompensated grades of 4 per cent., with curves of 325 ft. radius (about 18 deg.), often with no tangent between reverse curves. Although the volume of business is large, operating expenses are high. The high cost of construction also makes interest charges large.

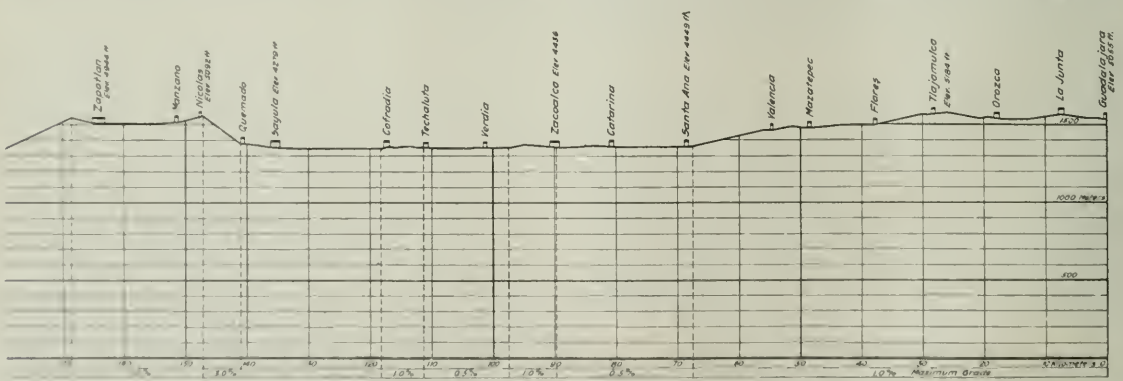
The volume of business at Vera Cruz later tempted other English capitalists to undertake construction of a second line from that port to Mexico City. The preliminary survey of this line was in charge of Mr. Wellington. His description of the work in a paper presented to the American Society of Civil Engineers is of unusual interest. The new line, the Interoceanic, parallels the older road in that it connects the same terminal cities, but otherwise departs widely from it. Although built to handle the business between Vera Cruz and Mexico City, its length was materially increased in order to reach two important cities, Jalapa and Puebla, which were not on the line of the Mexican Railway, this location being entirely consistent with the principles so ably advocated by Mr. Wellington in his "Economic Theory of Railroad Location." The Mexican Railway was projected to handle the through business and neglected local possibilities; the other road was lengthened so as to include certain intermediate cities at the cost of longer haul on its through traffic. It is interesting to note that it has been found advisable to alter both locations. The Mexican Railway has built a branch line to reach the city of Puebla, while the Interoceanic has built a cut-off which reduces the length of through haul by which that same city is left at one side.

The Interoceanic Railway was built with narrow gage, the grade kept down to 2 per cent. (uncompensated) and curvature to 289 ft. radius (20 deg.). The 2 per cent. grade extends unbroken for nearly 75 miles. The estimated cost of this road was $40,000 a mile, about one-half of that of the earlier road. The gross earnings are about the same for both roads, not far from $3,000,000 a year.



Profile of the Mexican Central's Line from Guadalajara to Manzanillo (1).

Extending to the south from Vera Cruz is one of the newer roads, the Vera Cruz & Pacific, built to exploit the rich tropical lands and to connect with the Tehuantepec National Railway, which crosses the isthmus of that name. The Tehuantepec road is interesting in that its construction was undertaken directly by the Mexican Government and marked the entrance of the government into the railroad field. The road follows the route of the line proposed by Captain Eads for a ship railroad and crosses a summit of only 850 ft. elevation.



Profile of the Mexican Central's Line from Guadalajara to Manzanillo (2).

The second company to enter Mexico was the Mexican Central. The organization of this road in 1880 was followed vigorously by surveys and construction, and in 1884 the line was completed from El Paso to the City of Mexico, 1,225 miles. This was the first road to be built under a law passed in 1880 to encourage railroad building. It received a government subsidy of $15,000 a mile, free importation of construction material and exemption from all taxation for 50 years.

The general location of this road has met with considerable

*The first article was published in the *Railroad Gazette* of July 12, 1907.

criticism. The line follows the entire length of the high plateau in the western part of Mexico and therefore its through route for international business is unnecessarily long. It was projected by men who had been building in the western part of the United States roads like the Atchison, Topeka & Santa Fe whose prosperity was dependent on the future development of the tributary country. The Mexican Central was located on the same theory. That to depend largely on local business was the correct view is indicated by the fact that the international freight and passenger business of the road is only 30 per cent of its total traffic, and that much of the local traffic comes from the northern part of the road. The growth of this company has been constant. The branch to Tampico, the second most important port in Mexico, was finished in 1890. During 1908 a line to the Pacific coast at Manzanillo will be put in operation. The Tampico branch makes the sharp descent from the plateau over a country similar to that crossed by the Mexico City-Vera Cruz lines, while the Pacific extension crosses the great Sierra Madre range. Though penetrating a more difficult country than is encountered by any other Mexican road, this extension is to have the easiest grades and lightest curvature of any line to either coast, a result which will be obtained only after most careful location and costly work. A Fellow of the Royal Geographical Society has said in regard to this extension:

"I have seen some of the most apparently hopeless problems of circumvention overcome, such as the magnificent bit of line from Wellington in Cape Colony; the 5,000-ft. climb of the La Guira & Caracas Ry. in Venezuela; the stupendous passage over the Sierras of the Sao Paulo Ry. in Brazil, and the clever piece of construction work on the Mexican Railway. In my opinion the new line from Tuxpan to Colima [the Mexican Central's Pacific extension] is incomparably more imposing than any of these and infinitely more difficult."

A topographic map and profile of this new extension are shown. The following table shows the rates of grade and costs of construction of certain mountain divisions of various Mexican railroads.

Table 1. *Rates of Grade and Cost of Construction on Mountain Divisions of Mexican Railroads.*

Name of railroad.	Location of grade.	Length of grade, miles.	Average cost per mile (U. S. currency).	Rate, grade, per cent.	Radius of curvature (ft.).	Deg. curve (100 ft. chord).	Gage.
Mexican Central	Tampico division	27	....	3	262	22	S.
" "	Cuernevaca division	25	....	3½	..	..	S.
" "	Colima extension	100	$50,000	2	627	9	S.
" "	Tuxpan Colima	40	57,080	2	627	9	S.
" "	Colima Manzanillo	60	335,500	2	627	9	S.
" "	Tuxpan-Colima	4	200,000	2	627	9	S.
Mexican Railway	Vera Cruz, main line	60	185,000	5	320	18	S.
" "	Vera Cruz, main line	283	70,670	5	320	18	S.
Interoceanic	Vera Cruz, main line	73	40,000	3	262	22	N.

S = Standard gage.; N = Narrow gage.

The Mexican National Railway, now the National Railway of Mexico, was projected to form a short line from Mexico City. It was promoted by men interested in the Denver & Rio Grande and other narrow gage roads in this country, and was intended to form part of a large system of affiliated narrow gage lines. The Mexican National operated for many years at a great disadvantage in handling its through business. A few years ago it was changed to standard gage. This change made, the fact that it is much shorter than any [illegible] gives it an [illegible].

The Mexican International Railway [illegible] interests crossing the [illegible] from the international boundary at Eagle Pass to the rich mining city of Durango. This was built standard gage and through a country which required only light grades. It crosses the Mexican Central at Torreon. For many years it was virtually a feeder of that system and by means of a traffic agreement served as a short outlet for the through business of that road. Mineral products form a larger percentage of this company's traffic than of any other of the larger roads of Mexico, being something like 75 per cent.

Is it not possible that the promoters of these roads have builded better than they knew, in view of recent developments in the railroad situation in Mexico? The proposed absorption of all these railroads except the Mexican Railway in the government merger by which competition will be done away with, makes it appear fortunate that the different lines were laid out on different principles—some to promote local business, some to handle through traffic, and some to care largely for mineral traffic. The business coming to the railroads in Mexico has not generally been of sufficient magnitude to encourage the construction of many competing parallel lines so that the way was made easy for the formation of government's merger.

(To be continued.)

Topography of the Mexican Central's Pacific Coast Extension.

Standard Specifications for Structural Timber.

Committee Q of the American Society for Testing Materials at the annual meeting of the society last month presented the following proposed specifications for grading structural timber:

STANDARD DEFECTS.

The definitions of standard defects are as follows:

Measurements which refer to the diameter of knots or holes should be considered as referring to the mean or average diameter.

1. *Sound Knot.*—A sound knot is one which is solid across its face and which is as hard as the wood surrounding it; it may be either red or black, and is so fixed by growth or position that it will retain its place in the piece.

2. *Loose Knot.*—A loose knot is one not firmly held in place by growth or position.

3. *Pith Knot.*—A pith knot is a sound knot with a pith hole not more than ¼ in. in diameter in the center.

4. *Encased Knot.*—An encased knot is one which is surrounded wholly or in part by bark or pitch. Where the encasement is less than ⅛ in. in width on both sides, not exceeding one-half the circumference of the knot, it shall be considered a sound knot.

5. *Rotten Knot.*—A rotten knot is one not as hard as the wood it is in.

6. *Pin Knot.*—A pin knot is a sound knot not over ½ in. in diameter.

7. *Standard Knot.*—A standard knot is a sound knot not over 1½ in. in diameter.

8. *Large Knot.*—A large knot is a sound knot, more than 1½ in. in diameter.

9. *Round Knot.*—A round knot is one which is oval or circular in form.

10. *Spike Knot.*—A spike knot is one sawn in a lengthwise direction; the mean or average width shall be considered in measuring these knots.

11. *Pitch Pockets.*—Pitch pockets are openings between the grain of the wood containing more or less pitch or bark. These shall be classified as *small, standard* and *large* pitch pockets.

(*a*) *Small Pitch Pocket.*—A small pitch pocket is one not over ⅛ in. wide.

(*b*) *Standard Pitch Pocket.*—A standard pitch pocket is one not over ⅜ in. wide, or 3 in. in length.

(*c*) *Large Pitch Pocket.*—A large pitch pocket is one over ⅜ in. wide, or over 3 in. in length.

12. *Pitch Streak.*—A pitch streak is a well-defined accumulation of pitch at one point in the piece. When not sufficient to develop a well-defined streak, or where the fiber between grains, that is, the coarse-grained fiber, usually termed "Spring wood," is not saturated with pitch, it shall not be considered a defect.

13. *Wane.*—Wane is bark, or the lack of wood from any cause, on edges of timbers.

14. *Shakes.*—Shakes are splits or checks in timbers which usually cause a separation of the wood between annual rings.

15. *Rot, Dote and Red Heart.*—Any form of decay which may be evident either as a dark red discoloration not found in the sound wood, or the presence of white or red rotten spots, shall be considered as a defect.

16. *Ring Shake.*—An opening between the annual rings.

17. *Through Shake.*—A shake which extends between two faces of a timber.

STANDARD NAMES FOR STRUCTURAL TIMBERS.

The following trade names are recommended:

1. *Southern Yellow Pine.*—Under this heading two classes of timber are used, (*a*) longleaf pine, (*b*) shortleaf pine.

It is understood that these two terms are descriptive of quality, rather than of botanical species. Thus, shortleaf pine would cover such species as are now known as North Carolina pine, loblolly pine and shortleaf pine. "Longleaf pine" is descriptive of quality, and if Cuban, shortleaf or loblolly pine is grown under such conditions that it produces a large percentage of hard summer wood, so as to be equivalent to the wood produced by the true longleaf, it would be covered by the term "longleaf pine."

2. *Douglas Fir.*—The term "Douglas fir" to cover the timber known likewise as yellow fir, red fir, western fir, Washington fir, Oregon or Puget Sound fir or pine, norwest and west coast fir.

3. *Norway Pine*, to cover what is known also as "red pine."

4. *Hemlock*, to cover southern or eastern hemlock; that is, hemlock from all states east of and including Minnesota.

5. *Western Hemlock*, to cover hemlock from the Pacific coast.

6. *Spruce*, to cover eastern spruce; that is, the spruce timber coming from points east of Minnesota.

7. *Western Spruce*, to cover the spruce timber from the Pacific coast.

8. *White Pine*, to cover the timber which has hitherto been known as white pine, from Maine, Michigan, Wisconsin and Minnesota.

9. *Idaho White Pine*, the variety of white pine from western Montana, northern Idaho and eastern Washington.

10. *Western Pine*, to cover the timber sold as white pine coming from Arizona, California, New Mexico, Colorado, Oregon and Washington. This is the timber sometimes known as "Western yellow pine," or "Ponderosa pine," or "California white pine," or "Western white pine."

11. *Western Larch*, to cover the species of larch or tamarack from the Rocky Mountain and Pacific coast regions.

12. *Tamarack*, to cover the timber known as "Tamarack," or "Eastern Tamarack," from states east of and including Minnesota.

13. *Redwood*, to include the California wood usually known by that name.

STANDARD SPECIFICATIONS FOR BRIDGE AND TRESTLE TIMBERS.

(To be applied to solid members and not to composite members.)

General Requirements.

Except as noted all timber shall be cut from sound trees and sawed standard size; close grained and solid; free from defects such as injurious ring shakes and crooked grain; unsound knots; knots in groups; decay; large pitch pockets, or other defects that will materially impair its strength.

Standard Size of Sawed Timber.—Rough timbers when sawed to standard size, shall mean that they shall not be over ¼ in. scant from actual size specified. For instance, a 12-in. x 12-in. shall measure not less than 11¾ in. x 11¾ in.

Standard Dressing of Sawed Timbers.—Standard dressing means that not more than ¼ in. shall be allowed for dressing each surface. For instance, a 12-in. x 12-in. shall after dressing four sides, not measure less than 11½ in. x 11½ in.

Stringers

1. *Longleaf Yellow Pine and Douglas Fir.*—Shall show not less than 80 per cent. of heart on each of the four sides, measured across the sides anywhere in the length of the piece; loose knots, or knots greater than 1½ in. in diameter, will not be permitted at points within 4 in. of the edges of the piece.

2. *Longleaf Yellow Pine, Shortleaf Pine, Douglas Fir and Western Hemlock.*—Shall be square edged, except it may have 1 in. wane on one corner. Knots must not exceed in their largest diameter one-quarter the width of the face of the stick in which they occur. Ring shakes extending not over one-eighth of the length of the piece are admissible.

Caps and Sills.

1. *Longleaf Yellow Pine and Douglas Fir.*—Shall show 85 per cent. heart on each of the four sides, measured across the sides anywhere in the length of the piece; to be free from knots over 2½ in. in diameter; knots must not be in groups.

2. *Longleaf and Shortleaf Yellow Pine, Douglas Fir and Western Hemlock.*—Shall be square edged, except it may have 1 in. wane on one corner, or ½ in. wane on two corners. Knots must not exceed in their largest diameter one-quarter the width of the face of the stick in which they occur. Ring shakes extending not over one-eighth the length of the piece are admissible.

Posts.

1. *Longleaf Yellow Pine and Douglas Fir.*—Shall show not less than 75 per cent. heart, measured across the face anywhere on the length of the piece; to be free from knots over 2½ in. in diameter, and must not be in groups.

2. *Longleaf and Shortleaf Yellow Pine, Douglas Fir and Western Hemlock.*—Shall be square edged, except it may have 1 in. wane on one corner, or ½ in. wane on two corners. Knots must not exceed, in their largest diameter, one-quarter the width of the face of the stick in which they occur. Ring shakes shall not extend over one-eighth of the length of the piece.

Longitudinal Struts or Girts.

1. *Longleaf Yellow Pine and Douglas Fir.*—Shall show one face all heart; the other face and two sides shall show not less than 85 per cent. heart, measured across the face or side anywhere in the piece; to be free from knots 1½ in. in diameter and over.

2. *Longleaf and Shortleaf Yellow Pine, Douglas Fir and Western Hemlock.*—Shall be square edged and sound; to be free from knots 1½ in. in diameter and over.

Longitudinal X-Braces, Sash Braces and Sway Braces.

1. *Longleaf Yellow Pine and Douglas Fir.*—Shall show not less than 80 per cent. heart on two faces and four square edges; to be free from knots over 1½ in. in diameter.

2. *Longleaf and Shortleaf Yellow Pine, Douglas Fir and Western Hemlock.*—Shall be square edged and sound; to be free from knots 2½ in. in diameter and over.

SPECIFICATIONS FOR CAR SILLS AND CAR FRAMING FOR FREIGHT CARS.

The following specifications are submitted as a preliminary report, it being the intention of the committee to give these further consideration during the coming year:

General Rules.

All timber shall be sound, sawed standard size, square edged, unless otherwise specified, free from unsound or loose knots, knot holes and ring shakes.

Standard Size of Sawed Timbers.—Rough timbers when sawed to standard size, shall mean that they shall not be over ¼ in. scant from actual size specified. For instance, a 12-in. x 12-in. shall measure not less than 11¾ in. x 11¾ in.

Standard Dressing of Sawed Timbers.—Standard dressing means that not more than ¼ in. shall be allowed for dressing each surface. For instance, a 12-in. x 12-in. shall after dressing four sides, not measure less than 11½ in. x 11½ in.

Sills.

1. *Longleaf Pine or Douglas Fir.*—Shall be square edged and show not less than 85 per cent. heart on wide faces, measured anywhere in the length of the piece; sound, tight knots less than 2 in. in diameter and standard pitch pockets permitted when not clustered; grain must be close and straight.

2. *Longleaf Pine, Shortleaf Pine, Norway Pine, Western Pine, Douglas Fir, Western Hemlock.*—Same specifications as for (1), except that sound, tight knots less than 2½ in. in diameter, if well scattered, will be permitted in longleaf pine and Douglas fir; wane not to exceed 10 per cent. of the width of adjacent faces will be permitted on opposite corners not to exceed one-half the length of the piece.

End Sills, End Plates, Posts, Braces and Carlines.

1. *White or Red Oaks.*—Shall show not less than 85 per cent. heart on each face, measured anywhere in the length of the piece; well-scattered, standard knots permitted.

2. *Longleaf Pine or Douglas Fir.*—Shall show not less than 85 per cent. heart on each face, measured anywhere in the length of the piece; must be close, straight-grained and free from all defects, except well-scattered, sound, tight knots, not over 1 in. in diameter.

Side Plates.

1. *Longleaf Pine, Douglas Fir.*—Shall show not less than 85

per cent. heart on wide faces, must be close straight grained, well scattered standard knots and standard pitch pockets permitted.

2. *Longleaf Pine, Douglas Fir, Western Pine, Western Hemlock, Shortleaf Pine.*—Same as for (1) except that a few well scattered, large knots will be permitted in longleaf pine and Douglas fir.

FRAMING FOR BUILDINGS.

The following specifications for framing for buildings are submitted as a preliminary report, it being the intention of the committee to give further consideration to these during the coming year.

General Requirements.

All timber shall be cut from sound timber and sawed standard size, close grained, free from ring shakes, decay and unsound knots, or knots and other defects that will materially impair its strength and durability.

Standard Size of Sawed Timber.—Rough timbers when sawed to standard size, shall mean that they shall not be over ¼ in. scant from actual size specified. For instance, a 12-in. x 12-in. shall measure not less than 11¾ in. x 11¾ in.

Standard Dressing of Sawed Timbers.—Standard dressing means that not more than ¼ in. shall be allowed for dressing each surface. For instance, a 12-in. x 12-in. shall after dressing four sides, not measure less than 11½ in. x 11½ in.

Posts—Longleaf Yellow Pine.

Will admit 1 in. wane on corners as measured on faces of timber. Must be free from knots 3 in. in diameter or over, and knots must not be in groups.

Beams and Girders—Longleaf Yellow Pine.

Will admit 1 in. wane on one corner as measured on faces of timber. Sound knots less than 3 in. in diameter will be permitted on the vertical faces at points not less than one-quarter the depth from the edge of the piece; sound, tight knots not exceeding 1½ in. in diameter at other points, provided they are not in clusters.

Joists—Longleaf Yellow Pine, Shortleaf Yellow Pine.

All joists over 2 in. in thickness to comply with the requirements for beams and girders.

Joists 2 in. in thickness will admit sound knots, none of which in 2 x 4's should be larger than 2 in. in diameter on one or both sides of the piece, and on wider stock which do not occupy more than one-third of the cross-section at any point throughout its length if located at the edge of the piece; or more than one-half of the cross-section if located away from the edge; pith knots, or smaller or more defective knots which do not weaken the piece more than the knot aforesaid; will admit of seasoning checks, firm red heart, heart shakes that do not go through, wane three-quarters deep on edge, one-quarter the width and one-third the length of the piece, pitch, sap stains, pitch pockets, splits in ends not exceeding in length the width of the piece, a limited number of small worm holes well scattered, and such other defects as do not prevent its use as substantial structural material.

Railroad Legislation in Connecticut.

BY CLARENCE DEMING.

In a railroad sense the seven months' session of the Connecticut legislature just ended, the longest in the history of the state, has been, if not important, at least most incongruous and fantastic. The session opened last January under peculiar and exceptional conditions. The anti-corporation wave sweeping over the country had struck Connecticut also, though with one of its minor surges. There was sharp criticism of railroad influence over-exercised in the lobby, albeit it had been modified in the legislature of 1905 in which the persuasive tongue of President Mellen in his so-called "open air" lobby had been more effective than the usual agencies. Meanwhile the Mellen policy of absorbing street railway lines had practically combined interests formerly at war, which new condition the legislature now faced for the first time. But the climax of that policy in the state by which, under the lease of the Connecticut Railway & Lighting Company's property some $18,000,000 of watered stock had become a dividend paying security, had, just before the meeting of the legislature, been sharply assailed in the press and apparently provoked public resentment. It had been carried through under the lax legislation of former years and the added laxity of a flabby and "political" railroad commission; and on the face of the disclosures, it seemed pretty certain that the legislature would seek the back track and pass severe statutes to secure honest street railway capitalization.

This natural forecast fell far short of fulfillment and, indeed, was reversed. Unexpectedly at the opening of the legislature trolley schemes came in like a flood. The state is small, its populous centers laced with trolleys and practically all of its really profitable street railway territory long ago occupied; yet, if it had been virgin street railway soil, the onset of trolley enterprises could hardly have been greater. They were some 24 in number besides those of minor importance. Most of them were of the "cross country" type and not a few of them called for layout through regions well [illegible] of patronage. In the case of a [illegible] the travels were parallel to the steam lines. Others appeared to involve pocket charters pure and simple—charters held merely for ulterior sale with no intention to build. In one particular region there was also a suspicious grouping of charters suggesting future consolidation and long distance paralleling, especially when coupled with power companies securing [illegible] privileges. What had actually come to pass was that trolley promoters instead of being deterred by the public clamor against the Railway & Lighting "deal" had been stirred by its success to try to repeat it by securing charter rights, building the new trolleys on bonds placed at a high broker's commission with the investing public and bonusing the stock among the projectors.

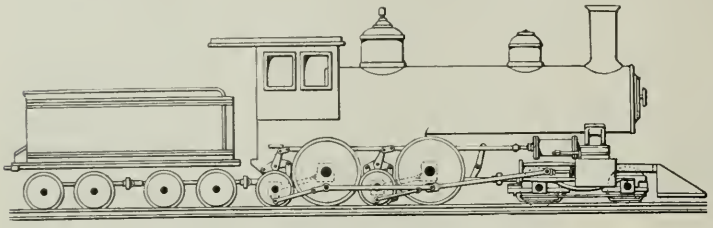
The promoters combined and went to work cleverly, drawing the "farm interest" into their net. In a Connecticut legislature this farm interest is very potential and, when united, dominant in the lower house, which at the last session contained 91 representatives who were farmers by vocation—in a house containing 255 members altogether—besides other members not farmers themselves but representing farm towns. This farm interest is to some extent consolidated in the granges of the state and much more effectively by the so-called "Farmers' Association" made up of members of the sitting legislature and holding a caucus at the opening of each legislative week to pass upon pending measures bearing on rural interests. Almost none of these farm members had seen previous legislative service and their ignorance of railroad and street railway questions was dense. On this soft timber, the more workable because green, the specious reasonings of the promoters were struck hard and cut deep. The benefits of the cities and larger towns from the trolleys as compared with the rural regions were contrasted. If the cities had parallel lines why couldn't the country have them too? The New Haven Railroad Company having now acquired the trolley roads, future extension must be left mainly to private enterprise; and such private enterprise would never try—in times like these with solid investments paying 5 per cent.—to link the farms with the cities unless "baited" by free gifts of street railway stocks as a bonus. These reasonings addressed to class selfishness prevailed in the lower house and, in most cases, in the Senate also. They were in brief: "Give us the trolleys and let the financing take care of itself." And the state of Connecticut, a *quasi* conservative and certainly a moneyed commonwealth, has been thus placed in the humiliating and discreditable position of approving dishonest street railway finance.

The trolley projects—except one or two which were a direct menace to the New Haven railroad—did not go through without stout resistance by Governor Woodruff who redeemed his pre-election pledge that his administration would be businesslike and not for party or persons. He sent in veto after veto of trolley charter bills, some 20 in number altogether. In almost all of these he urged in vain the undue opportunity for stock watering. But in all but two or three cases the bills were passed over his veto and so often that the certainty of an overruling vote became a theme of legislative laughter and jest. The temper of the Connecticut lawmakers was further indexed by the defeat of a bill for more careful and responsible engineering estimates of the value of new street railways as a basis for the amount of bonded debt. So far as it bears on street railways the substantial outcome of the session is the authorization of a new crop of watered trolley projects and pocket charters; and, in a larger civic sense, a most discouraging exhibit of blended ignorance, selfishness and fiscal laxity in the legislature of a New England state.

Steam railroad legislation of the session while not voluminous was stormy and the anti-corporation feeling much more in evidence than usual. The railroad interest secured control of the railroad and judiciary committees but in the latter case not without a contest which left behind bad blood, led to recrimination in the Senate and, incidentally, the passing of the lie between two Senators as to the nature and purpose of a joint interview with President Mellen. Sharp criticism of the New Haven company and personal attack upon its regular legislative counsel led to his withdrawal and the substitution of a new railroad attorney. Once again a bill was drawn modifying the four days car detention statute of the state; and, again, for the third successive legislative session it was withdrawn owing to resistance of the farm element and certainty of defeat in the lower house. Soon after the session opened the bill providing for issue of the New Haven company's convertible debentures was introduced with a pendant relating to mergers which, seemingly, added nothing to the corporation's existing charter powers. After a brief reverse in the lower house the measure went through and in the sequel, it appeared that the annex cleared definitely the way, under Connecticut law, for the absorption of the Boston & Maine. Under new laws records of mergers by a railroad company must be filed with the Secretary of State; towns and cities can appeal for proper facilities in street railway service; hours of labor of railroad telegraphers and train despatchers are regulated and reduced; towns and cities can appeal to the railroad commission for orders to stop trains and street railway employees are

subjected to the same penalty as those of a railroad in case of injury to passengers. Except at minor points the appeal of the Governor for larger powers of the railroad commission was disregarded, the legislature possibly thinking that a body that has not exercised powers already possessed would not use larger ones if granted. Bitter criticism of the work of state commissioners and other state officers in the lobby led to the suppression during the session of their usual pernicious activity.

In the way of indirect legislation that may include railroads should be noted the outcome of an acute telephone contest which still leaves with the state courts the question of the public necessity and convenience in authorizing rival lines. The result hints somewhat strongly at the theory of "natural monopoly" in public utilities though it is doubtful whether many members of the legislature recognized the fact. Just at the close of the session the Governor's insistent demand for a temporary commission to investigate the subject of public utilities legislation came to a head forced by his threat to summon an extra session if the legislature failed to act. A brief and loose law, naming the commissioners and thus taking their appointment out of the Governor's hands, was passed—in the lower house by a party vote. The commission of five is a weak one, deeply infused with politics, four of the five state officers present or past and, presumptively, representing corporation interests by which they were named. It is a body whose opportunity is likely to be larger than its courage or its works.



Bothwell Principle Applied to 8-Wheel Locomotive.

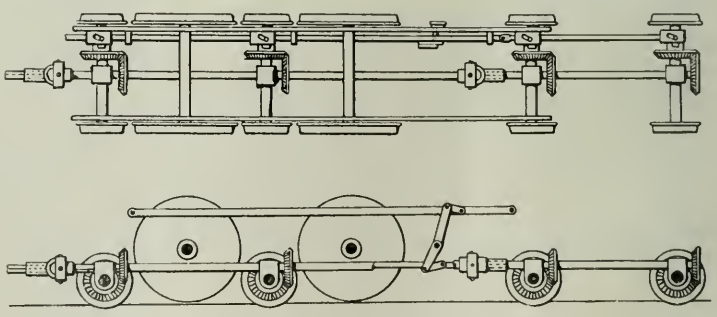
The Bothwell Locomotive.

A novel and interesting scheme for increasing locomotive tractive power and securing the additional adhesion to utilize this power, has been devised by George A. Bothwell, of Owen Sound, Ontario. Briefly, Mr. Bothwell's scheme consists in providing a second set of driving wheels of much smaller diameter than the regular drivers, to give the requisite greater tractive effort, and a system of gearing for utilizing the adhesion of the engine truck, and also of the tender, if desired. When the small drivers are on the rail the large ones are lifted clear of it and *vice versa*. The purpose of the scheme is a locomotive of maximum hauling capacity with minimum weight; that is, to provide within locomotives of the usual types means for taking over ruling grades trains which they would otherwise be unable to haul, or for which helper service would be needed.

The photograph and sketches herewith show the application of the idea to an eight-wheel locomotive. The change from one system to the other is effected by a cylinder controlled from the cab and worked either by steam or air. The working of the mechanism is such that by means of suitable clutches the gearing for driving the trucks is thrown into and out of service simultaneously with the changes between drivers. The mechanical details of the scheme are very ingeniously worked out.

The locomotive shown in the illustration was rebuilt at the Hicks Locomotive & Car Works, Chicago Heights, Ill. The auxiliary drivers are 32 in., the large ones 60 in., and the engine truck only is utilized to give the extra adhesion. This engine was equipped to demonstrate the feasibility of the idea. In a test made at the works, the engine running on the large drivers stalled with 25 empty cars on the grade on which the test was made, after taking 23 cars over. With the Bothwell mechanism it took 47 cars over and stalled with 50, showing a hauling capacity of about double the ordinary.

The scheme would appear to be limited to types of locomotives having not more than three pairs of drivers, on account of the necessary lengthening of the wheel-base. However, it is the inventor's idea that with such a mogul or 10-wheeler he would be able to take over the road trains for which much more powerful locomotives are now used and which may require helper service in addition on the critical grades. He would thus have the lower first cost and operating economies and advantages of the lighter locomotive, which it is considered would more than warrant the cost and maintenance, as well as the complication, of the additional mechanism for increasing its hauling capacity when desired. The Bothwell Locomotive Co. has been formed with headquarters at Owen Sound, Ont.



Sketch of Gear Mechanism; Bothwell Locomotive.

The Bothwell Locomotive.

GENERAL NEWS SECTION

NOTES.

In Cole County, Mo., the Missouri Pacific has been indicted on 14 counts for violating the law forbidding the employment of telegraph operators more than eight hours a day.

At a "family talk" of the Traveling and District Passenger and Freight Agents of the Wisconsin Central which was held in Milwaukee last week 52 traffic men employed by the company in various distant cities were present.

The Louisiana state railroad commissioners have ordered the Pontchartrain Railroad within 60 days to provide better cars for its passenger trains, and to run its trains to and from the Louisville & Nashville Central street station in New Orleans.

The principal railroads of Nevada have secured temporary injunctions against the new railroad commission of that state forbidding it to disturb freight rates. A hearing on the question of making the injunction permanent will be given on September 16.

The Central of New Jersey has begun suit at Easton, Pa., to test the validity of the Pennsylvania law passed this year, to go into effect October 1, reducing all passenger fares to 2 cents a mile. The Central avers that the proposed reduction would reduce its receipts $100,000 a year.

In Cole County, Missouri, the Missouri Pacific Railway has been indicted by the Grand Jury for failing to run at least one train each day over the Bagnell branch, and also, on 14 counts, for violating the law forbidding the employment of telegraph operators more than eight hours a day.

The New York, New Haven & Hartford now uses electric motors on all main line passenger trains which begin or end their trips at Portchester and New Rochelle, about 15 each way. All are suburban trains, most of them running to New York in the morning and from New York in the afternoon.

Complaint has been made to the Interstate Commerce Commission that the fare over the Michigan Central from Michigan City, Ind., to New Buffalo, Mich., 10 miles, which is 30 cents, is extortionate, to the extent of 50 per cent., 2 cents a mile being the intrastate rate both in Indiana and in Michigan.

According to a press despatch from Omaha, an order has been issued by the Union Pacific that between all stations where there is another railroad competing for passenger traffic, the rates on the Union Pacific shall be as low as those of the competitor; which will result in fares less than 2 cents a mile in many cases.

On the Mexican Central and the Mexican National Railroads second class fares and third class cars have been abolished. Henceforth there will be two classes, first and third, and the third class passengers will be carried in the cars hitherto used for second class. For third class passengers only 33 lbs. of baggage will be carried free.

The Adams Express Co. no longer does business on the Boston & Albany, and it has closed its offices at those stations between Boston and Worcester, where it has hitherto done local business, except those places which are reached also by the New York, New Haven & Hartford. The American Express now has exclusive rights on the B. & A.

The Isthmian Canal Commission announces that the excavation on the canal during July was as follows: Culebra division, 770,570 cu. yds.; Gatun, 74,765 cu. yds.; dredging in canal prism, 212,710 cu. yds.; total, 1,058,776 cu. yds., against 780,957 cu. yds. in June. This is the largest month's work yet done. The rainfall for the month is reported at 9.5 in., against 14 in. in June.

The arrests made on the Pennsylvania Railroad lines last month by the company's police numbered 638. Of these arrests, 237 were for illegal train riding. Of this number 31 paid the fare, while 107 were sent to jail and 66 were fined. The report shows that 147 arrests were made for trespassing, 63 for larceny and burglary and 13 for breaking into cars; and for stoning trains 13.

The Grand Trunk Railway has appealed to the Supreme Court against the recent order of the Canadian Railway Commission to run third-class cars on one passenger train each way daily, with tickets at 2 cents a mile. It appears that the Commission's order requires only what was required by a provision in the company's charter which, though never lawfully abrogated, has remained a dead letter.

In the Federal Court at Chicago, August 3, indictments were returned against the New York, Chicago & St. Louis and the Lehigh Valley railroads for granting illegal rebates on shipments of freight made in cars of the Overland Refrigerator Express Co. It is charged that commissions paid to the refrigerator company were used to reduce the [illegible] The [illegible] of the [illegible] erator [illegible]

The Chicago, Milwaukee & St. Paul, the Chicago & North-Western and the Wisconsin Central have given notice that on [illegible] they will reduce fares in Wisconsin to 2 cents a mile. [illegible] the Wisconsin Central say [illegible] the [illegible] of competition. The [illegible] & [illegible] bring it within [illegible]

At Jamaica, N. Y., last week Ralph Peters, President of the Long Island Railroad, and James A. McCrea, General Superintendent, were arrested on a criminal charge in connection with a railway crossing accident, and held in $1,000 bail each to await the action of the Grand Jury. The arrests were made on order of a coroner who declared these officers criminally negligent in failing to safeguard a crossing where two persons in an automobile were killed about two weeks ago.

At Palestine, Tex., one night last week, according to a press despatch, George Brush, a citizen of the state of Kentucky, presumably traveling in Texas, was arrested and fined $10 for taking a drink of whiskey while on a train of the International & Great Northern Railroad. According to the statement Mr. Brush had the whiskey in a flask, which he carried in his pocket, and he was only "sampling" it. In the eyes of the law, however—a law lately passed—drinking is drinking, and the drinker had to surrender to the sheriff.

The state of Arkansas, like Alabama, has a law designed to prevent railroads from transferring law suits from the state to the federal courts, the penalty being the forfeiture of the property of the company to the state. The Chicago, Rock Island & Pacific offended in this respect recently, and the Secretary of State started to apply the law, but, on application to the United States Circuit Court at St. Paul, August 5, the road secured an injunction against the Secretary of State, hearing on the injunction to be held at Little Rock, October 2.

The recent order of the state railroad commissioners of Missouri limiting the speed of trains on certain parts of the Missouri Pacific appears to have been due in considerable degree to political considerations, and parts of the order have been rescinded or suspended. Press despatches give contradictory information, so that the real facts are not made clear. It appears that there is dissension in the board, and two of the members have announced that the sections of railroad condemned are safe. The order limiting speed was made after the hearing of a complaint which was presented by an attorney for a trackmen's union.

The Wisconsin railroad commission has ordered sweeping reductions in freight rates on coal from Superior and Ashland to Eau Claire and intervening points over the Chicago, St. Paul, Minneapolis & Omaha. The reduction is about 40 cents a ton. The commission has also decided that at common points all railroads must switch each other's cars to their respective sidetracks for reasonable switching charges. They cannot charge distance tariff rates. It is also decided that a railroad acquiring a spur must so operate it as to serve the public reasonably and impartially; and again, that a certain minimum of passenger service must be maintained on a railroad regardless of the question of whether it is profitable.

The Southern Railway and other roads in Virginia have had to compromise with the Governor of that state concerning passenger fares in about the same way that they yielded to the Governor of North Carolina. In Virginia the Corporation Commission last April issued an order reducing fares to 2 cents and the railroads secured an injunction suspending the operation of the law, but on Saturday last the Governor told the railroads in substance that Virginia intended to fight for low fares on about the same plan that North Carolina has followed, and that an extra session of the legislature would be called if necessary to carry out what the Governor believes to be the wishes of the people. After a long conference the railroads agreed to reduce their fares on October 1 to 2 cents a mile, it being assumed that the United States Court would readily suspend its injunction forbidding such reduction. The railroads agreed to keep the low rate in force until the pending cases are settled by the Supreme Court of the United States, and both parties agree to secure such decision as speedily as possible. The Seaboard Air Line adopted the $2\frac{1}{2}$-cent rate for passengers in both Virginia and North Carolina on July 1. In Virginia, although the Jamestown Exposition is now stimulating travel, the receipts for passengers since the reduction have been less than in the corresponding period last year. In North Carolina the local passenger travel in July has been about 2 per cent. more than the last month while the passenger receipts have decreased 22 per cent.

A Phase of "Rapid" Transit in New York City.

Unless the Metropolitan Street Railway Company, which is now the owner of the old horse car line running from the Bartow station to City Island, on the Sound, gets some new horses to draw its cars before to-morrow, its line will be tied up. This was the order issued by the Society for the Prevention of Cruelty to Animals to-day. Of the 24 horses used on the line, one-half are about played out from old age, while others are suffering from sore shoulders. The horses have been worked on the line every day for nine years. It is bad enough to drive them over hill and dale at breakneck speed, with their rattletrap cars behind them, but in addition the horses suffer terribly from mosquito bites, as the entire country from Bartow to City Island is notorious for these pests. The company declares that it has been expecting for some time past to install electric cars but has been prevented from making this improvement because the city of New York is slow in widening and improving the street.—*New York Times.*

Blocking the Wheels of Civilization.

The Missouri, Kansas & Texas refuses to haul the Parker carnival train from Kansas City to Sedalia in the first week in October. The Missouri Pacific also refused to accept the train at Cole Camp and haul it to Sedalia. The railroads claim that they have entered into an agreement not to haul circus trains and will make no rate to haul them as circus trains, and can only accept them at the classified rates per 100 lbs., which would make the charges prohibitive. Operating officials contend that they must take special precautions with such trains and that they interfere with the movement of regular freight and cause congestion at the smaller terminals.—*Press Despatch.*

Another One.

A locomotive cab signal made by H. J. Jefcoate, of Crewe, England, was recently exhibited on the Wirral Railway, and the exhibition is described in a Consular Report as follows:

"A locomotive running 60 miles an hour, with its cab enveloped in tarpaulin, so that the engineer was entirely shut off from the outer world, was confronted by the distant signal set against it. The engine at once began to slacken and stopped dead at the home signal until the semaphore arm dropped, when it moved ahead again. The state of the signals was communicated to the engineer by an indicator in the cab, which announced them by bell, semaphore, and light. Two long bars parallel to the rails, one beginning where the other ended, were placed at both the distant and home signals, and as the engine passed over them, according as the semaphore was 'on' or 'off,' one or other of these bars rose on its pivots and pushed up one or other of two little plunger wheels which projected from the locomotive, and as it did so a bell was rung in the cab."

Railroad Course at New York University.

The New York University School of Commerce, Accounts and Finance will begin on September 26 a special one-year course in railroad traffic and accounts. The classes will be held on Monday and Thursday evenings. The following subjects will be included: Railroad accounts, corporation securities and reports, railroad transportation in the United States, and railroad traffic problems. Under the advice of railroad men of experience every effort has been made to make the course thoroughly practical.

Individual Car Owners' Association.

This is the name of an organization formed at Cleveland August 1 by 50 representatives of corporations, firms and individuals (other than railroad companies) owning freight cars, the meeting having been called by leading Pittsburg car owners. It is said that the men present at the organizing meeting represented 125,000 cars. All belong in states east of the Mississippi river. W. L. Andrews, of Baltimore, was chosen Chairman, and R. J. Bailey, of Pittsburg, Secretary. Other men prominent in the organization are: C. McIlvaine and C. O. Johnson, Pittsburg; T. J. Richman and Max Epstein, Chicago; C. D. Chamberlain, Cleveland.

Forty Passengers Killed in France.

In a derailment near Angers, France, on Sunday last, the engine, baggage car and the first passenger car of a passenger train fell off the side of a stone bridge crossing the Loire river, the parapet giving way, and all of the occupants of this part of the train, except the conductor and the fireman, were drowned. The passenger car, a third class, carried 40 passengers, and not one of them was able to get out of the car, although a part of the roof was forced off when the car sank in the water. The engineman was drowned, making 41 victims in all. The river at this place is 50 ft. below the track. The remainder of the train remained on the roadbed. Angers is at the junction of several railroads. The name of the road on which the accident occurred is not given in the press despatches.

Summer in the Suburbs.

W. Hardy Eshbaugh, living in Montclair avenue, Montclair, drives in his automobile to the Lackawanna station every morning. Yesterday he had just reached the station, when the 8 o'clock express pulled out. Mr. Eshbaugh had an important engagement at his office, and he told his chauffeur to "beat the train" to Bloomfield, nearly two miles away. The machine was thrown wide open, and only a streak of dust could be seen along Bloomfield avenue. Passing through Glen Ridge at a pace that surprised the natives, the automobile drew up at the Bloomfield station four minutes ahead of the train. When the chauffeur returned to Montclair Recorder Yost fined him $5 for excessive driving.—*New York Tribune.*

The old story about the Georgia ox team that beat a mixed train in a 10-mile run will now be retired.

The "Thor" Hose Coupling.

The "Thor" hose coupling for shop use is shown in the accompanying illustration. It is made of tough bronze to stand hard usage, and it will not rust. It has three hook-shaped lugs, which are made to engage by a third of a turn and produce a tight coupling. The couplings are made for ⅜ in., ½ in., ¾ in. and 1 in. hose or pipe with the same sized head, so that large and small hose or pipe can be coupled together without using reducers. Another advantage of this feature is that should a ¾-in. hose, for instance, burst and nothing be immediately available but a 1-in. piece, say, it can be used and delay thus avoided. There are no rights and lefts, every coupling joining to any other. There are only two patterns, one being to screw on to iron pipe, and the other being for hose. The "Thor" coupling is made by the Independent Pneumatic Tool Co., Chicago.

"Thor" Hose Coupling.

New Jersey Tax Law.

The New Jersey Court of Errors and Appeals has sustained the constitutionality of the Duffield act of 1905, under which second-class railroad and canal property is assessed at local tax rates instead of 1 per cent. as formerly. Under the Duffield act the entire revenue from this class of property goes to the municipality and none of it to the state, which now derives its revenues from a part of the tax levied against "main stem" property. The main stem consists of the right of way not exceeding 100 ft. in width, and second-class property is the real estate used for railroad purposes but not included in the main stem.

The test case was instituted by the Bergen & Dundee Railroad. Its second-class property in Passaic was taxed at $2.92 per $100. This rate varies in the different municipalities of the state, but in practically every instance is a substantial increase over the 1 per cent. rate formerly paid by the railroads.

INTERSTATE COMMERCE COMMISSION RULINGS.

In an opinion by Commissioner Clements the Commission has announced its decision in the case of Quimby and others against the Clyde Steamship Company and others. It appeared that class rates from North Atlantic ports were the same to a group of suburban mills as to Augusta, Ga., for 10 or 12 years before the absorption of the South Carolina & Georgia Railroad by the Southern Railway; that subsequent to such absorption the long-existing rates to these suburban points were increased by the concerted action of the defendant carriers, though the mill group is still recognized on shipments in the opposite direction, and that this grouping system is still effective to the extent of classing together some of these suburban points which are as far apart as Augusta is from the nearest of them. It also appeared that water lines by way of the Savannah river secure most of the freight of the heavy and bulky classes for these mills, and that a restoration of the Augusta rates to these suburban points would divert much of this traffic to the

defendant lines and thus increase their revenues. The Commission held that the rates to these suburban mill points in excess of those to Augusta are, under the circumstances, unjust and unreasonable. The places ordered to be put in the Augusta group are Aiken, Langley and Graniteville, S. C., but Blackville, S. C., 46 miles east of Augusta, was not ordered to be included in the Augusta group.

In an opinion rendered by Commissioner Clark, the Commission has announced its decision in the matter of the distribution of coal cars. The cases were brought by the Railroad Commission of Ohio against the Hocking Valley and the Wheeling & Lake Erie. Defendants are engaged principally in transportation of coal. Certain other railroads send their own cars to the coal companies with which railroads so sending their cars have contracts for fuel supply. Certain other coal operators have so-called "private" cars, devoted exclusively to their use. During a part of the year defendants are unable to furnish all of the cars desired by coal operators along their lines, and at such times the available cars not specially consigned or restricted as to use are divided among the several coal companies according to the capacities of their several mines. But in such distribution the foreign railroad fuel cars and the leased or private cars are excluded from consideration and are given to the coal companies to which they are consigned or assigned in addition to the full share of cars allotted to such mines in the proportionate distribution. Complaint alleges unjust discrimination against other coal operators along the lines of defendants, in that such distribution of cars and such failure to count the foreign railroad fuel cars and the private cars gives the coal operators to whom such cars are consigned and assigned unwarranted advantages over other operators in the mining and marketing of coal.

Upon the foregoing facts the Commission held that a carrier should give to the owner or lessee of private cars the use of such cars; and should also give to a coal company the foreign railroad fuel cars consigned to it; but that such private and foreign railroad fuel cars should, in the distribution of cars, be counted solely against the company to which delivered; and such company should not be given, in addition to such delivery, a share of the system cars (H. V. or W. & L. E.) except when the number of private and foreign railroad fuel cars so delivered to it is less than its distributive share of the available cars, including system cars, foreign railroad fuel cars, and so-called private cars, in which event it should be given only so many of the system cars as are necessary, when added to the number of private and foreign railroad fuel cars assigned to it, to make up its distributive share of the total available cars, including system cars, foreign railroad fuel cars, and so-called private cars. Defendants were ordered to distribute coal cars after Sept. 15 next on the basis here laid down.

TRADE CATALOGUES.

Storage Batteries.—The Gould Storage Battery Co., New York, is introducing a new design storage battery for small installations of closed circuit duty such as fire alarm and railroad telegraph systems, private telephone exchanges, etc., which is described in a recent catalogue. It is known as the "Tandem" couple type cell and it differs from other types in that the plates are placed end to end instead of side by side. Two plates only are used to each cell. The positive plate of one cell is lead burned to the negative plate of the next cell and no bolted connections are used. This method of grouping does away with separators and distributes the discharge and hence the wear and tear uniformly over all parts of both sides of the plates in each cell. The removal of plates for cleaning, inspection or renewal is also facilitated.

Storage Batteries.—Catalogue S-2 of the Westinghouse Machine Co., East Pittsburg, Pa., illustrates and describes the Westinghouse Type "S" storage battery for stationary service. This battery is of the pure lead sulphuric acid type with the active material formed from the lead itself after the Planté process. The advantages claimed for it are long life, high efficiency and freedom from injurious sulphation.

Mining Hoists.—Bulletin No. 56 of the Sullivan Machinery Co., Chicago, shows a number of views of typical installations of the large and powerful types of mining hoists developed in response to the demands of the Lake Superior iron and copper mines and now generally used in the West. There is also a brief description and a list of the advantages of the Sullivan machines.

MANUFACTURING AND BUSINESS.

The Falls Hollow Staybolt Co., Cuyahoga Falls, Ohio, is building a new mill of three times the capacity of the present mill.

Wilbur J. Watson, C. E., hitherto in charge of the bridge department of [illegible] Engineering Co., Cleveland, Ohio, [illegible]

The Northern Engineering Works, [illegible] Detroit, Mich., have installed a [illegible] Toledo Gas & Electric Co. [illegible] phy power plant at Detroit, Mich.

G. N. Sw[illegible], [illegible] Superintendent of Motive Power of the Rock Island system, was appointed Manager of Sales in the railroad department of the [illegible] Co., 174-176 E. Lake street, Chicago, on August 1.

On July 31, 1907, in the Circuit Court of the United States, District of New Jersey, a [illegible] was rendered in favor of the [illegible] Metal Company of Philadelphia, Pa., and [illegible], relative to infringement made upon their [illegible]

The Central Inspection Bureau, New York City, has [illegible] inspectors at the works of the Cincinnati Car Co., Cincinnati, Ohio; the Southern Car Co., High Point, N. C.; the Jewett Car Co., Newark, Ohio, the Niles Car & Manufacturing Co., Niles, Ohio, and at the J. G. Brill Company's plant.

E. H. Keating, M. Inst. C. E., M. Can. Soc. C. E., M. Am. Soc. C. E., and W. H. Breithaupt, C. E., M. Can. Soc. C. E., M. Am. Soc. C. E., have formed a partnership, with offices at Toronto, Ont., as Consulting Engineers, taking up railroad and municipal work, power development, bridges, foundations, buildings, etc., in Canada and other countries.

The mid-summer meeting of local managers and representatives from the Chicago house of The Sherwin-Williams Co. was held at the South Shore Country Club, Chicago, August 2. There were about 50 persons present, including Alex. Sclater, District General Manager of the company; Geo. A. Martin, Manager of the Cleveland district; J. P. Coleman, Manager of the Minneapolis district, and R. W. Sample, Manager of the Chicago district. There were talks by these managers and remarks from others among the representatives, following a dinner, after which the time was given up to social enjoyment.

In July the railroad department of the Westinghouse Electric Company, East Pittsburg, Pa., booked orders for about $2,500,000 worth of equipment. The Brooklyn Rapid Transit ordered 400 motors, 200 of which, of 200-h.p. each, are for 100 elevated railroad cars, while the rest, of 60 h.p. each, are for 100 surface cars. The cars were ordered last March. In connection with the elevated car equipment, the company will also furnish the Westinghouse multiple unit control. The Schoepf interests, of Cincinnati, Ohio, ordered a complete equipment of electrical apparatus for 24 substations, consisting of rotary transformers and switchboard appliances as well as four Westinghouse turbo-generators, aggregating 26,000 h.p.

Iron and Steel.

The Interborough Rapid Transit Company is in the market for 4,000 tons of rails.

The Southern has ordered 16,000 tons of bridge material from the Phoenix Bridge Co.

The Northern Pacific has ordered nearly 15,000 tons of steel for bridges from the American Bridge Co.

The Terminal Railroad Association of St. Louis has ordered 2,500 tons of bridge material from a St. Louis firm.

The New York, New Haven & Hartford has ordered 1,400 tons of steel for a Scherzer lift bridge at Providence from the Phoenix Iron Works.

The Atlanta, Birmingham & Atlantic has ordered steel for a number of bridges on its new line near Birmingham, from the American Bridge Co.

The Pennsylvania has ordered 750 tons of steel for bridges across streets in connection with the New York terminal, and 627 tons for the Duquesne Way elevated viaduct in Pittsburg.

It is reported from Chicago that an Illinois electric railroad has ordered 25,000 tons of rails for this year's delivery, and that other traction companies are in the market for from 5,000 to 10,000 tons.

The Detroit & Adrian Traction Co., a new company which is projecting a 61-mile interurban line in Michigan, is reported to be in the market for about 6,500 tons of 71-lb. rails. Address care of Security Trust Co., Detroit.

The Atchison, Topeka & Santa Fe has ordered 10,000 tons of rails from the Pennsylvania Steel Co. for 1908 delivery. This makes 40,000 tons that this company has bought for next year's delivery, the other 30,000 tons having been ordered from the Bethlehem Steel Co.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Alabama Great Southern.—See Cincinnati, New Orleans & Texas Pacific.

Central New England.—The authority of the following officials of the New York, New Haven & Hartford has been extended over the Central New England: H. M. Kochersperger, Vice-President; H. A. Fabian, Assistant to the President, and Thomas F. Paradise, Assistant to the Treasurer.

Cincinnati, New Orleans & Texas Pacific.—T. C. Powell, Vice-President of the Southern, has been elected also Vice-President of the C., N. O. & T. P., and of the Alabama Great Southern, with office at Cincinnati, Ohio, in charge of the operating department and purchasing department. W. J. Murphy, Vice-President, will be the resident executive officer at Cincinnati.

Escanaba & Lake Superior.—Edward Wicking has been appointed Auditor, with office at Wells, Mich., succeeding C. W. Kates, transferred. See this company under Operating Officers.

New Orleans, Ft. Jackson & Grand Isle.—F. T. Howard has been elected President, succeeding H. C. Warmoth, resigned.

New York, New Haven & Hartford.—See Central New England.

Susquehanna, Bloomsburg & Berwick.—H. R. Slifer has been appointed Auditor, with office at Watsontown, Pa.

Wisconsin State Railroad Commission.—John H. Roemer, of Milwaukee, has been appointed Chairman, succeeding John Barnes, resigned.

Operating Officers.

Atlantic Coast Line.—W. B. Darrow, Superintendent of the Southern at Jacksonville, Fla., has been appointed Superintendent of Transportation of the First division of the Atlantic Coast Line, with office at Rocky Mount, N. C. F. T. Bowles has been appointed Superintendent of Terminals, with office at South Rocky Mount, N. C. R. C. Westcott has been appointed Trainmaster of the Richmond district, with office at Richmond, Va., succeeding E. C. Lucas, resigned.

Canadian Pacific.—J. T. Arundel, Superintendent at Winnipeg, Man., has been appointed Superintendent at Vancouver, B. C. A. L. Clements has been appointed Superintendent of Terminals at Vancouver.

Chicago & Illinois Midland.—W. S. Cook has been appointed Superintendent, with office at Pawnee, Ill., succeeding M. A. Zook.

Chicago, Rock Island & Gulf.—D. Van Hecke has been appointed Assistant Trainmaster of that part of the Mexican division from Dalhart, Tex., east. G. W. Keene has been appointed Assistant Trainmaster in charge of the line from Dalhart west.

Erie.—A. J. Stone, Assistant General Manager, has been appointed General Superintendent, with office at Jersey City, N. J., succeeding R. H. Bowron, resigned, and the office of Assistant General Manager has been abolished.

Escanaba & Lake Superior.—Charles W. Kates, Auditor, has been appointed Superintendent, with office at Wells, Mich., succeeding Wesley E. Wells, resigned to become Manager of the John O'Brien Lumber Co., Somers, Mont.

Interoceanic of Mexico.—E. W. Thompson has been appointed Trainmaster at Puebla, succeeding E. W. Bowans, resigned to go to the National of Mexico.

Lehigh Valley.—G. B. Minshull has been appointed Inspector of Transportation, succeeding W. D. Vincent, transferred.

Louisville, Henderson & St. Louis.—W. R. Hensley has been appointed Car Accountant, with office at Louisville, Ky., succeeding Ridgely Case, assigned to other duties.

McCloud River.—J. C. Wilder has been appointed Superintendent, with office at McCloud, Cal., succeeding M. H. Burkhalter, deceased.

Minneapolis & International.—The office of the General Manager has been moved from St. Paul, Minn., to Brainerd, Minn.

New York Central & Hudson River.—F. E. Williamson, Assistant Superintendent of the Harlem division, has been appointed to the new office of Superintendent of Freight Terminals at Albany, N. Y.

Oklahoma Central.—F. C. Hand, Chief Engineer, has been appointed also General Superintendent.

Southern.—J. A. Baumgardner has been appointed Superintendent at Jacksonville, Fla., succeeding W. H. Darrow, resigned to go to the Atlantic Coast Line. See Atlantic Coast Line.

Traffic Officers.

Baltimore & Ohio.—Edward M. Davis, division freight agent at Baltimore, Md., has been appointed General Eastern Freight Agent, with office at New York, succeeding F. M. Johnson, resigned.

Birmingham & Atlantic.—H. J. Meade has been appointed General Freight and Passenger Agent, succeeding W. M. Tarpley, resigned.

Cumberland & Pennsylvania.—J. T. Robertson has been appointed General Passenger and Freight Agent.

Litchfield & Madison.—F. M. Campbell has been appointed General Freight Agent, with office at Edwardsville, Ill.

Mexican International.—Fritz Niggli, General Agent at Torreon, has resigned to go into other business.

Engineering and Rolling Stock Officers.

Atlantic Coast Line.—L. L. Sparrow has been appointed Engineer of Roadway of the First division, with office at Rocky Mount, N. C.

Chicago, Indiana & Southern.—L. Slattery has been appointed Signal Engineer, with office at Gibson, Ind., succeeding Byron Layton.

Kalamazoo, Lake Shore & Chicago.—W. K. Christie has been appointed Master Mechanic, with office at South Haven, Mich.

Kingston & Pembroke.—G. G. Hare has been appointed Chief Engineer, succeeding T. W. Nash.

New York, Chicago & St. Louis.—W. J. Bergen, Chief Supervisor of Track, has been appointed Assistant to the Chief Engineer, with office at Cleveland, Ohio. C. B. Hoyt succeeds to the duties of Mr. Bergen with the title Superintendent of Track Maintenance and Construction, reporting to the General Manager.

New York, New Haven & Hartford.—W. L. Larry, Master Mechanic at Taunton, Mass., has resigned to become an inspector for the Massachusetts State Railroad Commissioners.

Northern Central.—See Philadelphia, Baltimore & Washington.

Pennsylvania.—George D. Fowle, Signal Engineer of this company and of the Philadelphia, Baltimore & Washington, the Northern Central and the West Jersey & Seashore, has been appointed Consulting Signal Engineer of the three companies. A. H. Rudd, Assistant Signal Engineer, succeeds Mr. Fowle. C. C. Anthony, inspector of signals, succeeds Mr. Rudd.

Philadelphia, Baltimore & Washington.—See Pennsylvania.

West Jersey & Seashore.—See Philadelphia, Baltimore & Washington.

Purchasing Agents.

Seaboard Air Line.—W. M. Portlock has been appointed General Storekeeper, with office at Portsmouth, Va., succeeding R. E. Dickinson, resigned to go to another company.

Special Officers.

St. Louis & San Francisco.—Dr. Herman Von Schrenk has been appointed Supervisor of Timber Preservation, with office at St. Louis, Mo.

LOCOMOTIVE BUILDING.

The Las Vegas & Tonopah has ordered four locomotives.

The Northern Pacific is said to be in the market for five switch engines.

The Galveston, Houston & Henderson is said to be in the market for two switching locomotives.

The Sandy Run Lumber Company, Norfolk, Va., is said to be in the market for one locomotive.

The Great Northern has ordered two rotary snow plows from the American Locomotive Company.

Jones & Laughlin have ordered one 4-wheel tank locomotive from the American Locomotive Company.

Swift & Co., Chicago, it is said, are having one locomotive built by the Baldwin Locomotive Works.

The Tombigbee Valley, it is said, has ordered two locomotives from the Baldwin Locomotive Works.

The Nevada, California & Oregon, it is said, has ordered one locomotive from the Baldwin Locomotive Works.

The Escanaba & Lake Superior, it is said, is having one locomotive built by the Baldwin Locomotive Works.

The Detroit & Toledo Shore Line, it is said, has ordered four locomotives from the Baldwin Locomotive Works.

The Wichita Falls & Northwestern has ordered two mogul locomotives from the American Locomotive Company.

The Chilian Government is said to have bought 25 heavy locomotives from the American Locomotive Company.

The Chicago & North-Western, it is said, is having 20 additional locomotives built by the Baldwin Locomotive Works.

The American Steel & Wire Company is said to have ordered one locomotive from the Baldwin Locomotive Works.

The Wickwire Steel Company, Cortland, N. Y., has ordered one 4-wheel tank locomotive from the American Locomotive Company.

The Kiangsu Railway, Japan, has ordered through Mitsui & Co., New York, three mogul locomotives from the American Locomotive Company.

The San Antonio Madruga Plantation, Cuba, has ordered through the Czarnikow, MacDougall Company, New York, one mogul locomotive from the American Locomotive Company.

The San Pedro, Los Angeles & Salt Lake recently ordered 23 simple consolidation locomotives from the American Locomotive Company for November and December, 1907, delivery. These locomotives will weigh 208,000 lbs., with 187,000 lbs. on drivers; cylinders, 22 in. x 30 in.

CAR BUILDING.

The Las Vegas & Tonopah has ordered 10 tank cars.

The San Pedro, Los Angeles & Salt Lake has ordered 110 tank cars.

The Northwestern Elevated, Chicago, will buy 50 additional cars in the near future.

The Northwestern Pacific recently asked prices on 200 steel underframe flat cars.

Charles Clarke & Co., Galveston, Tex., are in the market for narrow gage side dump cars.

The Cold Blast Transportation Company, Chicago, has ordered 200 stock cars from Haskell & Barker.

The Texas Central is said to have ordered three sleepers from the American Car & Foundry Company.

The Erie denies being in the market for freight equipment, as reported in the *Railroad Gazette* of August 2.

The San Antonio & Aransas Pass, as reported in the *Railroad Gazette* of July 26, is asking prices on 500 box cars.

The Connecticut Electric Company has ordered seven double-truck derrick cars from the McGuire, Cummings Manufacturing Company.

The Chicago, Burlington & Quincy, as reported in the *Railroad Gazette* of July 26, recently ordered 1,000 steel gondola cars of 100,000 lbs. capacity from the Bettendorf Axle Company.

The Union Pacific has ordered 25 all steel box cars similar to the experimental car built at its Omaha shops. The company is building 22 gasolene cars and will shortly start building more.

The Interborough Rapid Transit has ordered two steel underframe snow sweepers mounted on McGuire, Cummings heavy pedestal trucks from the McGuire, Cummings Manufacturing Company.

The New York & Long Island Traction, Long Island City, N. Y., has ordered three steel underframe snow sweepers, mounted on McGuire, Cummings heavy pedestal trucks, from the McGuire, Cummings Manufacturing Company.

The Delaware, Lackawanna & Western is reported to be in the market for freight equipment. The company has not ordered one chair car, as reported in the *Railroad Gazette* of August 2, and the order for one baggage and mail car, also reported on that date, is an old order.

The Louisville & Nashville, as reported in the *Railroad Gazette* of August 2, will build at its own shops the following equipment during the present year: Six hundred 36-ft. box cars of 65,000 lbs. capacity; 700 36-ft. drop bottom gondolas of 80,000 lbs. capacity; 350 40-ft. flat cars of 80,000 lbs. capacity; 250 30-ft. double hopper ore cars of 100,000 lbs. capacity, and 100 40-ft. refrigerator cars of 50,000 lbs. capacity. During the first half of next year it will build: Four hundred 36-ft. box cars of 65,000 lbs. capacity; 350 36-ft. drop bottom gondolas of 80,000 lbs. capacity; 100 40-ft. flat cars of 80,000 lbs. capacity; 50 30-ft. double hopper ore cars of 100,000 lbs. capacity, and 100 40-ft. refrigerator cars of 50,000 lbs. capacity.

The Intercolonial has ordered 400 box cars of 60,000 lbs. capacity from the Crossen Manufacturing Company. These cars will weigh 34,800 lbs. and will measure 36 ft. long, 8 ft. 6 in. wide and 8 ft. high, inside measurements, and 36 ft. 9⅝ in. long, 9 ft. ⅝ in. wide and 13 ft. 5 in. high, over all. Bodies and underframes will be of wood. The special equipment includes:

Roofing	Semi-x
Brake beams	Simplex
Brake-shoes	Carlton
Brakes	Westinghouse
Brasses	Canadian Ironsides Co.
Door fastenings	National Malleable Castings Co. "Security"
Doors	Independent sandard
Draft rigging	Miner tandem
Dust guards	Pennsylvania
Journal boxes	M. C. B.
Paint	Red oxide
Roofs	Chicago
Trucks	Interchangeable standard

The Isthmian Canal Commission, as reported in the *Railroad Gazette* of August 2, has received bids on 500 dump cars of 12 cu. yds. capacity and 115 dump cars of 4 cu. yds. capacity. The bids on the larger cars were as follows: American Car & Foundry Company, $524,000; Kilbourne & Jacobs Manufacturing Co. of Columbus, Ohio, $215,000 for 100 cars; Arthur Koppel, Pittsburg, Pa., $665,000. William J. Oliver Manufacturing Co., Knoxville, Tenn., $562,000; Russell Wheel & Foundry Co., Detroit, Mich., $697,500. Standard Steel Car Company, $622,500; Western Wheel & Scraper Co., Aurora, Ill., $645,000. On the smaller cars the bids were as follows: Continental Car & Equipment Co., New York, $19,500; Kilbourne & Jacobs Manufacturing Co., $25,875; Kilgore Peteler Co., Minneapolis, Minn., $28,635; Arthur Koppel, $34,500; William J. Oliver Manufacturing Co., $24,725; Western Wheel & Scraper Co., $25,415.

RAILROAD STRUCTURES.

ARMOURDALE, KAN.—The Chicago, Rock Island & Pacific has begun work on shops that will cost $585,000, including a 27-stall roundhouse to cost $58,000. The plant will give employment to 1,500 men.

CLINTON, IOWA.—The Chicago & North-Western is reported to have let the contract for its new double-track steel bridge two miles long across the Mississippi.

DAUPHIN, MAN.—The Canadian Northern is to build a new roundhouse and make other improvements.

FORT WILLIAM, ONT.—The Canadian Pacific is said to be planning a coal handling plant here to cost $1,250,000.

KAMLOOPS, B. C.—The Canadian Pacific is getting bids on a station, freight house and oil house.

MACON, GA.—The Central of Georgia has let the contracts for shops to cost $1,400,000 to the McKenzie DeLeon Construction Co., Savannah.

PORT ARTHUR, ONT.—The Grand Trunk Pacific is said to have bought a block of land as a site for a passenger station and freight houses.

SAN ANTONIO, TEX.—The International & Great Northern is reported to have let the contract for its new passenger station to the Stewart Construction Company of St. Louis, Mo.

SASKATOON, SASK.—The Canadian Pacific is getting bids on a station and freight shed.

SPRINGFIELD, MO.—Bids were opened in St. Louis, on July 27, for a freight depot to be built here for the Missouri Pacific. Plans are being prepared for a passenger station to cost $65,000.

SUPERIOR, WIS.—The Great Northern is to build shops here for making steel, ore and freight cars. The cost of the plant is estimated at $200,000.

The Great Northern is reported to have let the contract for new shops for building ore cars to Schmidt Brothers & Hill.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

ATLANTA, BIRMINGHAM & ATLANTIC.—The Third division has been extended from La Grange, Ga., west to Roanoke, Ala., 25 miles.

ATLANTIC & GULF TRANSPORTATION CO.—Chartered in Texas to build in Orange, Chambers, Harris, Galveston, Brazoria, Matagorda, Jackson, Victoria, Calhoun, Refugio, San Patricio, Neuces and Cameron counties. Alfred A. Glazier, Boston, J. P. Underwood, Chicago, and J. S. Macnamara, C. M. Teagle and J. M. Conley, of Beaumont, Tex., incorporators.

COLORADO & SOUTHERN.—A new branch from Marshall, Colo., to Eldorado Springs, three miles, has been opened for business.

DETROIT & ADRIAN TRACTION.—This company has been organized with $2,000,000 capital to build an electric road on a private right-of-way from Detroit to Adrian, 61 miles.

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EDITORIAL ANNOUNCEMENTS.

THE BRITISH AND EASTERN CONTINENTS edition of the Railroad Gazette is published each Friday at Queen Anne's Chambers, Westminster, London. It contains selected reading pages from the Railroad Gazette, together with additional British and foreign matter, and is issued under the name Railway Gazette.

CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.

ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

CONTENTS

VOL. XLIII., No. 7. FRIDAY, AUGUST 16, 1907.

THE ELECTRIFICATION OF THE NEW HAVEN.

On July 24 the New York, New Haven & Hartford began running a few suburban trains out of New York with electric locomotives. This was the beginning of operation of the first system of single-phase alternating current electric traction for heavy steam railroad service in America. It is an experiment in the sense that it is new and untried in actual service of this kind, but it has been carried out on such a tremendous scale that it must succeed, because the railroad and the builders of the apparatus simply will not let it fail. There is published elsewhere in this issue of the *Railroad Gazette* an article by the Vice-President of the road in charge of engineering, who has had the supervision of the plans and work of electrification, which is illustrated with many photographs, and describes important features of the system. This article is of particular interest because it is the first authoritative statement of its kind, we believe, of the position of the New Haven on the much-discussed subject of electric traction for heavy railroad service.

The New Haven started its electrification plans with two narrow limitations. On the one side, whatever system was adopted must permit operating trains over the New York Central tracks from Woodlawn to Grand Central Station, and the Central had already begun to install 600-volt direct current, third-rail. This limited the consideration of systems to low-tension direct current identical with the New York Central apparatus and single-phase alternating current. Multi-phase alternating current and high-tension direct current systems, now well beyond the experimental stage in Europe, were out of the question. On the other side, the railroad company had to consider that whatever system of electric traction was to be adopted would sooner or later be extended over most, if not all, of the New Haven's present steam railroad system. There are a number of good reasons for this expectation. The mileage of the road is grouped closely together in a comparatively small territory; nearly half of its earnings come from passenger business and a large proportion of its freight is carried in small trains at a rate approximating the average passenger speed on many of the branch lines. Thus, as Mr. McHenry points out, it should be possible when electric traction is extended to operate various diverging lines each from central electric-producing stations serving a definite surrounding territory. There is a further reason, not far in the future, for the extension of electric operation. The consolidation of the New York, New Haven & Hartford and the Boston & Maine, now delayed, but in all probability delayed only by the restraining action of the Massachusetts legislature, will have particularly important results in its effect on terminal and suburban facilities at Boston. The thickly clustering lines owned either by the New Haven or the Boston & Maine leading into that city make this a peculiarly desirable field for electrification. President Mellen, indeed, has already promised to electrify along with the rearrangement and reconstruction of the present Boston terminals, once the consolidation is completed.

Mr. McHenry discusses the relative advantages and disadvantages of the two systems of electrical distribution in a fair-minded spirit, and shows how, all things considered, a single-phase alternating current system more nearly meets all the requirements of the present and further development of electric traction on the New Haven. It permits joint operation over the New York Central tracks out of New York, has a high efficiency of distribution over wide areas from power house to contact conductor and a high efficiency of consumption in the motors. The cost of installing and maintaining the apparatus and structures is little different from that required for a direct current installation, and the capacity of the locomotives and feeder lines is ample for the work to be done.

Another interesting point which is brought out is the standardization of power supply. The decision to use 25-cycle current instead of the more economical 15-cycle current was based entirely on commercial grounds. The standard frequency in nearly all street railway and electric lighting plants is 25 cycles, and in the event of breakdowns or other emergencies it was essential to be able to draw on outside sources for current. Furthermore, there was the advantage of future centralization of power supply for all the varied uses of such a railroad system as the New Haven. Now or later one central power house in each district can supply power not only for the electric service on the present lines of steam railroad and the street railways and interurban lines, of which the New Haven already controls some 1,500 miles as well, but for station lighting, station heating, small power plants for other uses and, provided the railroad company permanently retains the various lighting and power companies of which it became possessed as part of its Connecticut Railway & Lighting and other trolley purchases, the furnishing of power for these plants for local consumption in various towns and cities. Such centralization of the power supply of a given

district in one compact central station will result in great economies as soon as the scheme can be completely carried out—economies which should make up for a considerable part of the greater expense of heavy electric traction when first installed.

RULES AT THE END OF THE TONGUE.

In the Lackawanna coal mines each foreman henceforth must have the rules for safety at his tongue's end. Passing an examination when taking a job will no longer be sufficient; there will be a test every six months. The rules which these men have to memorize are not exactly parallel to railroad rules, and the catechising alone, even if it were more frequent than half yearly, would not in the railroad service insure safety; but this announcement of the coal mine manager* should be suggestive to railroad superintendents, nevertheless. The railroads of this country have made great progress since 1886, when they examined their men on rules very little, but most of them have great progress yet to make, if they are going to put their train service on a satisfactory basis. What conductor or engineman has even the more important rules of the standard code at his tongue's end? It may be said that such minute knowledge is not always necessary for safety. Granted; but it would greatly assist the examiner in gaining a knowledge of the employee's competency and reliability, and the teaching process would aid him in weeding out inefficient men. Compulsory half yearly study of rules would have a beneficial general effect, regardless of any improvement that could be specified in regard to any particular rule.

We advocate increased attention to rules—which already receive proportionately too much attention—because improvement in that feature could be expected to lead up to improvement in the other and more important one of increased attention to practice. Take, for example, the rule that conductor and engineman shall co-operate in checking train-registers, interpreting orders, and at other important junctures; after this rule has been revolved times enough in the minds of examiner and examinee they will begin to see more clearly the connection between the collision record and careless acts which could have been prevented by the correction of loose habits which are very common. Even the best conductors and enginemen, with rare exceptions, obey many of the rules loosely. We are not here asserting that the best men do dangerous things; the more competent they are, the more latitude can they take, in many situations, without danger; but they do omit precautions. Granting for the moment that such a course by a high-grade man usually is not an impairment of safety, the fact remains that the only safe course for the superintendent is to require exact compliance by all grades of trainmen. Only by being rigid with the good men can he enforce reasonable obedience among those who are not so good.

The requirement that conductors and enginemen shall jointly perform the most important acts incident to the movement of their train will be of less consequence as the block system comes more generally into use (unless the conductor rides in the cab); for the safety of the train, as regards its right of way, will depend more exclusively on the keeping of a good lookout at the forward end; but the joint-responsibility rule will not become a dead letter, for the block system has to be virtually suspended now and then, making it necessary that men in charge of trains shall know perfectly how to get them over the road promptly and safely without rules. The block system is not yet in use on all important lines—not to mention the less important—and in many cases where it is used some of its features are neglected or ignored. Apparently, American railroad officers and employees are to go through a long process of slow acquisition of knowledge by experience before they will come to depend as constantly and exclusively on the space-interval as they now depend (for the control of passenger trains) on the automatic air-brake; though it is certain that such complete dependence will be recognized eventually as the only safe and satisfactory plan.

Not the least attractive feature of this coal mine order is the promise of a reward for proficiency. In the enforcement of train rules the granting of a "trophy" would be looked upon probably as a measure too mild to be useful, but the principle is important. Every railroad superintendent who has paid premiums or prizes has apparently continued to have a favorable opinion of the practice; and yet it does not make headway. Why is such a simple means of arousing men's interest in their work so persistently neglected? Outside of the roadway department, where prizes, rewards and "honorable mention" have been used acceptably on a number of roads for many years, the employment of any kind of bonus is so rare that one has to search his memory to find any instances at all. Where it does not seem to cost anything, commendation of excellent service is favored; but why not make the matter a little more tangible? The recording of "merits" by the Atchison, Topeka & Santa Fe is highly commendable, but it is really only a beginning—a sample. Surely this is not the only way to show good will to employees. If tedious discussions with overbearing labor leaders abont wages have come to take up so much of our railroad superintendents' time and energy that they have no time to cultivate and increase their good will for their employees, it is time that a few presidents stepped in and corrected the wrong tendency. The American railroad superintendent, in the management of his men, has to deal with some of the hardest problems known, and yet he everywhere neglects one of the simplest means of mitigating hard problems—the granting of special compensation for voluntary improvement or unusual effort by individual employees. To give a prize for having rules on the tongue's end would be a very simple thing. It might not produce real improvement in the service for some months or years. An improvement, when effected, might not be demonstrable, mathematically. Yet such a prize might be a useful stepping stone to something more detailed and definite, and could be made to lead to marked betterment of service. It will be highly discreditable to the railroads if coal mines are made safer than passenger trains!

*School of Safety for Coal Mine Foremen. Realizing that rules are readily forgotten unless constantly discussed, the Delaware, Lackawanna & Western has decided to hold competitive examinations every six months concerning the details of its coal mine regulations. State mining laws and company's rules must be on the "tongue's end" of every mine foreman, fire boss, barn boss or driver boss. An examining board, consisting of the General Manager, his assistant, and the Chief Engineer, are to examine the men in a hall specially engaged for the purpose. To each man will be given practical questions to answer. The answers, recorded by a stenographer, will be carefully gone over and receive marks of relative merit. To the district showing the highest average for all men examined, will be awarded a handsome trophy which can be retained until the next competitive examination. If any district wins the trophy three times in succession, it is then to own it. Mine foremen and assistant foremen are examined by boards appointed by the State before receiving certificates which permit them to hold their position, but these examinations conducted by the company are intended to be supplementary to those prescribed by the State.

TRANSATLANTIC STEAMSHIP DEVELOPMENT.

We show this week, on another page, a very striking photograph of the new Cunarder, Lusitania, taken on her trial trip on the Clyde last month. To all persons who are interested in transatlantic navigation, the Lusitania is, and is likely for some time to remain, a peculiarly interesting vessel. She enjoys the transitory distinction of being the fastest and much the largest transatlantic steamship ever built. She is also the first transatlantic steamship to be fitted with four sets of engines driving four propellers (also two sets to go astern with), and these engines are turbines, developing 68,000 h.p., 26,000 more than that of any other vessel in the merchant service.

Besides these physical details, the most interesting thing about the Lusitania is the fact that she is a theoretic ship. The builders have had only moderate opportunity to study the workings of large turbine marine engines, and the work demanded of the Lusitania is so much heavier than that of any of the other three turbine steamers now in transatlantic service that the builders have been obliged to place entire reliance upon the calculations intended to meet a set of conditions largely new. The first turbine steamer to cross the Atlantic was the Victorian, of the Allan line, built in 1904 for the service between Liverpool and Montreal. She has been followed by a sister ship, the Virginian, and by the Carmania of the Cunard line, built in 1905. The Lusitania will, therefore, be the fourth turbine steamship in transatlantic service, although a considerable fleet of these vessels is now doing coastwise work in Great Britain and there are four upon our American coast—the Creole, of the Morgan line, between New York and New Orleans, and the Yale, Harvard and Governor Cobb, owned by Mr. Morse and his associates.

The gross tonnage of the Lusitania is 32,500, and the next largest steamer afloat, the Adriatic, of the White Star line, is approximately 7,500 tons smaller. The increases in gross tonnage, accompanied by changes in type, during the last 20 years have been so great and so significant that the topic is worthy of special notice. The Cunard line began its operations in 1840 as the pioneer among companies furnishing a regular steam service across the Atlantic, but during the next 48 years only one ocean steamship was built with a gross tonnage exceeding 10,000, and that was the famous Great Eastern (1858), which was 680 ft. long and of 18,918 tons, propelled by both paddle and screw, but with a maximum speed, seldom attained in actual service, of 14 knots, and with horse-power and design of engines totally inadequate to the task at

hand. As a result, the Great Eastern, as everybody knows, was a monumental failure.

In 1888 the Inman & International Company built the City of New York and City of Paris, of approximately 10,500 tons each, and these vessels remained the largest afloat until the Cunard line built the Campania and Lucania, in 1893. The latter were of 12,950 gross tons, and remained the largest on the ocean until 1897, when the North German Lloyd built the Kaiser Wilhelm der Grosse, of 14,349 gross tons. The first vessel of over 15,000 gross tons was the Oceanic, built for the White Star line in 1899 and having a gross tonnage of 17,274. The first vessel to exceed 18,000 tons was the Celtic, of the White Star line, built in 1901, and having a gross tonnage of 20,904. Since that time, approximately 16 vessels with a gross tonnage in excess of 18,000 have been built and a number of others are building.

Along with these increases in dimensions certain changes in type have also been developed. It may be said in general that the best transatlantic lines of steamers, from the earliest beginnings of steam navigation up to about 1896, were composed of vessels which were built for speed, the slower vessels on the line as a characteristic being older ships which were frequently record holders in their day. An instance of this may be found in the Cunard fleet at the time the Campania and Lucania were built, the next best vessels being the Etruria and Umbria, each of which at one time held the transatlantic record, while the older Auranla, Gallia and Bothnia were once famous as fast ships. Similarly, the best and most popular steamers of the North German Lloyd line in the north Atlantic service were small but fast vessels, each one of which had achieved a reputation for speed at the zenith of its career. Of course, the defect in a fleet of this kind from an economical standpoint was that each one of the older vessels burned altogether too much coal in proportion to the results gained. Beginning about 1896, therefore, a number of lines began building vessels of large carrying capacity and equipped with excellent passenger accommodations but capable of only a moderate speed. The Barbarossa, of the North German Lloyd line, with a gross tonnage of 10,915 and a speed of about 15 knots, was one of the first of these vessels, and they became so profitable that they became the characteristic carriers of the last decade. The four Red Star steamers, built between 1900 and 1902, had gross tonnages of about 12,000 and a speed of about 15 knots. The Holland-America fleet and the Atlantic Transport fleet were about the same size and the same speed. These boats were great carners, and their owners were quite content to allow the palm for speed to other lines willing to pay the very high price necessitated. As an example of the economy of this type of construction it may be noted that La Bretagne, built as a fast steamer by the French line in 1886, and having a gross tonnage of 7,010, burns slightly more coal per day than the Baltic, built as an economical ship of moderate speed, with a gross tonnage of 23,876, while the old Fürst Bismarck (Hamburg-American, built 1890; 8,430 tons) burned 300 tons a day, as against 110 tons burned by the President Lincoln (1907; 17,540 tons).

It is a striking fact, therefore, that in the 15 years of astonishing size development since the building of the Campania and the Lucania, no British steamer has been built to exceed them in speed in the transatlantic service. The two great German companies, the North German Lloyd and the Hamburg-American Packet, have found it profitable to maintain express steamers, perhaps in part for their advertising advantage, the North German Lloyd having four of these fast vessels now in operation and the Hamburg-American line, one. The Lusitania and her sister ship, the Mauretania, represent what is virtually a protest by the British government at having the ocean speed record held by Germans. To enable these new steamers to be built an arrangement was made by which the government virtually furnished funds to the steamship company at a cost of about 2½ per cent. to the company.

On her recent trial trip the Lusitania made a speed of approximately 25½ knots, and it is confidently expected that she will succeed in crossing the ocean in less than five days. It may be noted briefly that the first ship to cross in less than six days was the City of Paris, then of the Inman & International line, in 1889. The first ship to cross in less than seven days was the Alaska, of the Guion line, in 1882; the first to cross under eight days was the City of Brussels, of the Inman line, in 1869; and the first ship to cross under nine days was the Scotia, of the Cunard line, in 1862. The gross tonnage of the Scotia (paddle wheel) was 3,871; the gross tonnage of the Lusitania, as mentioned, is 32,500, and she has to burn about 1,000 tons of coal per day to make her contract speed. It has apparently not been proved that turbine steamers are more economical of coal than [illegible] although the space saved gives [illegible] are almost wholly free from vibration, a feature much appreciated by passengers. But a turbine engine of the present type (Parsons turbines are used on the Lusitania) cannot be driven astern, [illegible] auxiliary turbines have to be used for manoeuvering. This has been a defect in existing ships; we have seen the Virginian require an hour to turn around in Lough Foyle, when space was limited and the tide was running. The manoeuvering problem, however, should resolve itself into a question of the power of the auxiliary turbines, and it is to be presumed that the Lusitania has profited by the experience of earlier builders.

NEW PUBLICATIONS.

American Railways as Investments. By Carl Snyder. 762 pages, 6½ x 9 in. Published by the Moody Corporation, 35 Nassau Street, New York, 1907. $3.20; by mail, $3.40.

Mr. Snyder, in his voluminous and in many ways comprehensive work, has the very laudable idea that the private investor in American railroad securities ought to have some other standard of comparison and basis of judgment than that furnished by *ex parte* statements from bankers and brokers desirous of selling certain stocks and bonds. In the introduction to his book he very properly points out the folly of buying from tips supplied by persons who are not disinterested in the course of the market, and he emphasizes the importance of forming independent conclusions of values, based upon the relation of capitalization and charges to earnings, after the management of a road and its general history and prospects are taken into account. Mr. Snyder shows the important difference between nominal and actual capitalization and gives a fairly good rule of thumb for determining true capital. To do this, he takes stocks and bonds outstanding, adds to them rentals, capitalized on a 4 per cent. basis, and subtracts from the result the value, as well as it can be obtained, of securities held as assets. He also calls attention to the importance of a careful consideration of a road's equities in the earnings of other properties and very properly cites the New York Central as an example of a road whose securities sell for a much higher price than is indicated by the actual excess of earnings over expenses, for the reason that it controls a group of highly prosperous subsidiary companies earning far more than they are dispersing in dividends, so that these dividends can be raised when the parent company needs a greater income, as was done this year.

The author calls attention also to the investigation of concealed earnings, that is, earnings which have been "plowed back" into the property, but we cannot agree with his comment, given as a note on page 66, to the effect that costs of material, etc., have so increased in the last year or so that there are, except in rare instances, no concealed earnings in the maintenance accounts of 1906 and 1907. This is obviously incorrect. It would be possible to cite an extremely large group of roads which have spent from 25 per cent. to 100 per cent. more than their strict requirements in maintenance of way and maintenance of equipment during the past year. We are also disposed to criticise the tabular statements of costs of maintenance of way per mile and of maintenance of equipment per mile, as given for each road discussed. The author makes it clear in his introduction that it is miles of single track and not route mileage which determines the cost of maintenance on the mile basis, and yet, in contradiction to his own rule of conduct, he uses the route mile throughout his work. The fallacy of estimating equipment maintenance on a mileage basis is too well known to need comment. Averages are queer cattle at best, and the only kind of an average that is of any use in a hasty comparison of equipment maintenance is an average based upon the numbers of each kind of equipment in use or upon the miles of service obtained from each engine and car. The author, so far as we have observed, does not even point out the most common pitfall of all to which the investigator of equipment and maintenance is subjected, that is to say, the fact that a very large number of roads charge renewals in the repair account without saying anything about it, while an equally large number carefully separate the two.

The general plan of the work is to take each of the principal railroads in the country and most of the smaller lines as well and give a rough outline of the principal facts in their respective developments, followed by a discussion of present ownership, of capitalization, of equities owned, character of traffic, stability of earnings, maintenance improvements from earnings, dividend record, balance sheet, and investment value, so called. A tremendous amount of material has been gathered together in this way and, even though the critical reviewer may find instances of loose work, such as have been cited, and methods of analysis which seem to him superficial, it is nevertheless true that the book is prolific in suggestions and is capable of material usefulness to the investor, provided he takes the author's own advice and forms independent conclusions, based upon the facts presented.

CONTRIBUTIONS

The Collision at Salem, Mich.

Bristol, Va.-Tenn., Aug. 7, 1907.

To the Editor of the Railroad Gazette:

I have read with interest your editorial in the August 2 issue of the *Railroad Gazette* in regard to the collision at Salem, Mich. Let me suggest that a ruled train order blank, similar to that used by a great many railroad companies, would probably have prevented this accident. If the train order had been put upon a blank of this kind and had been properly taken by the receiving operator the leaving time of the special would have been shown on a level with the word Salem, and in that event it is not likely that the engineer and conductor would have misread the order. J. H. M'CUE.

Superintendent, Virginia & Southwestern.

Difficulties With Track Circuits.

Jamaica, N. Y., Aug. 5, 1907.

To the Editor of the Railroad Gazette:

I was much interested in your timely editorial entitled "Track Circuits in Railroad Signaling," in your issue of July 26th. There is one phenomenon, however, on which you did not touch; the effects of metallic structures, such as bridges, acting as condeusers to retard the pick-up of a track relay. In one especially noteworthy case of this that once came to my notice the retardation was so great that a fast passenger train would pass through two blocks before the first home signal would clear. I know of no remedy for this except cutting the circuits.

I have long been in favor of two track relays to a track circuit under certain conditions, but the battery should be placed in the middle of the section, with a relay at each end, the relays to be of equal resistance. No combination of two relays, however, will guard against dangers from foreign current. With one relay, one unbonded joint is liable to cause a clear failure; with two relays, it requires only two unbonded joints, or two broken rails a train length apart, to produce the same condition.

Likewise should we consider putting three or more relays in the circuit, the additional relay would only protect against one additional break in the circuit. Probably where A. C. track circuits cannot be used a great measure of protection could be secured by using stick relays, each relay to be restored by the one in advance.

W. H. ARKENBURGH.

Railroad Legislation of the Year.

As most conveniently summarizing the numerous and important statutes affecting railroads that have been adopted by state legislatures in the United States within the past 12 months we have made the following brief abstract of these laws, arranged by subjects. Important changes in railroad rates or practices which have been made in obedience to orders of state railroad commissions are also included, these in most cases having the force of direct legislative action. The compromises in North Carolina, Virginia and Alabama by which the principal railroads have complied with reduced-rate laws under protest are fresh in the mind of the reader. The new railroad law of the state of New York, in some respects more important than that of any other state, was printed in full in the *Railroad Gazette* of May 31, 1907. The other states which have passed general, comprehensive and radical railroad laws within the past year are Michigan, Oregon and Vermont.

PASSENGER FARES.

Alabama.—Roads 100 miles long or over 2½ cents a mile. For shorter roads the State Railroad Commission may prescribe rates. The commission is also to see to the introduction of interchangeable mileage tickets. The railroads secured an injunction against the enforcement of this law, but, following the compromise in North Carolina, the Southern Railway and at least one other have agreed to put the 2½-cent rate in effect pending litigation to settle the validity of the law.

Arkansas.—Two cents a mile; went into effect April 9.

Georgia.—The commission ordered the larger roads to reduce rates to 2 cents; other roads to 2¼ cents and still smaller roads to 2½ cents. This order was to go into effect September 2 next. One prominent road advises that no decision has yet been reached as to whether the law shall be complied with or be challenged in the courts.

Illinois.—Two cents a mile, all roads; went into effect July 1. Passengers paying fare in the cars may be charged 3 cents a mile.

Indiana.—Two cents a mile.

Iowa.—Two cents a mile on roads earning more than $4,000 per mile per annum; 2½ cents a mile on roads earning $3,000 per mile per annum; 3 cents a mile on smaller roads. Went into effect July 1.

Kansas.—No legislation concerning ordinary fares. Five-hundred mile tickets at 2 cents a mile required on all roads, and interchangeable 2,000-mile tickets at the same rate (net); went into effect May 1.

Michigan.—Two cents a mile on roads having passenger-train receipts of $1,200 per mile per year; 3 cents a mile on smaller roads; higher rates allowed on journeys of 10 miles or less. The rate on the main line of the Michigan Central has been 2 cents a mile for over four years past. The new law goes into effect September 27 next. The Detroit & Mackinac in one place will have to carry passengers 197 miles for $3.34, this being the rate by the shorter competing line.

Minnesota.—Two cents a mile; went into effect May 1.

Missouri.—Two cents a mile on all roads over 45 miles long; 4 cents a mile on shorter roads; went into effect June 19.

Montana.—New railroad commission required to "adopt" rates. Mileage tickets (3,000 miles) sold by large roads at 2½ cents.

Nebraska.—Two cents a mile; went into effect March 6.

New York.—New commission has power to prescribe rates.

North Carolina.—Two and one-quarter cents a mile on roads over 60 miles long; higher rates on smaller roads. The principal railroads secured an injunction against the enforcement of these rates, but they have this month agreed, under protest, to put the low rates in effect pending litigation to test the validity of the law.

Pennsylvania.—Two cents a mile; to go into effect October 1 next. The Pennsylvania Railroad has this year reduced to 2½ cents a mile all local passenger rates higher than that, making substantial reductions throughout its lines; and has introduced 1,000-mile tickets at 2 cents a mile, good for bearer.

South Dakota.—Railroad commission ordered to make valuation of railroads and then proceed to establish fares not over 2½ cents a mile.

Vermont.—New railroad commission has power to prescribe rates.

Virginia.—Two cents a mile on the principal roads; on other roads and on certain divisions of large roads higher rates are allowed, namely, 2½ cents, 3 cents, 3½ cents. The railroads secured an injunction against the enforcement of this law, but have agreed, under protest, to put the low rates in effect.

West Virginia.—Two cents a mile on roads over 50 miles long; on other roads 3 cents; went into effect May 21.

Wisconsin.—Two cents a mile on roads having over $3,500 receipts per mile per year. This goes into effect August 15.

The constitution of the new state of Oklahoma, not yet in effect, names a passenger rate of 2 cents a mile, but the railroad commission will have power to order increases if the low rate is found to be unjust.

RESTRICTION OF FREE TRANSPORTATION.

Alabama, Indiana, Iowa, Kansas, Michigan, Minnesota, Nebraska, Nevada, New York, Oregon, South Dakota, Texas and Vermont have passed prohibitory laws similar to that passed by Congress. In Nebraska monthly reports must be made to the state, and in Michigan yearly. In Nevada the classes excepted from the prohibition include teachers and students. The Texas law is more radical than any of the others. New Hampshire passed a law forbidding state officers to ride on passes and providing for an appropriation to pay their fares. In Oregon the persons excepted include judges and state officers; and a certain law passed to facilitate the appropriation of land by railroads, had a proviso that any road that desired to secure the benefit of the law must agree with the state to carry free the Governor, the members of the legislature and all the principal state officers.

FREIGHT RATES.

Alabama.—Rates in effect were made the legal maximum. Reductions were prescribed on over 100 commodities with a proviso for changes by the commission. The railroads have secured an injunction against the enforcement of this law, but the compromise which has been made concerning passenger rates probably will include some arrangement concerning freight rates.

Georgia.—Reductions ordered by commission some months since; order suspended by the courts; suits now pending.

Iowa.—The commission has this year ordered a reduction in rates on live stock, and a reduction of 20 per cent. in all joint through freight rates.

Kansas.—All grain rates reduced 15 per cent. This superseded certain changes made by the commission last year. Coal rates reduced by the commission (1906).

Michigan.—New commission (not yet in office) will have power to change freight rates. A law passed this year prescribing the procedure to be followed in securing rights of way has a proviso limiting certain carload freight rates.

Minnesota.—Many commodities were reduced 10 per cent.; but injunctions have been secured restraining the enforcement of the law.

Missouri.—Rates prescribed on apples, bricks, stone and certain other commodities. Commodity rates made in 1905 further reduced.

Nebraska.—Commission must make classification and fix rates. Legislature ordered a reduction of 15 per cent. on many commodities.

Nevada.—Legislature prescribed maximum rates much lower than those in effect, but new commission has power to change. Railroads have secured injunctions against enforcement of the law. Legislature prescribed rates on eight grades of ores. The Western classification was made the state classification.

New York.—New commission has power to prescribe rates.

North Carolina.—Reduction of 15 and 25 per cent made in joint through rates, suspended by injunction.

Oregon.—Commission must see that a uniform classification is adopted.

Texas.—No recent legislation, but the commission, which has prescribed rates for several years has, within the past 12 months, made heavy reductions on the rates for many commodities. For example, Fuller's earth, formerly charged 34 cents for 250 miles, must now be carried that distance for 9 cents. The commission about a year ago ordered the adoption of the Western classification in Texas. On carpets and rugs rates have been reduced 40 per cent. On certain iron articles heavy reductions were ordered in rates to Galveston and certain other centers, but this was not a general reduction. Low rates were established on refined oils and heavy reductions were made in rates on green hides. The commission has ruled that freight wrongly described by shippers for the purpose of securing lower rates may be subjected to 10 per cent increase on the proper rate as a penalty.

DEMURRAGE.

Alabama.—Reciprocal. Free time, 48 hours, but on many commodities 72 hours.

Colorado.—Reciprocal. Free time, 48 hours.

Indiana.—Reciprocal. Penalty, $5 a day.

Kansas.—Reciprocal. Penalty, $5 a day; free time on cars holding 30 tons, 48 hours; on larger cars, 72 hours.

Michigan.—New commission has power to prescribe rates.

Minnesota.—Reciprocal. Free time, 48 hours, except coal, lumber, etc., which are allowed 72 hours.

Missouri.—Reciprocal. Free time for cars holding 30 tons, 48 hours; larger cars, 72 hours.

New York.—New commission has power.

Oregon.—Reciprocal; commission may suspend.

South Dakota.—Reciprocal. *Texas.*—Reciprocal.

Vermont.—Reciprocal; severe conditions; free time four days.

Washington.—Reciprocal.

TARIFFS.

New tariffs must be posted in advance of the day they are to go into effect as follows:

Alabama	10 days.	New York	30 days.
Colorado	30 "	Oregon	10 "
Indiana	10 "	Vermont	30 "
Michigan	10 "		

SECRET RATES PROHIBITED.

Provisions like those of the Federal law have been enacted in Alabama, Colorado, Michigan, Nevada, New York, Oregon and Vermont. In Montana the new commission must prevent discrimination and extortion. Nebraska has prescribed heavy fines.

DISTRIBUTION OF CARS.

Fair distribution of freight cars is required under heavy penalties in Alabama, Indiana, Kansas, Michigan and Nevada. In New York the new commission has large powers in this matter. In Indiana and New York track connections must be built to private sidings wherever the commission may require.

JOINT PASSENGER STATIONS.

Railroads are required to provide suitable joint passenger stations at intersections in Alabama (where practicable), Michigan, Missouri and Oregon.

NEW RAILROAD COMMISSIONS.

New railroad commissions have been established as follows:

Alabama.—Three members, four-year terms, elected by popular vote.

Colorado.—New commission of three members. The railroads have begun a suit to enjoin the commissioners from exercising their functions. Law was to have gone into effect June 10.

Michigan.—In place of present single commissioner there is to be a new commission of three members; one a railroad lawyer and one familiar with transportation and traffic. For the third member no restriction is mentioned.

Montana.—New commission of three members, six-year terms.

Nebraska.—A new commission; appointees must be 30 years old.

Nevada.—New commission of three members, three-year terms.

New Jersey.—New commission of three members.

New York.—Old commission has been abolished. The state is divided into two districts, and for each district there is a Public Service Commission of five members having control not only over railroads, including street railroads, but also electricity and gas. The first district comprises New York City and the second all the rest of the state.

Oregon.—New commission of three members. These are to be elected, one at large and one from each of the two congressional districts.

Pennsylvania.—New commission, three members; to take office January 1, 1908.

Vermont.—In place of the old commission of three members a new one was established consisting of the same number. The Governor designates the chairman.

The commissions of Indiana, Washington and Wisconsin were established in 1905.

In Arkansas and Iowa the powers of the existing commissions have this year been materially enlarged.

WORKING HOURS.

Laws limiting the working hours of men having to do with the operation of trains and of telegraph operators have been passed in 12 states. We give a brief statement for each state, omitting the qualifying clauses for which the reader will have to refer to the fuller reports heretofore published.

Connecticut.—Telegraphers, eight hours; small offices, 12 hours.

Indiana.—Trainmen, 16 hours. *Kansas.*—Trainmen and telegraphers, 16 hours. *Maryland.* (1906).—Telegraphers, eight hours. *Minnesota.*—Trainmen, 16 hours.

Missouri.—Telegraphers, eight hours; small offices, 12 hours.

Montana.—Trainmen and telegraphers, 16 hours.

New York.—Trainmen, 16 hours (March 4, 1908); telegraphers, eight hours (October 1, 1907); small roads excepted.

North Carolina.—Trainmen, 16 hours; telegraphers, 12 hours. Penalties for violation, fine and imprisonment.

South Dakota.—Trainmen, 16 hours. *Texas.*—Trainmen, 14 hours; telegraphers, 8 hours, small offices excepted. *West Virginia.*—(1906). Telegraphers, eight hours.

TRAIN CREWS.

The minimum number of men to be assigned to the management of trains has been prescribed by law in Arkansas, Indiana, Kansas, Texas and South Dakota.

EXPRESS COMPANIES AND PRIVATE CARS.

Express companies are brought under the regulative power of the state railroad commissions in Colorado, Iowa, Kansas, Michigan, Montana, Nebraska, Nevada, New Hampshire, New York, Oregon and Vermont. Private cars are brought under the regulative power of the commission in Colorado, Michigan, Montana, Nebraska, New York, Oregon and Vermont. The Colorado law specifies pipe lines and the Kansas and New York laws specify sleeping cars.

ACCIDENTS.

Railroad accidents are mentioned in recent laws as follows:

Colorado.—Commission to investigate.

Indiana.—Serious cases to be reported in five days; commission to investigate.

Minnesota.—Serious cases to be reported by telegraph. Commission to investigate if found necessary.

Montana.—Commission to investigate important accidents.

Nevada.—Accidents to be reported at once. Commission may investigate.

Vermont.—Serious cases to be reported by telegraph.

Washington.—Commission to investigate if any person killed. Monthly reports required same as those made to Interstate Commerce Commission.

EMPLOYER'S LIABILITY.

Laws extending liability of employers for accidents to employees, due to negligence of fellow employees, or accidents due in part to the victim's contributory negligence, have been passed in Iowa, Kansas, Nebraska and South Dakota.

MISCELLANEOUS.

The foregoing list embraces those subjects which have been most generally discussed and in which interest is felt throughout the country. In addition to these, there are numerous other matters of local importance which have been made the subject of legislation in one state or another within the past year. We note some of these.

Cabooses.—In Montana only eight-wheel cabooses may be run.

Confiscation of Coal.—Kansas, Montana and North Carolina have passed laws regulating the confiscation of coal by railroads. In Kansas and Montana the owner must be paid double the value of the coal. In North Carolina he must pay 125 per cent. of its value.

Express Rates.—Nebraska has passed a law reducing the rates for transportation of merchandise by express companies 25 per cent. The express companies have taken action in the courts to restrain the enforcement of this law.

Fences.—Iowa and Montana have passed laws requiring railroads to be fenced on both sides.

Frogs.—Missouri has adopted a law similar to that long in effect in many states requiring frogs and switches to be suitably blocked so that workmen shall not catch their feet in them.

General Powers.—Arkansas has passed a number of laws affecting the powers of railroad corporations, including one requiring that a general office shall be maintained in that state. In California a new law defines the rights of railroad corporations in regard to buying land, etc.

Headlights.—In Texas all train engines must have electric headlights.

Intoxication.—In Vermont a railroad company is now subject

to $3,000 fine for employing on trains men known to be dangerous on account of their drinking habits, and any person working in the train service and being intoxicated is liable to imprisonment for one year.

Lobbyists.—Nebraska has a law requiring legislative agents to be registered and to report their expenses.

Mercantile Business.—The new constitution of Oklahoma, not yet in effect, has a clause, like that in the Federal statute, forbidding railroads to transport their own products or manufactures except for their own use.

Penalties for Appealing.—Three states, Alabama, Arkansas and Missouri, have enacted laws designed to punish any railroad company which by appeal, or by any process, transfers to a Federal court any suit begun in a state court to enforce the laws of the state against the railroad.

Taxation.—In Nebraska a new law affecting local taxes increases the burden on the railroads of the state $500,000 yearly. In New Mexico there is a new law taxing sleeping cars. In Utah taxation is regulated by a new law, chapter 9.

Telephones.—In Montana railroads are required to allow all telephone companies to put up instruments in stations.

Train Rules.—An Indiana law requires the State Railroad Commission to see that the rules of the operating department of railroads shall be adequate and satisfactory. There is a provision for holding a convention of railroad men annually to consider this subject.

Safety Appliances.—We have made no mention of laws regulating safety devices—air-brakes, automatic couplers, grab irons, etc. Several states have passed laws of this kind, but as all are substantially similar to the Federal law on this subject, and as the practice of nearly or quite all of the railroads in every state now conforms to the Federal law, at least as well as it would conform to a state law, these new state statutes may be treated merely as confirmatory supplements to the Federal law. It is to be noted, however, that there are now three states in which the use of the block system is compulsory, on the order of the State Railroad Commission, namely, Indiana, Massachusetts and Minnesota. In Massachusetts this law has been in effect about a year but we have as yet heard of no mandatory order being issued. The state of Washington has provided for a safety appliance inspector at a salary of $2,000 a year. He must look after railroad safety generally. He may order dangerous cars out of service. The appointee must have had seven years' experience in railroad operation and must give a bond of $5,000 for the faithful performance of his duties.

In Nebraska night telegraph operators and towermen must be at least 21 years of age. In Minnesota the state commission must inspect and approve new railroads before they are put in use. The commission may require interlocking signals not only at crossings of one road with another, but also at junctions and drawbridges. In Illinois the law regulating the establishment of crossings has been revised.

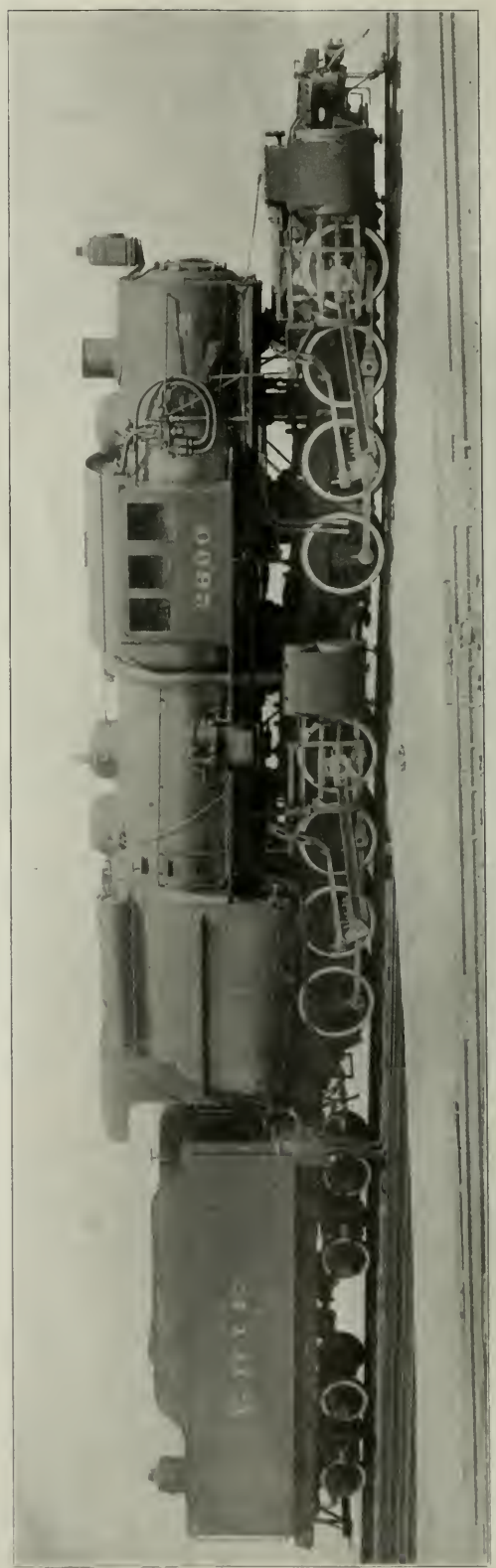
Mallet Compound Locomotive for the Erie Railroad.

The Mallet compound locomotive, introduced to American railroads three years ago in the monster that was built for the Baltimore & Ohio by the American Locomotive Company, has been so efficient from the start, both in economy of operation and maintenance, that its construction was followed closely in the engines of the same general type for the Great Northern illustrated in the *Railroad Gazette* of October 12, 1906; and then came the placing of an order for three of the original general type but of greater capacity for the Erie, to be used in pusher service on the 1.3 per cent. grade between Susquehanna and Gulf Summit, where, with a consolidation locomotive ahead, they will be capable of handling 2,660 tons. Although these Erie engines are much heavier and more powerful than the Baltimore & Ohio engine, the essential features of the two designs—such as flexible joints to high and low-pressure cylinders, receiver and exhaust pipes, articulated connection between frames, boiler, bearings, power reversing gear, etc., are practically the same, none of these features having failed to give perfect satisfaction during the two years this engine has been in continuous service.

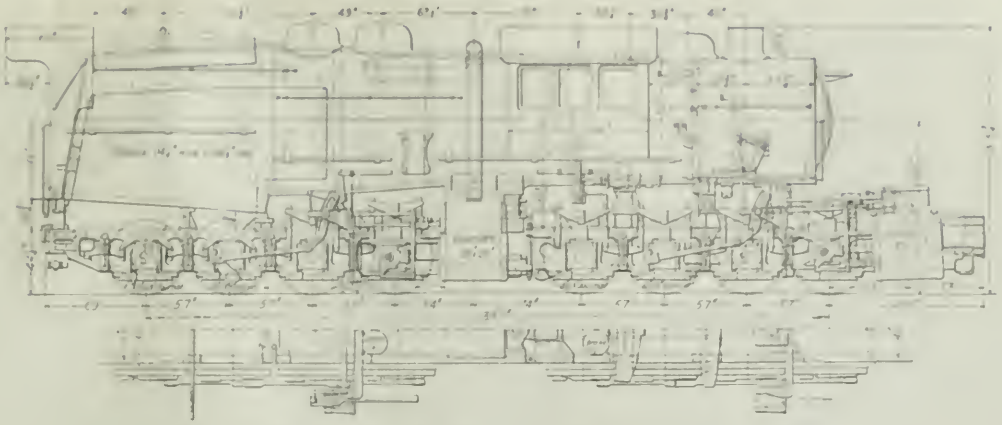
The accompanying tabular comparison will show the principle differences in the two designs:

	Baltimore & Ohio.	Erie.
Wheels	0-6-6-0	0-8-8-0
Total weight	334,500 lbs.	"
Size of cylinders	20 & 32 x 32 in.	25 & 39 x 28 in.
Diameter of drivers	56 in.	51 in.
Tractive effort (working simple)	71,500 lbs.	91,800 lbs.
Steam pressure	225 "	215 "
Total wheel base	30 ft. 8 in.	39 ft. 2 in.
Driving wheel base, rigid	10 ft.	"
Total heating surface	5,600 sq. ft.	5,313.7 sq. ft.
Grate area	72.2 "	100.0 "
Weight on drivers, tractive effort	4.78	"
Total weight, total heating surface	59.9	"
Trac. eff. x diam. drivrs., total htg. surf.	700	910
Htg. surf., vol. equiv. simple cylinders	295	217
Grate area, vol. equiv. simple cylinders	385	108

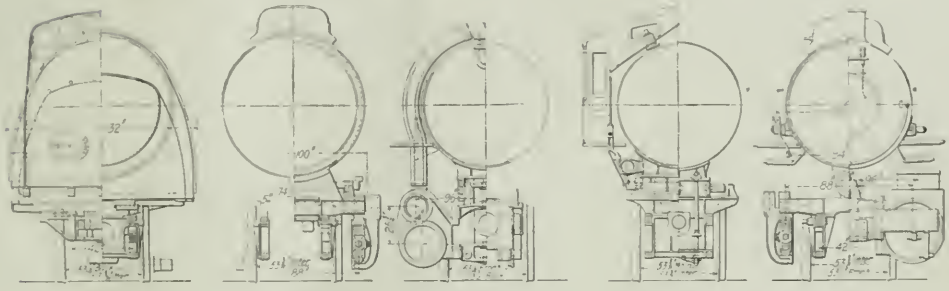
It must be noticed in comparing the above ratios that the engine illustrated is provided with a 4 ft. combustion chamber which decreases the total amount of heating surface, a point that will



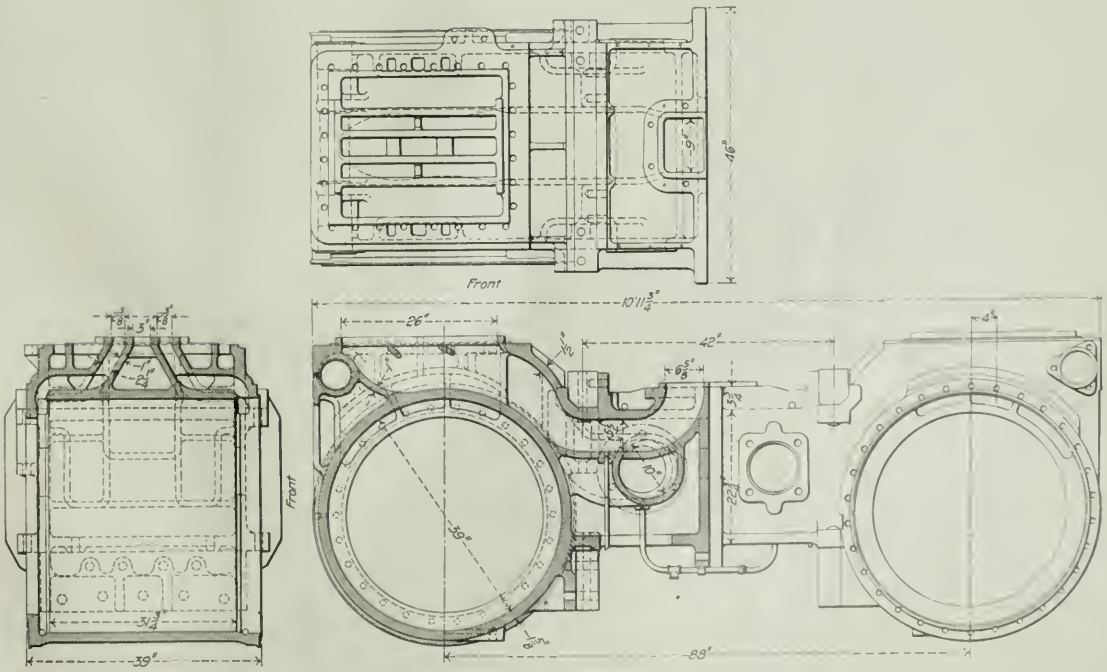
Sixteen-Wheel Mallet Compound Locomotive; Built by the American Locomotive Company for the Erie Railroad.



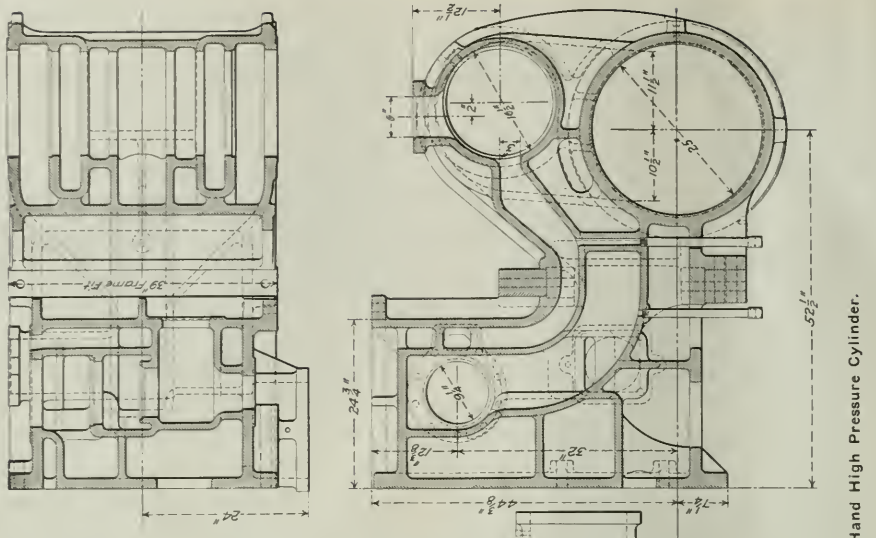
Side Elevation and Half Plan of Running Gear; Erie Mallet Compound.



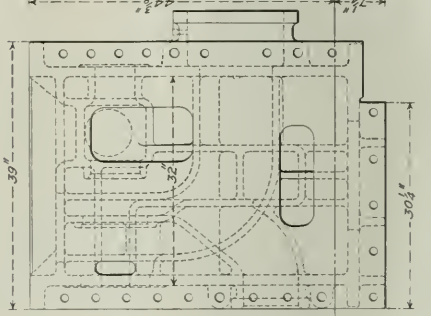
Cross Sections of Erie Mallet Compound.

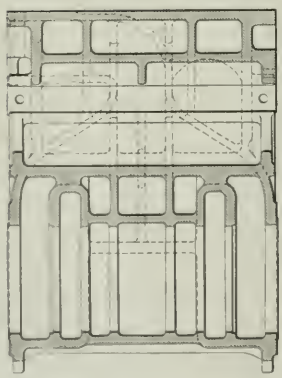


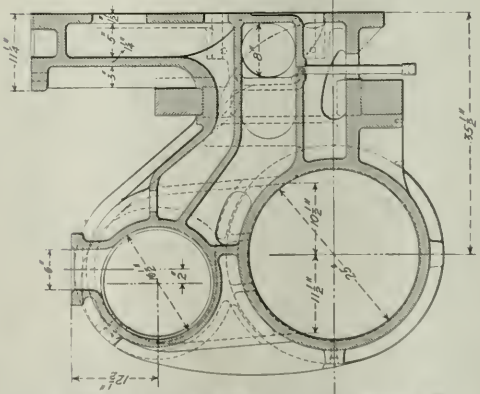
Details of Low Pressure Cylinders; Erie Mallet Compound.



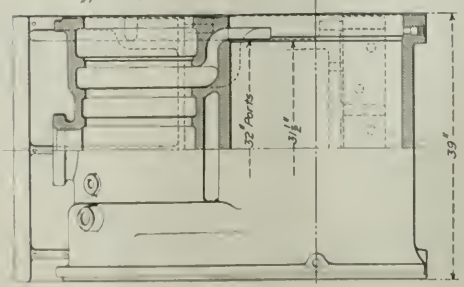
Left Hand High Pressure Cylinder.

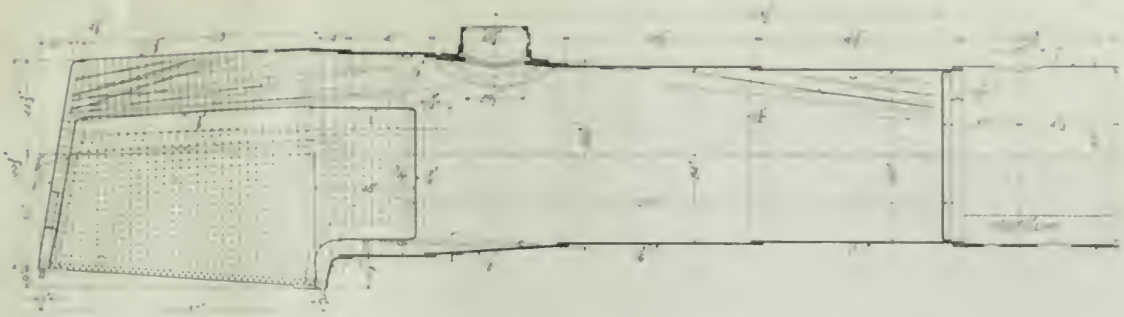




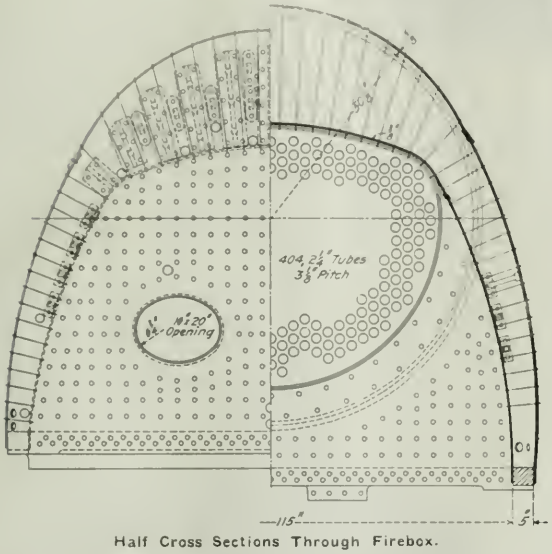


Right Hand High Pressure Cylinder.





Longitudinal Section Through Boiler of Erie Mallet Compound.

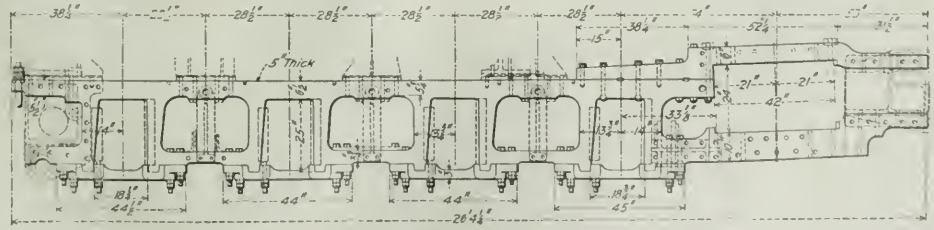


Half Cross Sections Through Firebox.

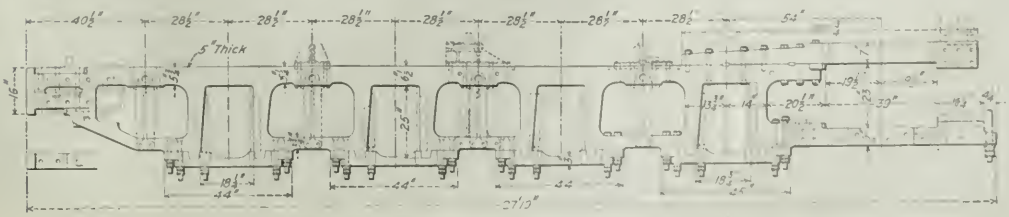
be discussed later. The weight of the Baltimore & Ohio engine was 334,500 lbs., which was carried by three pairs of driving wheels. This has been increased to 410,000 lbs. in this case; which necessitated the introduction of one more pair of wheels in each unit, thus increasing the total number to 16, by which means the load per wheel has been reduced to about 25,600 lbs., which is well below the limit set by a number of other road engines in service. The fact that this has been done is regarded by the builders as an argument showing the advantage of this type for obtaining a maximum adhesion for tractive power with a minimum rail pressure per wheel.

Of course in an engine of this size the point vital to its successful operation is the boiler. In this case the largest locomotive boiler ever built is used. It is of the radial stayed type with conical connection, the inside diameter of the first or smallest course being 82 in., while the inside diameter of the largest course is 96 in. The heaviest ring of the shell is 1 1/16 in. thick. This is also the thickest plate that has been used, and is needed for carrying the pressure of 215 lbs., which is also well up to the upper limit of what has been used in locomotive practice. The water alone in the boiler weighs 42,700 lbs., and the tubes, of which there are 404, 2¼ in. outside diameter and 21 ft. long, weigh 23,700 lbs. The total weight of the boiler with water is 139,900 lbs. The firebox is of the Wooten type, 120⅛ in. long and 114¼ in. wide, and has a grate area of 100 sq. ft. The water space at the mud ring is 5 in. on all sides. Aside from these dimensions the boiler has little about it of striking novelty, beyond the use of a cast steel dome; which, while not entirely new, is still sufficiently uncommon to attract attention. It was placed where it is, at the center of the length of the boiler, in order to avoid the possible disadvantages that might arise, due to the working of the engine in both directions, if it were near one end. It is on the conical course. It will be noticed that the conical course is lighter than the front, and is 1⅛ in. thick; still with the dome base and the stiffening ring for the opening there is an impressive mass of metal 3⅜ in. thick at the top. This is not far from the width of many foundation rings, and serves to account for the great weights noted above.

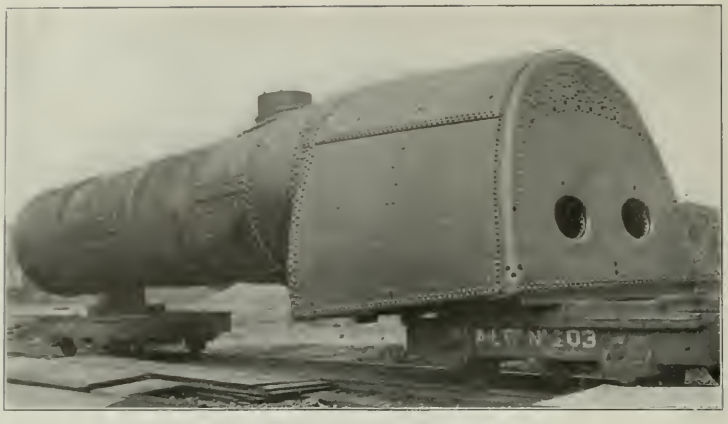
The cutting down of the actual amount of heating surface as compared with the smaller engine of the Baltimore & Ohio is another tribute to the demonstrated efficiency of the combustion chamber. By equating the heating surface of the two engines, it will be found that the Baltimore & Ohio engine had a total equated firebox heating surface of 1,369 sq. ft., while the Erie has 1,428.7 sq. ft., showing that, on the basis of the Vaughan formula, an allowance has, in reality, been made for the increased size and capacity of the engine. Attention is again called to the location of the injector check, which, on this boiler, is set only 8 in. back



Front Frame for Low Pressure Cylinder; Erie Mallet Compound



Cast Steel Rear Frame for High Pressure Cylinders.

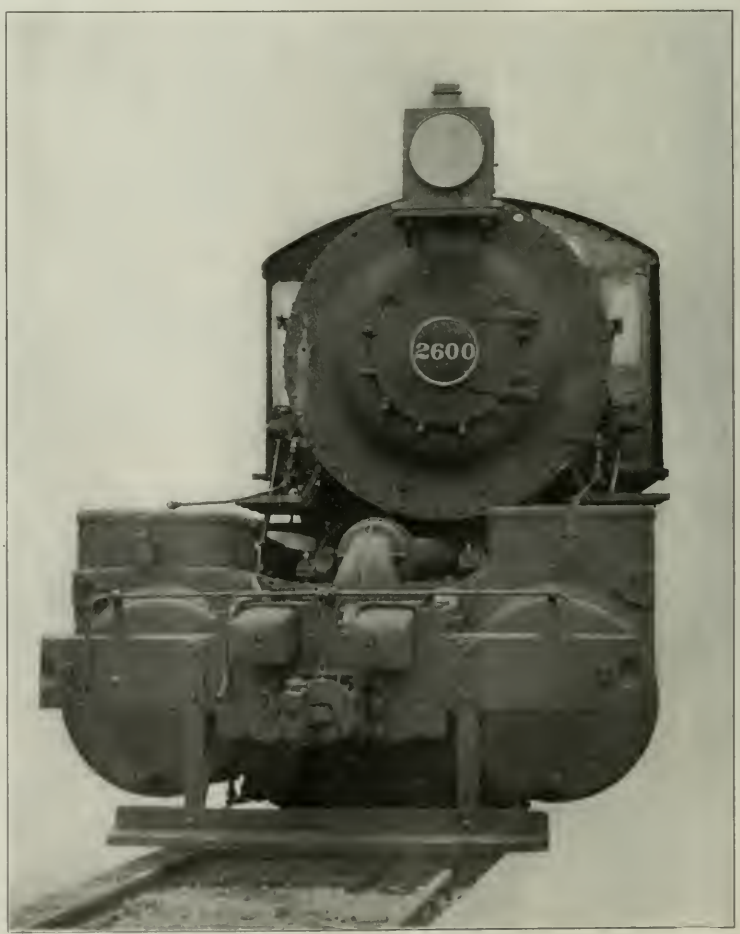


Boiler for Erie Mallet Compound.

of the front tube sheet and is nearer than in any other boiler yet shown in the *Railroad Gazette*. In the construction of the firebox and combustion chamber, sheets $\frac{1}{2}$ in. thick are used for the latter, and the ordinary thickness, $\frac{5}{16}$ in., for the crown and side sheets. The crown sheet drops $5\frac{1}{2}$ in. in its slope from front to back.

The throttle valve is of a peculiar and somewhat novel construction. The great height of the top of the boiler above the rail (14 ft. $7\frac{1}{2}$ in.) necessitates the use of a very low dome, and this in turn makes it advisable to take steam from the top of the same. The throttle valve has therefore been designed with this end in view; and, while it is balanced in the usual manner, steam is taken from the highest and dryest part of the dome only. To accomplish this the throttle casing A is surmounted by a crown piece B that curves in and beneath the overhang of the hood C that is fastened to the top of the valve and moves with it. The valve is hollow and is closed at the bottom by a piston $8^{31}/_{16}$ in. in diameter. This piston is furnished with water packing grooves and moves in a cylinder bored in the casing. Steam is admitted at all times to the top and interior of the valve through the space between the crown B and the hood C, a space which is never less than $\frac{1}{4}$ in. This arrangement serves not only to take the steam from near the top of the dome but also acts as a separator. This last feature is due to the fact that it is a tendency of steam under pressure and flowing rapidly over a concave surface, to deposit its contained water under the influence of centrifugal action on that surface. The water so deposited follows along past the upper lip D of the opening to the valve interior and thence down through the central space around the stem to the water in the boiler. Steam is led from the throttle pipe through a short dry pipe to a point directly in line with the high-pressure cylinders, from whence it passes through the top of the shell and is divided in a tee-pipe and passes down through wrought iron steam pipes on either side of the boiler to each of the high-pressure valve chambers. The design of the high-pressure cylinders which is shown in the accompanying illustration is similar to that used on the Baltimore & Ohio engine, the cylinders being cast in pairs with saddles, and the separation between the two cylinders being $8\frac{1}{2}$ in. to the right of the center line of the saddle, to make room for the receiver pipe. The engines are compounded on the Mellin or Richmond system, the intercepting valve being located in the upper part of the left cylinder casting. Exhaust steam from the right high-pressure cylinder passes through a cored passage to the back of the cylinder casting, from whence it passes through an outside U shaped pipe connecting to a passage in the left cylinder casting leading up into the intercepting valve chamber into which the exhaust steam from the left high-pressure cylinder also passes. The emergency exhaust valve is located in the side or the left cylinder casting and has a $4\frac{1}{2}$-in. jointed pipe connection with an opening in the back of the exhaust pipe in the smokebox. A three-way cock within easy reach of the engineer operates the emergency exhaust valve.

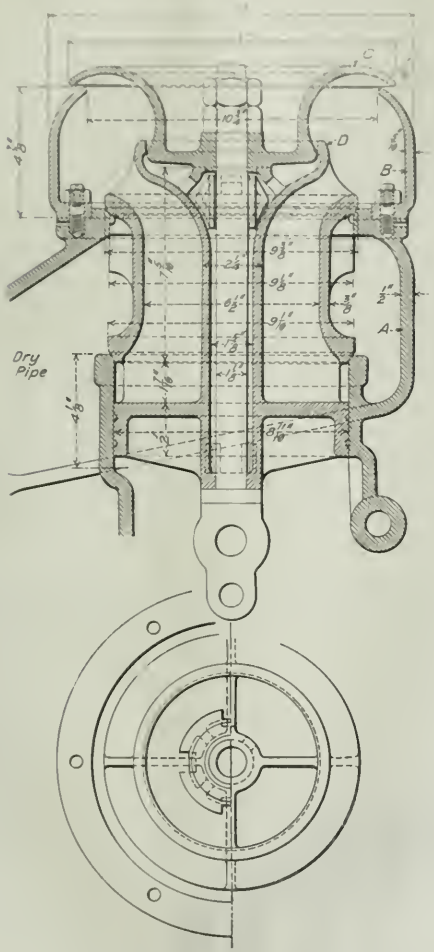
Steam from the high-pressure cylinder passes into a 9-in. receiver pipe extending forward from the center of the cylinder saddle to which it is connected by means of a ball joint. In order to facilitate putting in place or removing, this pipe is made up of three sections and is connected at the front end by means of a slip joint to cover variations in length due to curving to a Y pipe through which steam reaches each of the low-pressure steam chests. The receiver pipe is laid out for 16-deg. curves. The flexible connections are the same as those used in the Baltimore & Ohio design, which have proved so satisfactory—no trouble from leaky joints having been experienced throughout the entire two years this engine has been in service. Steam from the low-pressure cylinders, which are located considerably ahead of the front end of the boiler, exhausts back through a flexible pipe connection to the exhaust pipe in the smokebox. The high-pressure cylinders are equipped with piston valves, and the low-pressure cylinders with Richardson slide valves. The valve gear is, of course, of the Walschaert type. By an ingenious arrangement of the reversing gear the weights of the valve motion of the front and rear engines counterbalance each



Front View of Erie Mallet Compound Rounding a Curve.

other. The side elevation clearly shows the arrangement. As the high pressure valves have an internal admission and the low pressure an external admission it was possible with this arrangement of reversing gear to obtain a most satisfactory valve motion with both eccentric cranks leading the pin, the rear engines taking the forward motion from the top of the link and the front engines from the bottom of the link. The operation of the engine is rendered easier than that of an ordinary rigid engine by the application of pneumatic reversing cylinders to the ordinary gear with positive automatic locking in any desired position. The frames of both the front and rear engines are of cast steel, 5 in. wide. The articulated connection between the front and rear frames is shown in the illustration of the side elevation.

The part of the weight of the boiler which is carried on the forward engines is supported by a self-adjusting sliding bearing located between the third and fourth driving-wheels. This bearing consists briefly of a built-up saddle casting which extends down and bears on a cast steel cross-tie directly below it, through a wrought iron case hardened sliding plate. A brass wearing plate is introduced between the boiler bearing casting and the wrought iron plate. The sliding plate is radially planed on the bottom so that it adjusts itself to the alinement of the engine and the load on the sliding plate is at all times perfectly distributed and there is no cutting of the wearing surfaces. Movement in a vertical direction is prevented by a safety connection between the boiler bearing casting and the cross-tie, which prevents the frames from dropping away from the boiler in case of any derailment. There is also a similar safety connection provided at the front end of the boiler between the guide yoke casting and the exhaust pipe elbow.



Throttle Valve; Erie Mallet Compound.

Another sliding support is located between the second and third pair of driving wheels. This support is so adjusted that it does not take any of the load except under unusual conditions when [illegible] it necessary. It is provided with a floating [illegible] which serves to take some of the load off the main boiler bearing. This device consists of a pair of [illegible] one on either side of the center of the engine from [illegible] as the engine turns through curves. These columns have a ball joint connection at the upper ends with saddle castings bolted to the boiler and a ball joint connection at the lower ends with flap castings hinged to the bottom of a cross tie across the lower rails of the frame. Around the outer ends of these hinged castings are U bolts, the bars of which extend up through the bottom of the cross tie and through coil springs seated on the cross tie. These springs thus exert an upward force on the columns equal to the total compression of the springs. The initial total compression is 30,000 lbs., which can be increased by screwing down the spring caps by means of nuts on the ends of the U bolts. This boiler support is also provided with a spring centering device of the same design as that used on the Baltimore & Ohio engine.

Another sliding support is formed between the exhaust pipe elbow and the guide yoke casting. As mentioned above this support also forms a connection between the boiler and the frames.

The four pairs of front driving wheels are equalized together on each side and cross equalized in front of the forward drivers, making this system equivalent to a single supporting point. The rear engine on the other hand is equalized throughout on each side only without cross equalization. This forms a complete three point suspended engine, or the best obtainable condition for flexibility and ease on the track.

The following are some of the principal dimensions of the engine:

Cylinder diameter, H. P.	25 in.
Cylinder diameter, L. P.	39 "
Piston stroke	28 "
Wheel base, rigid	14 ft. 3 in.
" " total	39 " 2 "
" " engine and tender	70 " 5½ "
Weight	410,000 lbs.
Heating surface, tubes	4,971.5 sq. ft.
" " firebox	342.2 "
" " total	5,313.7 "
Grate area	100.0 "
Journals, main	10 in. x 13 in.
" trailing	9 " x 13 "
" tender	5½ " x 10 "
Steam pressure	215 lbs.
Firebox, type	Wootten
" length	10 ft. 6½ in.
" width	9 " 6¼ "
" thickness, tube sheet	½ in.
" thickness side, back and crown sheets	⅜ in.
" water space	5 in.
Tubes, number	404
" diameter	2¼ in.
" length	21 ft. 0 in.
" gage	0.125 in.
Smokestack, diameter	18 in.
Smokestack, above rails	15 ft. 3¾ in.
Valves, H. P. type	Piston
" L. P. type	Richardson balanced
" travel	5¾ in.
" lap, H. P.	1¼ "
" lap, L. P.	1 "
" exhaust clearance	¼ in.
" lead H. and L. P.	9/16 in.
Wheels, diameter, drivers	51 in.
Wheels, diameter tender	33 "
Tractive effort	94,800 lbs.
Ratio, high to low pressure cylinders	1 to 2.43

Weight on drivers / Tractive effort	4.32
Tractive effort x diameter of drivers / Heating surface	909.87
Heating surface / Heating surface	53.14
Grate area / Firebox heating surface	6.16*
Total heating surface / Weight on drivers	17.84
Heating surface / Volume 2 H. P. cylinders = 15.86 cu. ft.	
Heating surface / Volume 2 h. p. cylinders	33.5
Grate area / Volume 2 h. p. cylinders	6.31
Tube heating surface, equated to firebox heating surface (Vaughan formula)	1,085.5 sq. ft.
Total equated firebox heating surface	1,428.7 "

*In per cent.

Picked Up on the Road.

BY GULF.

I am not what is ordinarily known as a traveling man, though I do move about somewhat, and I am not disposed to draw final conclusions from the experience of one man; still I cannot help wondering whether my experience is exceptional or whether I am a railroad hoodoo. During the past eight or nine months I have moved across a considerable territory in the south, east and north, on many different roads, and I have not yet reached my destination on time. This is a broad statement, but it is rigidly true. The

trains have been from 15 minutes to six hours late, and in not a single instance was it due to accident or track obstruction, but to carelessness and inefficiency in getting started or the inability of the locomotive to haul the train on schedule time. Yet when I speak to a railroad man on the subject he invariably claims that a late train is the exception. My experience tells me that that is not the truth, and I would like very much to see a show-down of the despatcher's sheets. I remember once, a number of years ago, I had such a controversy with a superintendent of one of the roads running out of New York, and he claimed that his trains were always on time. So I kept a record of about 275 trains on that road during the next nine months, and found only one that fell within the five-minute limit, and that was two minutes late. When I called the superintendent's attention to the subject I received no reply.

As a matter of fact there is no reasonable excuse that can be offered for a train regularly off schedule. Oh, yes; I know all about bad coal, head winds, slippery rail, loading baggage, and the other causes that are given as excuses *ad nauseam*, but they are not excuses. These causes of delay will occur and should be provided for in the schedule. It looks very nice to make up a schedule on a 50-mile pace for an express or a 30 for a local, but what is a paper schedule good for if the locomotive cannot do the work? The general manager and superintendent work it out that a certain type of engine ought to haul a given train between terminals in a definite time. The superintendent of motive power is coerced into saying "yes, under favorable conditions." So the schedule goes into force on the assumption that the conditions will always be favorable on our line, and the train may make one or two trips on time. Then an extra car is added, or there is a little more slate than usual in the coal, or a theatrical company with a lot of baggage sees fit to go that way, and then the capacity of the hauling power is exceeded and "train late" is the result. "Train late" then becomes the rule, but the beautiful fast schedule remains on paper, a mockery to the trustful traveler who innocently confides in its untruthfulness.

It seems that the definition of the time-table should be changed from "a statement of the time at which trains are expected to arrive and depart from the several stations," to "a statement of the time at which some people hope they will."

Now, what is the result of this state of affairs? In the first place there is a feeling of unmitigated disgust aroused in the mind of the traveler. He feels that he has been imposed upon; that the railroad company has been derelict in the execution of its part of the contract; and there comes a determination to get even at the first opportunity. There is not one man in a thousand who would not prefer, by far, to travel on a very slow schedule and be sure of reaching destination on time than to take these fancy fast trains that lose time every inch of the way. This is not the expression of an individual opinion, but is the consensus of statements made to me by hundreds of men with whom I have talked on the subject. At present it is well-nigh impossible to schedule a trip with any certainty that the itinerary can be followed because of that *bete noir* of all travelers, the late train. So, if I have any advice to give to managers on the subject, it is, "Do not bite off more than you can chew; don't make a paper schedule that your wheels can only follow on rare occasions, if you wish to secure the favor of your patrons."

The effect of a late train on the employees is demoralizing, to say the least. Ask any yardmaster what it means to him to have a train late. His movements are all disturbed and the orderly execution of his work made an impossibility. His crews will try to steal a few more seconds on the main line or be late in breaking up the train, and so more time is lost and a bad matter becomes worse, and when this is scattered throughout the line, the despatchers become overworked, crews and agents become confused by the multiplicity of orders, and the climax is reached by somebody forgetting. Then there are damages galore, that ought to put a damper on the complacency of the general manager. But instead of that he puts the blame on the poor devil who forgot, instead of realizing that the fast schedule that the engine could not make was the primary cause of the trouble, and that "Thou art the man" should be sent home to him.

I know of the troubles with labor and the difficulty of securing reliable men, and so does every superintendent in the land. And knowing this, the blame comes home so much the more, in that there is put upon this unreliable material a task that it is impossible for it to perform. If state legislatures and railroad commissioners and general executive reformers would pay less attention to rates and rebates and see to it that the railroads do not make time-table bargains that they cannot execute, and when an accident occurs to a belated train, besides hauling up the forgetful one, would go deeper and see what may have been the record of that train in the past as to punctuality, and what is the common practice of the road, they would get closer to the true cause of the difficulty than they usually do. Then, if they must act or legislate, let it be along the lines of cutting down impossible schedules and seeing to it that those made are lived up to, and thus earn the commendation of all concerned—the traveler and the employee—with the possible exception of the manager who is so smugly complacent over the 50-mile schedule for a 40-mile gait, and whose complacency may well be ruptured for the general good of the public.

The Lusitania, of the Cunard Line, on Her Trial Trip. (See Editorial Page).

Electrification of the New York, New Haven & Hartford.

BY E. H. MCHENRY,
Vice-President, N. Y. N. H. & H.

The New Haven company was one of the pioneers in the field of heavy electric traction, and has operated six of its shorter branch lines by electricity for a number of years past beginning as early as 1895. Three of these lines, aggregating 35 miles, were equipped for overhead contact, and the remaining lines, aggregating 39½ miles, for third rail operation. All lines were operated with 500 volt continuous current, supplied from main stations and substations. The third rail was primitive in form and without protective devices of any sort. So many accidents followed the use of this method of supplying current to the motors that the railroad was compelled to abandon all third rail operation in Connecticut, and revert to steam service, by a decree of the Superior Court dated June 13, 1906, and it now has no third rail in service except a junction overlap with the New York Central at Woodlawn. The unsatisfactory experience with this type of construction influenced the company's decision in favor of the single phase system for the New York terminal electrification, which was finally adopted after a careful investigation of the relative merits and disadvantages of the two methods of construction.

Had the study of the question been limited to the equipment of the terminal section in New York, considerations of uniformity and expediency would doubtless have influenced the decision in favor of continuous current motors, taking current from a third rail. The New Haven, however, recognized the importance of its decision in its effect on future extensions of electric service to other parts of its system, and the final decision was based upon a study of the subject as a whole rather than upon the solution of the terminal problem only. The selection of a system of transmission which combines efficiency, flexibility, simplicity and lowest first cost, was important. The New Haven system comprises a network of lines and its transmission problems must be worked out for areas rather than for linear distances, thus reversing ordinary conditions. As the area served increases as the *square* of the radius of transmission from the generating center, the commercial and practical value of high potential transmission is much increased.

While both methods under consideration included high tension transmission by alternating current, it was believed that the combination method requiring transforming devices and continuous current motors was less well adapted to the conditions than single phase for many reasons. The electric efficiency of the combination system between power house bus bars and engine shoes is 75 per cent. only, as compared with 95 per cent. for the single phase system. The flexibility of the combination system is impaired by the limited radius of the secondary low tension distribution, requiring substations at frequent intervals, and still further by the limitations imposed by the use of a third rail. The position and height of this rail must be rigidly maintained, and the practical margin of permissible variation is small. Its continuity is broken at switches and crossings by frequent transferrence of the conductor rail to the opposite side of the track or to an overhead position. In contrast, the single phase system requires no substations or secondary circuits; the continuity of the overhead conductor is complete, and its position and height may vary within vertical and horizontal limits of 8 ft. and 4 ft., respectively, without losing contact with the collecting shoes on the pantagraph frames.

It is yet too early to furnish definite and positive comparisons of cost of the two methods under consideration, but the calculations and experience of the company's engineers indicate that the total cost of a single phase installation will be much less than that of the continuous current system, and that the higher electrical efficiency, lower fixed charges, maintenance and operating expenses of the single phase system all tend to reduce the relative cost of current delivered to the engine shoes in about the same proportion.

The determination of the most economical and desirable frequency and voltage of the transmission system involved the consideration of many factors. The choice of frequency was limited to 15 cycles or 25 cycles. The lower frequency afforded a material reduction in weight, size and cost of motors, a reduction in conductor losses and induction disturbances, together with an increase in the power factor of the motors, but its adoption would have materially impaired the commercial value of the system as a whole, in restricting or preventing its extension for many other uses incidental to railroad operation. The standard frequency in general use is 25 cycles, and as the New Haven already owned a number of power houses generating current at this frequency for trolley operation, and, in addition, had equipped many of its shops with 25-cycle motors, the adoption of 15 cycles would have required the abandonment of a large amount of standard apparatus, or the interposition of costly and inefficient means of transiation. It was also considered desirable to provide for operation in parallel with the 25-cycle generators already adopted by the New York Central. The practical effect of a change from 25 to 15-cycle apparatus was thus substantially equivalent to a "break in gage," and it was decided that the practical commercial value of the higher frequency outweighed the theoretical merits of the lower one.

Various alternatives were considered before fixing the best trolley and transmission *e. m. f.* of the system. It was at first proposed to increase the economical radius of transmission to the utmost by generating current at the highest initial voltage for which generators could be safely designed (about 22,000 volts) and to provide substations at suitable intervals, equipped with static transformers, for supplying current at 3,000-6,000 volts to secondary contact circuits. As the two motors in each electric locomotive truck are permanently connected in series, current must be supplied at 550 volts through the transformer which forms part of the locomotive's equipment. It became evident, however, that a great gain in simplicity would result if the intermediate substations and line transformers could be cut out altogether by reducing the initial *e. m. f.* to 11,000 volts and raising the ratio of the locomotive transformer to correspond. This was done with a resulting reduction in capital and operating cost, coupled with an increase of electrical efficiency. Incidentally, the difficulties in designing satisfactory collecting devices were greatly diminished.

Before giving a detail description of the apparatus used in the electrified district it may be interesting to give a few comments on the commercial aspects of electric traction, as the natural prejudice of the stockholder in favor of the continued maintenance of dividends must be respected, and the technical expert too frequently neglects this in his scientific ardor.

Numerous analyses and comparisons of the comparative costs of electric and steam operation have been published from time to time, which tend to prove that a considerable saving in fuel, engine repairs and other operating expenses may be expected. Under favorable conditions this saving may be large enough to pay interest and other fixed charges on the additional construction investment and still leave a satisfactory margin to be applied to dividends. Under general conditions, however, it is altogether improbable that the direct saving resulting from the simple substitution of electric for steam power will be sufficient to justify the additional investment and financial risk.

In changing the method of motive power on existing railroads, the conditions are by no means so simple as in the construction of new lines, since a great amount of capital already invested must be sacrificed, and the problems of adaptation to existing conditions are peculiarly severe. The transition stage in bridging over the gap between steam and electric operation is both expensive and difficult, as the change affects train lighting and heating, telegraph and telephone service, signaling and track maintenance, for which both temporary and permanent provision must be made. The simultaneous maintenance of facilities and working forces for both steam and electric service within the same limits will rarely be profitable, for the reason that a large proportion of expenses incident to both kinds of service is retained, without realizing the full economy of either.

To secure the fullest economy it is necessary to at least extend the new service over the whole length of the existing engine district, and to include both passenger and freight trains.

The application of electric traction to heavy railroad service will probably be governed by other and more important considerations than its mere relative cost as a motive power under similar conditions, as illustrated in the development of the ordinary trolley service. In this development the commercial value of higher speeds and of increased car capacity is so large that the relative cost of electric versus animal tractive power becomes almost negligible by comparison. Analogous results may be hoped for in the corresponding development of electric traction in heavy railroad service, as the new conditions will afford opportunities for at least two radical modifications of existing conditions, quite apart from minor economies.

In steam service the weight and speed of trains are limited by the horse-power capacity of the locomotive, which generates its own power, and there are but few locomotives which can generate sufficient steam to utilize their full cylinder tractive power at speeds in excess of 12 miles an hour. Consequently, any increase of speed beyond certain limits can only be attained by sacrificing train tonnage in a corresponding degree. The division of the train-mile cost by the lesser number of tons increases the ton-mile cost proportionately.

The high cost of fast freight service is principally due to this effect of a diminishing divisor, while it would seem that electric traction should permit high speeds without sacrificing commercial tonnage, as, with a relatively unlimited source of power at command, the maximum drawbar pull permitted by the motor design, may be maintained at all speeds.

Hardly less important is the opportunity afforded for the economical operation of trains of *minimum* capacity. The train capacity cannot be reduced, without loss, below the point where the earnings equal the train-mile cost, and if this cost cannot be reduced proportionately with reduced capacity, the inferior limit of capacity may be uneconomically large. In steam service the irre-

ducible elements entering into the train-mile cost are so large that it is rarely profitable to operate trains earning less than 40 to 50 cents per mile. In contrast, electric service permits an extreme reduction of the train length to single car units, costing to operate but 10 to 15 cents per car-mile. Hence, the frequency of service may be increased and rates reduced, which in turn will react on the volume of traffic, with the final result of increasing both gross and net earnings. It may, therefore, be claimed for electric traction that it will extend the limits of profitable operation of high-speed heavy trains, and also of light trains of low capacity.

Other but relatively minor advantages are possible in the effect on earnings, due to the elimination of smoke, gases, dust, cinders and heat, the better ventilation of cars, the extension of electric train lighting and heating; and of the effect on expenses due to the concentration of power production in large and economical power houses, a reduction of engine repairs, an increase of effective engine and train mileage, a more or less complete elimination of engine houses, turntables, fuel stations, water tanks, cinder pits and other operating facilities, the consolidation of power requirements for traction, pumping, operating shops, elevators and general uses, and the use of current for lighting switch lamps, stations and other buildings.

Finally, the availability and value of real estate and structures at large terminals will be greatly augmented by the possibilities of using two or more superimposed track levels, as in the new terminals in New York for the New York Central and the Pennsylvania.

A general change from steam to electricity will render unproductive a very large amount of invested capital, and create the necessity for the expenditure of additional amounts still greater, but there is no reason to doubt that the transition already in progress will be rapidly extended and applied at all points where congested terminals, high frequency of train service and low cost of power create favorable conditions.

Overhead Catenary Construction over Four Tracks; New York, New Haven & Hartford.

OVERHEAD LINE CONSTRUCTION.

The overhead line construction is of the catenary type and consists of two steel cables of high strength, supported at intervals by steel bridge structures. A copper conductor or trolley wire is suspended below the two supporting cables by means of hangers placed at frequent intervals. Wherever the cables pass over the steel supporting bridges they rest on porcelain insulators, and at intervals heavy bridges are provided against which the cables are anchored by means of specially constructed strain insulators.

The steel supporting bridges are of varying lengths so as to accommodate four, five, six or as many as 12 tracks, as the local conditions require, without placing posts between tracks. These bridges are of a uniform design and consist of angle iron and lattice bar construction. The anchor bridges are provided with automatic circuit-breakers by means of which the different sections may be isolated, and also the several parallel tracks separated from one another in case of accident to any one track. The anchor bridges also carry lightning arresters, shunt transformers for operating the circuit-breakers, together with foot walks, hand railings, lighting circuits and the wires and conduit for the auxiliary control circuits.

The main conductors over the running tracks are paralleled throughout their entire length from Stamford to Woodlawn by two feeder wires. These feeders constitute auxiliaries to the main track conductors and are connected with the latter at each anchor bridge through circuit-breakers. The auxiliary feeders provide means for feeding around any one section in case it is cut out of service on account of some accident in that particular section.

In laying out the bridges for the section from Woodlawn to Stamford, it was found that the sharpest curvature was 3 deg. As this curvature will permit of stringing trolley wire in straight lines between points of support 150 ft. apart without deviating from the center of the track more than 8½ in. on each side, it was decided to place all bridges a fixed distance of 300 ft. apart, and on curves to provide guide poles from which pull-over wires are attached and secured to the catenary spans. By this means a minimum amount of overhead wiring was obtained, and the deviation from the center of the track was maintained within safe limits.

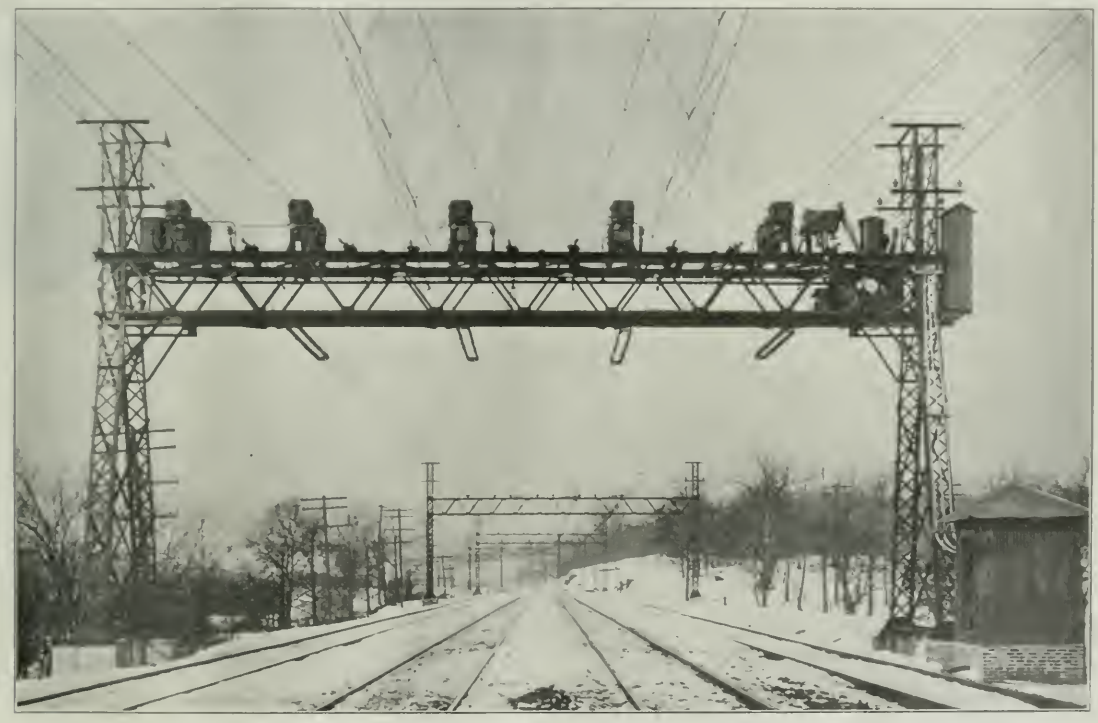
The standard four-track intermediate bridge consists of two supporting side posts and a horizontal truss. Each supporting post is approximately 38 ft. long by 1 ft. 10 in. square. Each is composed of four 4-in. x 4-in. x $^{7}/_{16}$-in. angles, secured together by 2¼-in. x ⅝-in. lacing bars. Each post rests on a concrete foundation. The cross truss is bolted to the vertical posts, allowing a distance of 23 ft. 4 in. from the lower side of the truss to the top of the rails. The truss is 4 ft. 6 in. deep from back to back of the upper and lower chord angles, which are placed 1 ft. 10 in. from back to back. The upper chord angles are 3½ in. x 6 in. x ⅜ in. and the lower are 4 in. x 3½ in. x $^{9}/_{16}$ in.

The extensions of the side posts above the trusses are utilized for supporting the feeder wires which are carried on angle iron cross arms bolted to the posts. The lower cross arm carries the auxiliary feeder. The upper cross arm is located 5 ft. above the lower one and carries two wires of three-phase circuit. The third wire of the three-phase circuit is carried on a light vertical channel iron support which is not shown in the illustration.

Anchor bridges of heavy construction are placed every two miles, and against these bridges the catenary cables are anchored. The auxiliary apparatus and signals are mounted on the bridge, the semaphore blades being located below the truss so as to afford an unobstructed view to the engineer. The four-track anchor bridge consists of two A-shaped posts having a spread at the base of 15 ft. and a width at right angles to the track of about 2 ft. The main members of the posts consist of 6-in. x 4-in. x ⅝-in. angles. These posts are also extended above the truss for carrying the feeder

wires. The truss is bolted to the side posts allowing a clearance above the rails to the lower side of the truss of 24 ft. 3 in., and is 4 ft. 6 in. deep by 5 ft. wide between the backs of the chord angles. The upper chords consist of 8 in. x 8 in. x $^{7}/_{16}$-in. angles, and the lower chords consist of 4 in. x 3½ in. x $^{5}/_{16}$-in. angles.

A ladder is provided on one of the posts leading to a small platform at the end of the truss. This platform is provided with a hand rail and carries upon it a box containing an 11,000-volt, low-equivalent lightning arrester. A portal is provided in the end of the truss by means of which the attendant may step to the platform supported upon the lower chord of the truss. From this platform access is provided to the short ladders leading to the signal lanterns and a second short ladder extending up to another platform supported upon the upper chord of the truss. This platform is surrounded by a hand rail which is also attached to the iron supporting frames of the circuit-breakers in such a manner that the attendant can in no way come in contact with the live parts of the circuit. At each end of the truss a 5-k.w., 11,000-volt, shunt transformer is provided, one of these being connected directly into a bus-bar which runs around the outside of the circuit-breakers and which is supported on porcelain insulators and bus-bar brackets



Four-Track Anchor Bridge with Circuit Breakers and Section Breaks.

secured to the upper chords of the truss. The other transformer is connected directly to one of the "power" feeders. As the "power" feeder is connected to the third phase of the generating system, this provides means for operating the switches in case of accident to the trolley section. The four-track anchor bridge is secured to concrete foundations by long anchor bolts and nuts.

Each of the two catenary cables which support the copper trolley conductor consists of an extra high strength steel cable, $^{9}/_{16}$ in. in diameter, consisting of heavy strands. This steel has an ultimate strength of about 200,000 lbs. per square inch, and each strand is heavily galvanized. The completed cable has an ultimate strength of 33,800 lbs. These cables are strung between the bridges, with a sag at mean temperature of 6 ft. in a standard span of 300 ft.

The trolley wire, which is No. 0000 grooved copper, is supported every 10 ft. from the catenary cables by triangular trolley hangers of varying lengths. These hangers are so adjusted in length that the trolley wire is maintained in a horizontal position, 6 in. below the catenary cables at the middle point of the span. They consist of a pair of small drop forged steel jaws, which engage with the grooves of the trolley wire and are clamped by means of a malleable iron Y which is screwed down upon the threaded portions of the jaws. The sides of the triangle are then screwed into the Y and are bolted to the messenger cable above. As all of the threads

to the bridge above the insulating structure to prevent accumulations of dirt and water on the insulators.

At a number of points where there are numerous side-tracks, it is necessary to provide extra long bridge supports. An illustration shows one of these long bridges, which is designed to cover 12 tracks. The catenary cable insulators are attached to the lower member of the truss. Both rails of all tracks are bonded with No. 0000 compressed terminal flexible bonds placed round the fish plates.

Wherever one track diverges from another a section insulator is inserted in the trolley wire. Insulators are inserted in the catenary cables supporting the diverging wire between parallel tracks.

The diverging trolley wire is connected to the main wire by a frog of standard design, and in order to prevent the contact shoes on the locomotive from catching, deflector wires are placed in the angles between the two trolley wires. These deflectors are carried by yokes screwed to the trolley wires and to yokes at the ends fastened to the catenary hangers. These deflectors are raised at each end so that the collector shoe cannot catch over them.

ELECTRIC LOCOMOTIVES.

The specifications under which the locomotives were built require that they shall be able to handle a 200-ton train on the most severe schedule in the present time-table, corresponding to the local express which stops about every 2.2 miles and operates on a schedule

speed of over 26 miles an hour. This requires a maximum speed of about 45 miles per hour. The locomotive is also to haul this weight of train at 65 to 70 miles per hour and a 250-ton train at 60 miles per hour in the long runs. Three 100-ton, or even heavier, trains may also be handled on the long runs at reduced speeds. Heavy trains may be operated at high speeds by coupling two or more of the locomotives together and operating them on the multiple-unit system.

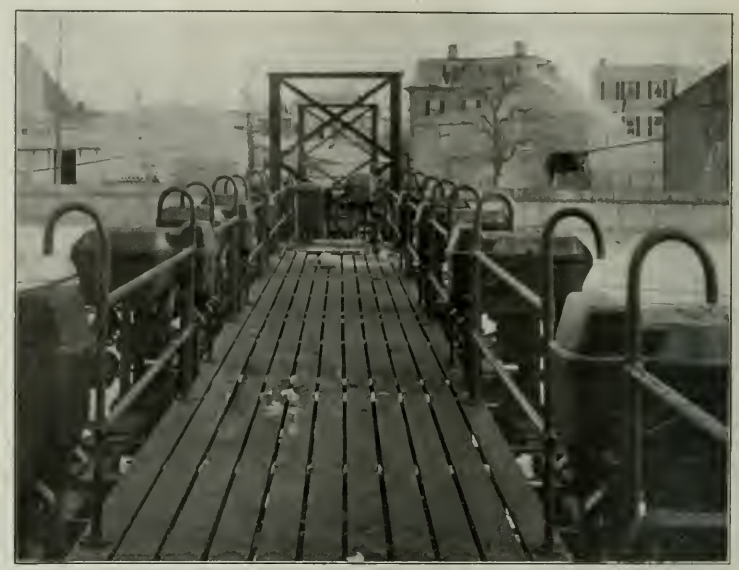
The design of the locomotives was largely dictated by certain requirements: (a) Gearless motors having a flexible drive and with all the weight carried on springs were desired and finally adopted as the most desirable form, and (b) operation on 600 volts direct-current necessitated the use of four motors in order that they might be operated in the usual series-parallel relation.

The bogie truck type was adopted after careful consideration as the one best adapted to meet the conditions imposed. Its riding qualities are the best and it offers the least resistance in taking the curves in the line. The locomotives are 36 ft. 4 in. over bumpers and weigh approximately 90 tons.

The mechanical parts of the locomotive were built by the Baldwin Locomotive Works from designs developed with the co-operation of the Westinghouse Electric & Manufacturing Company and the New Haven engineers.

The longitudinal members of the frame consist of deep plate girders reinforced at the top by channels and at the bottom by heavy angles and plates. To these frames are riveted plate cross members, one over each truck, forming the transoms. These transoms are further braced by gusset plates riveted to the bottom flanges of both sets of channels, which transmit the tractive power from the center-pin to the side frames. The side girders are placed outside the wheels as low down as the wheels and drawhead will permit and are braced and squared by substantial steel flooring plates which are riveted to the top flanges. The drawbar effort is transmitted to the side frame through deep box girders joining the frames at the ends of the locomotive. The cab is built up on a framework of Z-bars which are riveted to the side girders. This forms a light but strong construction, able not only to transmit large drawbar pulls but to resist heavy shocks in bumping.

The running gear consists of two trucks, each mounted on four 62-in. driving wheels. The trucks have side frames of cast steel



Deck of Anchor Bridge, Showing Circuit Breakers and Other Auxiliary Apparatus.

Method of Erecting Bridge Columns with Locomotive Crane.

to which are bolted and riveted pressed steel bolsters which carry the center plates. A strong construction is secured without excessive weight by the use of bolsters 30 in. wide at the center plate and extended to nearly double that width at the ends where they are bolted to the side frames. Center bearings 18 in. in diameter transmit the tractive effort to the frame. They are well lubricated to permit free motion on curves. The weight on the journal boxes is carried by semi-elliptic springs. Under the ends of the equalizer bars are small spiral springs to assist in restoring equilibrium. The distance between truck centers is 14 ft. 6 in.

The motors are of the gearless type. The hollow shaft of the armature is made in two halves. These two halves are alike and each is provided with an end disk from which project seven hollow pins. Each half is forced by hydraulic pressure into the ends of the hollow armature spider and is securely keyed in place. The armature and quills are mounted on the locomotive axle. The split housings at each end of the armature carry the armature bearings and are rigidly clamped to the outer field frame of the motor. On each end of the locomotive axle is mounted a 62-in. driving wheel in the hub of which are formed seven circular pockets which contain helical springs for assisting in carrying the weight of the motor and for transmitting the torque from the armature. Into each of these pockets there projects one of the hollow pins on the end of the armature shaft. Each pin is surrounded by a spring placed between the outer circumference of the pin and the inner circumference of the pocket. This spring is arranged so as to tend to hold the pin concentric with the pocket, and it resists yieldingly to any gravitational or torsional force for a total movement of ¾ in. The spring is of unusual form; its turns are progressively eccentric. Thus an end view of the spring would show an inner radius and an outer radius differing from each other by ¾ in. greater than the thickness of the stock from which the spring is built. Between the outer circumference of the spring and the inner circumference of the pocket is fitted a sheet iron tube, and a similar tube is placed between the spring and the pin. These tubes and the spring form a unit which may be taken intact from the pocket when the outer end cap is removed. On account of their mechanical form and their position in the pockets these springs cannot be stretched beyond their elastic limit, and, since each pocket is provided with adequate lubrication it is expected that they will withstand the most severe wear and last indefinitely. They are capable of sustaining the whole weight of the motor, but they will normally be used solely for transmitting the torque to the drivers. Each pin contains a hollow space in which is placed an additional spring which serves for receiving the end thrust of the motor against the drivers.

The method of carrying the weight of the motor from the truck and of resisting the backward torque of the field structure is by providing a steel frame entirely distinct from the truck and pivoted from the journal boxes of each locomotive axle. From this frame

the weight of the motor is carried by springs on which rest lugs of the field structure. The adjustment of the tension on these springs determines what portion of the weight of the motor is carried by them and just how much weight is carried through the pinion on the armature quill. Since the frame from which the motor is suspended is distinct from the truck the swinging of the locomotive can have no effect on the motor and the motor delivers a cushioned blow to the rails. The backward torque of the field is transmitted to the truck through rods which permit a certain amount of vertical motion

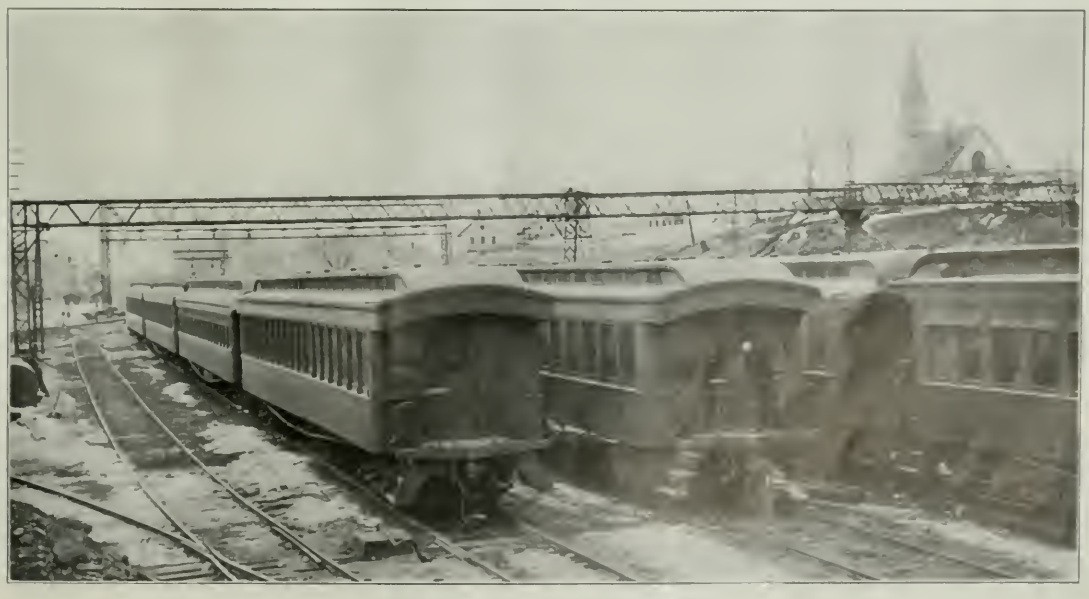
Erecting a Long Trolley Bridge Truss in the Yards.

in the motor. The armature and field windings are of the usual form employed in Westinghouse single-phase series motors. The armature winding is closed in itself and is indirectly connected to the commutator through preventive leads which reduce the short circuit current produced when the brushes pass from one commutator segment to the next. The field winding is of the compensated type with the compensating field evils wound in slots in the projecting pole pieces. These compensating coils are always in series with the armature circuit and serve to neutralize the reactance of the armature.

There are several brushes per holder and both the brushes and holders resemble closely those used for direct-current work. The brushes are ⅝ in. thick and are pressed against the commutator by a coiled spring. The total locomotive mileage is not yet sufficient to determine the life of the armature except by approximation from the present rate of wear and this has been so small that an accurate estimate cannot yet be made. A flexible copper jumper or shunt is used for carrying the current to the brush.

The two armatures on each truck with their corresponding compensating field coils are joined permanently in series and are operated at all times as a unit. For direct-current work the two-motor units of each locomotive are connected in series at starting and in parallel at full speed, while for alternating-current work the two units are joined in parallel at all times. Although during direct-current operation the familiar series-parallel method of control is employed, several unusual features have been introduced so that the losses during acceleration are equally as small as would be the case if there were complete series paralleling of the four motors by the method used ordinarily with four-motor equipment. The motors being of the compensated type will run sparklessly with the fields weakened to any desired extent, and this condition is taken advantage of during the acceleration period before passing from the series to the parallel position. Thus there is eliminated a large portion of the loss which would take place in the resistance if the motors were changed directly from the normal series position without resistance to the parallel position with the full resistance in circuit. Much of the lower part of the normal speed range in the parallel position is covered by the motors connected in series with shunted field coils.

The acceleration is extremely smooth, which is to be attributed partly to the facts just stated and partly to the fact that in passing from the series to the parallel connection the circuit to neither motor is opened nor is either motor short-circuited. In the initial series position at starting, one motor unit is connected to the ground side and the other to the trolley side, with the resistance in series between them. In the final series position the resistance is out of circuit and two units are in series across the line. If now there be connected in parallel with each motor unit a resistance of a value such that one-half of the line voltage will cause to flow through it a current equal in value to that passing through each motor, the two motor units will in effect be connected in parallel across the line, each unit having in series with it a resistance which absorbs one-half of the line voltage. Under this condition no current will flow directly through the middle-voltage connection between the two motor units, and this connection may be broken without changing the performance of the motors, after which the resistance in series with each motor may be decreased until the two units are directly in parallel across the line.



Special Trolley Bridge over Yard Tracks.

During alternating-current operation each motor unit is fed at variable voltage from the secondary of a step-down transformer, there being two separate transformers on each locomotive. The same master controllers are used for alternating-current as for direct-current.

Each switch used in the motor circuits is of the Westinghouse "unit" type, operated by air under 80 lbs. pressure and controlled by an electromagnet which receives current from a 20-volt storage battery. There are, therefore, on the locomotive three systems of wiring: the 11,000-volt primary circuits to the step-down transformers; the lower-voltage motor circuits (corresponding to the secondary circuits from the transformers and the equivalent 600-volt direct-current circuits), and the battery electromagnet circuits. The high-potential circuits pass directly from the trolleys through the manually-operated oil switch to one terminal of the primary of each of the step-down transformers, the other terminals of which are grounded to the locomotive frame. The lead from the trolleys to the oil switch is protected by a grounded covering, and only the 20-volt battery runs to the master controller. The motor circuits pass either from direct-current trolley, third-rail shoe or the taps on the secondaries of the transformers to the unit switches and through the motors to the ground.

The unit switches are arranged in groups for convenience, and the switches of each group have their magnetic blow-out coils placed mechanically in the same line so that they assist one another in producing the blow-out flux.

The locomotive may be controlled from either end by means of a master controller which is of the usual type except that its handle is somewhat different from those heretofore used. The handle resembles somewhat the throttle lever of a steam locomotive. No gears are used, the handle being connected directly to the drum shaft. The reverse lever is mounted immediately below the operating lever of the controller. The circuits which run to one master controller are in multiple with those to the other controller. A continuation of these circuits through flexible leads from one locomotive to another allows any number of locomotives to be operated simultaneously from one master controller. When the master controller is in the off position, connections are so established that all circuit-breaker trips which may be open may be closed by pressing a small push button on top of the controller. Current is supplied to the control circuits by two sets of 10-cell storage batteries, each of which has a capacity of 40 ampere-hours and weighs 150 lbs. In connection with the switch groups, cut-out switches are provided so that either pair of motors may be cut out by simply rendering certain switches inoperative. It is thus possible to cut out the motors without manipulating the main circuit.

There are two pantagraph bow trolleys for collecting the current from the 11,000-volt overhead conductor system. The upward pressure against the wire is supplied by springs. Compressed air is admitted to a cylinder when it is desired to lower the collector. When the collector is in its lowest position a catch engages the mechanism and holds it in place. This can be released by means of an electro-pneumatically operated lever when compressed air is on hand, or it can be released manually if desired. The framework of the pantagraph mechanism is built up of steel tubing and the collector bow is a broad strip of soft copper. The collector mechanism is mounted on moulded insulators bolted to the roof of the locomotive.

For use over the New York Central tracks there have been provided both a second and lower overhead direct-current pantagraph trolley and third-rail contact shoes. The direct-current trolley is

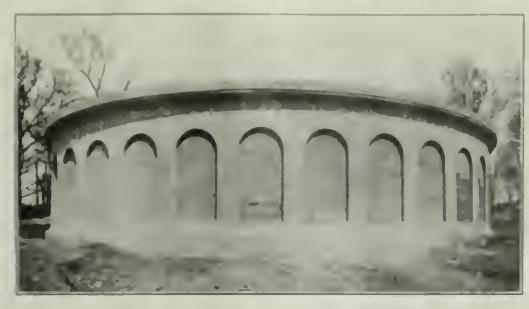
New Haven Electric Locomotive with A. C. Trolleys Raised.

of the same general type as that used of the high-potential collectors and it is mounted over the center of the locomotive. There are two mechanically separate but electrically interconnected contact shoes on each side of each truck, making a total of eight shoes per locomotive. These shoes are designed for use with either an over-running or an under-running rail, and the mechanical pressure in each case is supplied by springs. On account of the fact that no third-rail will be used over the high potential portion of the route, and the projecting shoes in their normal position would be liable to strike any small obstruction along the side-paths, a device is used for lifting the contact shoes out of the way when the locomotive is using alternating-current. This device will be operated electro-pneumatically and will be automatic so that when the alternating-current circuit is completed the shoes will be lifted from the rails.

All of the controlling mechanism of the locomotive is placed in the cab. In addition to the various switch groups and the two main transformers referred to above, the cab contains two air compressors driven by compensated motors of the same general type as the main driving motors. The circuits to these motors are con-

Cos Cob Power House and Coal Dock; New York, New Haven & Hartford.

trolled automatically by the pressure of the air in the main reservoirs which are located underneath the locomotive. The four main traction motors, the high-potential transformers and the main circuit rheostats are cooled by air furnished at low pressure by means of two motor-driven centrifugal blowers which draw air through openings in the cab. The low-pressure air has two paths. One path passes first through the transformer and then to the rheostat. The other path goes directly to the motors. It enters the armature near the shaft, passes around and between the armature laminations, flows outward through the ventilating ducts in the field cores and reaches the outer air through perforated caps on the frame of the motor.



Concrete Water Reservoir at Cos Cob Power House.

Since a considerable volume of air is required for each motor and it is undesirable to cause the air to assume a high velocity, it was necessary to provide a large flexible conduit between the air passages on the cab and those on the motors proper. The flexible conduit is made of heavy canvas tubing which is reinforced with wire and given an accordion pleating. By the use of the air blast the temperature of the motors under load has been so decreased that the continuous rating is almost equal to the one-hour rating.

COS COB POWER HOUSE.

The initial single phase electrification comprises that portion of the New York division of the New York, New Haven & Hartford from Stamford, Conn., to the junction with the New York Central at Woodlawn, N. Y., 21 miles. From Woodlawn to the Grand Central Station the New Haven trains are operated over the tracks of the Harlem division of the New York Central by the New Haven electric locomotives, using direct current from the New York Central's third rail electric equipment. The power house at Cos Cob furnishes single-phase current for the operation of electric trains over the New Haven road and is also designed to deliver three-phase current to the Port Morris power house of the New York Central to compensate for the energy required to operate the New Haven trains over the lines of the New York Central.

The power house is adjacent to the main line of the railroad and on the bank of the Mianus river about one mile from Long Island sound. Coal can be delivered either by water or rail, and an unlimited amount of salt water for condensing purposes is available. By the erection of a dam in the river about a mile up-stream from the power house an abundant supply of pure boiler feed-water is obtained.

The general style of architecture of the power house building is Spanish Mission; the walls are built of plain-faced concrete blocks. The site selected was on solid rock, and this required blasting the excavation for the basement and the condenser intake and discharge flumes. The building walls, below the water-table, and the machinery foundations are monolithic concrete. The interior columns in the boiler room are of structural steel, but all other columns required in the building are of concrete blocks. The steel roof trusses over the turbine room are supported on concrete block pilasters formed in the building walls, while over the boiler room they are carried by the pilastered building walls and by the interior steel columns, which also support the boilers, the mechanical draft equipment and the stack. The front of the switchboard gallery, at the south end of the turbine room, is carried on concrete block columns which also support a reinforced concrete girder forming one of the crane runways. The other crane runway is formed on another reinforced concrete girder built into the partition wall between the engine room and boiler room, and is supported on pilasters formed in this wall. The basement floor is concrete laid on the rock. All other floors in the building are of reinforced concrete and the roof is of reinforced cinder concrete finished with Ludowici tile.

A self-supporting steel stack 14 ft. 6 in. in diameter extending to a height of 100 ft. from the engine room floor is carried by the steel columns which support the fan room floor, leaving the space below, on the boiler room floor, entirely clear.

The turbine room is 60 ft. wide by 112 ft. long and the switchboard occupies a space next the turbine room which is 25 ft. wide by 110 ft. long. The boiler room is 160 ft. long and 110 ft. wide.

The initial generating equipment of the power house consists of three multiple expansion parallel flow Parsons steam turbines direct-connected to single-phase Westinghouse generators. Provision has been made for the installation of a fourth unit of corresponding size. The turbines are rated at 4,500 brake horse-power each and the generators at 3,000 k.w. each, at 80 per cent. power factor.

As the requirements necessitated the generation of three-phase current for delivery to the New York Central system as well as single-phase current for the operation of the electric locomotives over the New Haven railroad, the generators are wound for three-phase current but are arranged for the delivery of both three-phase and single-phase current. The turbines are operated at 1,500 revolutions per minute by steam at 200 lbs. pressure and 100 deg. superheat. The continuous overload capacity of the units is 50 per cent., and momentary overloads of 100 per cent. can be taken care of when operating condensing.

The generators are entirely enclosed by a casing into which air is drawn through suitable ducts from a fresh air chamber under the switchboard gallery, and from which the air is discharged through other ducts into the basement. This renders the operation of the generators practically noiseless.

The excitation of the generator fields is provided for by two 125-k.w. direct-current generators, direct-connected to Westinghouse engines; and one motor-driven exciter.

To prevent rapid deterioration of the brass condenser tubes by galvanic action a motor generator set has been installed and provided with suitable controlling apparatus for maintaining in each condenser a counter electro-motive force slightly in excess of the electromotive force due to galvanic action and the stray currents.

Interior of Turbine Room at Cos Cob Power House.

The initial installation of boilers consists of twelve 525-h.p. Babcock & Wilcox water-tube boilers set in batteries of two boilers each, and arranged with eight boilers on one side and four boilers on the other side of the boiler room separated by a 21-ft. firing floor. Provision is made for four additional boilers to take care of the fourth turbo-generator unit when installed. These boilers are equipped with Roney mechanical stokers and Babcock & Wilcox

superheaters and deliver steam at 200 lbs. gage pressure and 125 deg. superheat.

Under ordinary conditions the boiler feed water is delivered from the pump house at Mianus through a 10-in. main to a concrete reservoir of 600,000 gallons capacity just outside the power house. From this reservoir the water flows by gravity to two 13,000 gallon feed water tanks in the boiler room basement. These tanks also receive the discharge from the hot well pumps. The water is then drawn from these tanks by the feed pumps and delivered through the feed water heaters and the economizers into the boilers.

An auxiliary source of feed water supply is provided for by a connection to the mains of the Greenwich Water Company.

Four 14-ft. fans, direct-connected to horizontal high-speed engines, deliver the flue gases from the economizers to the stack, which is only of sufficient height to carry the gases away from the building.

All coal received by water is unloaded from barges by a steel derrick operating a clam shell bucket and delivering to a hopper of 15 tons capacity at a height of 55 ft. above the dock. From this hopper the coal is fed by gravity into a coal crusher and from the crusher it drops into steel cars where it is weighed. The cars are then drawn by cable up an inclined railroad into the boiler room through an opening near the roof. Two cars can be operated on this track, passing each other through an automatic turnout at the center. The cars discharge the coal into a hopper, from which it is delivered into two flight conveyors, extending the length of the boiler room. Openings in the bottom of the flight conveyors discharge the coal into spouts leading to the stoker hoppers of the boilers. The capacity of the flight conveyors is in excess of the amount of coal required to operate the boilers, and the surplus coal is discharged at the further end of the boiler room into a concrete storage bin below the boiler room floor. Coal received by rail is dumped from the car directly into a chute leading to this storage bin. When the boilers are to be supplied from this source the coal is discharged from the bin by gravity into a coal crusher, thence into a bucket conveyor located in a tunnel underneath the bin, by which it is delivered to the flight conveyors above the boilers, and thence through the chutes to the stoker hoppers. The cable railway and the conveyors are operated by three-phase induction motors, taking current from the station service line.

The ashes are disposed of by gravity from the dumping grates of the stokers into chutes leading to narrow-gage cars in the basement, by which they are at present carried to the low ground in the neighborhood of the power house and used for filling.

The Westinghouse Electric & Manufacturing Company were the contractors for the electric locomotives, catenary track equipment and turbo-generator units. Westinghouse, Church, Kerr & Company were the contractors for the Cos Cob power house and equipment. The task of determining and analyzing operating conditions and requirements was assigned to Calvert Townley, Consulting Engineer, and William S. Murray, Electrical Engineer, of the New Haven company, to whom credit is due for the design, supervision and execution of the details.

Cultivating Public Opinion.*

The drastic and to some extent revolutionary amendments to the Interstate Commerce law made last year, whatever their beneficial effect, must be much changed to meet even the quasi-approval of the general shipping public, which they were designed mostly to benefit. Shippers are beginning to point out the hardships of the law, and the decisions of the Commission threaten to paralyze their business and to bring greater destruction than under the worst of the old conditions. The Merchants' Association of Illinois, a representative body, has submitted a list of grievances against the new law. There has recently been held in New York a meeting of representatives of shippers of eastern states to formulate a protest against the practical working of the rate law.

Prosecutions with convictions have been secured under the Elkins law with beneficial results, yet that law has been in effect several years, and the government with its great resources could as easily have secured its evidence long ago as now for such convictions. An increase of power was desired, and if to gain this and the government allowed conditions which are now known to have prevailed, the responsibility should rest in the public mind where it belongs.

In the cases of recent convictions for payment of rebates, I believe the public reached the conclusion that all lines were equally guilty, and that they disobeyed the law by choice for their own special aggrandizement. Their attention was not directed to the fact that in most cases the railroads simply met conditions which they did not create and which they were powerless to control. This is not intended as a justification, but to call attention to the fact which the public had no way of hearing, that the lines which were perhaps really at fault were not those which were so severely punished. There is no justification for breaking the law, but there is justification for meeting conditions which are forced by the lax enforcements of such laws.

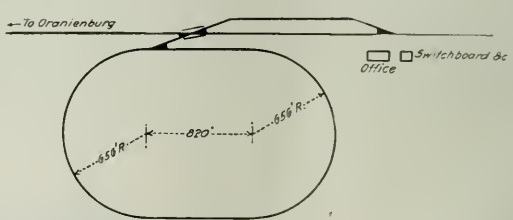
The railroads must take the public more closely into their confidence. There must be a bending backward of every official and every employee to satisfy as nearly as possible an exacting patronage, and to argue on sound premises in working for the rights conferred by constitution or charter. As public opinion has been outraged by the methods of high finance, care must be taken that the reasons for new capital should be given not only to the stockholders but to the public. If reorganizations are necessary, such necessity and expected results must be explained in detail. If this is an invasion of private rights, or tending to thwart the best results, it must, nevertheless, be done, or else there will be the same public distrust in the necessity and suspicion of private benefit at the expense of the public welfare. The fact must be brought home to the public mind that if the railroads are to be under government control, they have the right to expect the government to protect their interests as scrupulously as it looks after the interests of the public.

*From an address by C. A. Swope, Eastern Freight Agent, Louisville & Nashville.

Test Track of the Prussian State Railways.

Last December the Prussian State Railways put into operation near Oranienburg, 20 miles from Berlin, a special curved test track, a plan of which is shown in the accompanying drawing. It was built to carry out an exhaustive series of tests to determine: (1) The influence of different kinds of ballast and of different designs of ties on the vertical and horizontal alinement of track on curves; (2) efficiency of various forms of rail joints on curved and straight track, and (3) wear of rails on curved and straight track.

The track is oval, with two semi-circular curves of 656 ft. radius, joined by tangents 820 ft. long, giving a total circumference of about 5,762 ft., or nearly 1.1 miles. On the curves the superelevation is



Curved Test Track of the Prussian State Railways.

4.92 in. and the gage is widened 0.095 in. The elevation is tapered off 1:300, 1:500, 1:1000 and 1:1500 at the four points of tangency to determine the effect of the different tapers on the running of the cars.

Power is furnished by a single phase alternating current of 6,000 volts. The conductor is overhead, connection with the car being by means of a sliding contact.

Two motor cars of 58 tons each are provided. Each car has two 6-wheel trucks and is equipped with 4 motors. The motors develop 45 h.p. in ordinary steady running, with a maximum hourly capacity of 110 h.p., and they can develop for a short time 125 h.p. It is proposed to increase the capacity for steady running to 60 h.p., then by coupling on some freight cars it will be possible to run a train weighing 190 tons at a speed of 31 miles an hour for any length of time.

The train is run without a crew, the current being switched on and off from a small building provided with switchboards, meters, etc. With the exception of Sundays and holidays the train is to run 20 hours daily, the number of laps being automatically registered. At a speed of 31 miles the train would make 570 circuits of the track daily. With a train weighing 190 tons and running for 300 working days, upward of 32,000,000 tons will pass over every part of the track annually.

In these experiments the fundamental principle to be observed is that different constructions are to be compared only under identical conditions. Thus, if rail joints are to be tested, then ties and ballast must be the same; if ties are to be compared, rail joints and ballast must be the same; if different materials for ballast are under examination, rail joints and ties are to be the same.

The locomotive works of J. A. Maffei in Munich have built for the Bavarian State Railroads a locomotive capable of hauling a train weighing 165 tons at a speed of 93 miles an hour. This engine was tested July 1 and 2, and maintained for a prolonged time a speed of 96 miles an hour, which is declared to be the greatest speed ever made in Europe by a steam locomotive. It is a four-cylinder compound with 6-ft. drivers, Schmidt superheaters, and Westinghouse high-speed brakes.

GENERAL NEWS SECTION

NOTES.

The general storehouse of the Erie at Susquehanna, Pa., was destroyed by fire on the morning of August 14

The State Railroad Commission of Wisconsin has ordered a reduction of 20 to 25 per cent. in freight rates on live stock from all parts of the state to Milwaukee

Mrs. Russell Sage has given the sum of $50,000 for a building for the railroad Young Men's Christian Association at Long Island City, N. Y. The railroad company will give the ground for the building.

The railroads and the Minnesota state railroad commission have agreed that Duluth, St. Paul and Minneapolis shall be the only "terminal" points in the state at which, under the law, cars must be supplied within 48 hours after being ordered.

The State Railroad Commissioners of South Dakota, at their regular meeting, on August 29, will consider the question of reducing passenger fares in the state to 2½ cents a mile, in accordance with the recent act of the legislature.

On August 9 the Grand Jury in the Federal Court at Jamestown, N. Y., reported indictments against the Standard Oil Company, the New York Central & Hudson River Railroad and the Pennsylvania Railroad for making illegal rates on oil from Olean, N. Y., to points in Vermont.

In the United States Court at Minneapolis, Aug. 10, the Wisconsin Central Railway was fined $17,000 for paying rebates. This was in the suit in which the company was convicted last April. Burton Johnson and G. T. Huey, freight officers of the road, were fined $2,000 and $1,000 respectively.

A strike of the Brotherhood of Railway Trainmen members employed by the Colorado & Southern, which had disturbed freight traffic for a week, was settled August 13 by the granting of one cent an hour increase to yardmen and switchmen. It was agreed to arbitrate the demand for another cent.

Against the protest of initial lines in California, Eastern roads have decided to make a charge of $5 a car on shipments of citrus and deciduous fruits, after two diversions in transit. Heretofore there has been no restriction, and at times cars have been diverted five or six times before the fruit was finally disposed of.

In Alabama the Southern Railway and the St. Louis & San Francisco have agreed with the officers of the state to put in effect the laws passed this year reducing passenger fares to 2½ cents a mile, and reducing freight rates on 110 commodities. The agreement provides for the early reference of these laws to the courts of last resort to settle their constitutionality.

The National Industrial League claims now to have a membership of 20,000 firms, although only one month old. This is a combination of shippers which, it is declared, will contest the recent ruling of the Interstate Commerce Commission that railroads have the right to publish notice in their through tariffs that the initial road reserves the right to route the freight beyond its own lines.

The railroad commissioners of Indiana, who are seeing to the enforcement of the law recently passed in that state requiring a certain minimum number of men in the crew of each train, find that some of the railroads propose to class the porter of a passenger train as a member of the crew and thus avoid the expense of employing a higher grade man to comply with the law. The Brakemen's Brotherhood is vigorously opposing this interpretation of the statute.

Judge Grosscup, in the United States Circuit Court at Chicago, Aug. 12, issued the final order turning over to the Chicago Railways Company all the street railways on the north and west sides of the city, which heretofore have been operated under the name of the Chicago Union Traction Company. An application has been made for an appeal from the order in behalf of the holders of the first mortgage bonds of the North Chicago Street Railway. The hearing of the appeal is set for next Monday.

The Long Island Railroad has prepared statistics to show that in the matter of protecting grade crossings that company has done better than any other prominent road in the state of New York. On all the steam railroads in the state there are 6,793 unprotected crossings, 1,940 protected crossings, 714 overhead and 930 undergrade crossings. The percentages of crossings protected by gates, flagmen or bells are as follows: Long Island road, 52 per cent.; D., L. & W., 43; New York Central, 41; Erie, 36; Delaware & Hudson, 30; N. Y., O. & W., 30. On the Long Island 22 per cent. of all crossings are either above or below grade as against 10 per cent. on the D. & H., 13 per cent. on the D., L. & W., 13 per cent. on the Erie, 12 per cent. on the Lehigh Valley, 19 per cent. on the N. Y. C. and 16 per cent. on the N. Y., O. & W. On all the roads of the state there are 8,734 crossings at grade. Estimating the average cost of changing each one at $50,000 each, the cost of abolishing all grade crossings in the state would be in the neighborhood of 300 million dollars.

The Nebraska State Railroad Commission has filed with the Interstate Commerce Commission a complaint of exorbitant rates on coal over the Union Pacific from the mines of Wyoming to points in Nebraska. The complaint recommends and asks that a reduction of $1.50 a ton be ordered from the mines to Omaha, a reduction of 25 per cent. Further west reductions of from 50 to 65 per cent are asked. In the past the Union Pacific has charged a blanket rate to all Nebraska points from Wyoming, points only 300 miles distant being made to pay the same as those 800 miles from the mines.

Judge Lacombe, in the United States Circuit Court at New York Aug. 10 denied the motion of the Delaware, Lackawanna & Western Railroad for a preliminary injunction restraining the Interstate Commerce Commission from carrying out its order directing the railroad to transfer tank cars containing petroleum to the dock of Preston & Davis, independent dealers in Brooklyn. The road claimed that the danger of fire on the Brooklyn dock prevented it from doing this business for Preston & Davis, but the judge holds that the danger can be overcome by sufficient watchfulness and care, and leaves all questions to be decided at the final hearing.

Prof. Benjamin Succeeds Prof. Goss at Purdue.

Prof. Charles Henry Benjamin has been appointed Dean of the Schools of Engineering of Purdue University, to succeed Dean W. F. M. Goss, who resigned to accept a similar appointment at the University of Illinois. Professor Benjamin has been professor of mechanical engineering at Case School of Applied Science, Cleveland, Ohio, since 1889, prior to which time he was for three years engaged in engineering practice and for six years as instructor and professor of mechanical engineering in the University of Maine, of which institution he is a graduate. He is well known as a teacher, investigator, author and engineer. Prof. Benjamin is a member of the American Society of Mechanical Engineers and has contributed a number of papers on power transmission and flywheels to that society.

Explosions.

At Essex, Ont., Aug. 10, half a carload of nitroglycerine exploded and did damage estimated at $200,000. Two men were killed, three were fatally hurt and 50 were slightly injured. The explosion wrecked every building in the town and was felt for 20 miles around. The car containing the explosive was side-tracked near the Michigan Central station. When a train was being made up a brakeman discovered that the explosive was leaking in the car. He was trying to stop the leak when the explosion came. The new stone station, the freight sheds, Green's elevator and Fagin & Ritchie's mill were wrecked.

At Boulder, Colo., on the same day a fire in the Colorado & Southern station destroyed the building and a lot of freight and spread to a powder house containing 1,000 lbs. of dynamite. This exploded, injuring about 100 persons. Two of the injured will die. The property loss is estimated at $250,000.

Exhibit of the American Locomotive Company at Jamestown.

The American Locomotive Company has an exhibit at the Jamestown Exposition, which includes two locomotives for Southern railroads built at the Richmond, Va., works. Both of these are consolidation locomotives, one for the Chesapeake & Ohio, with a total weight of 208,600 lbs., and the other for the Southern Railway, weighing 202,800 lbs. Both locomotives have Walschaert valve gear. There is also on exhibition a four-wheel-connected saddle-tank locomotive weighing 36,000 lbs., for use by contractors, on logging roads, in industrial plants, and anywhere on sharp curves and light rails. The Atlantic Equipment Company is exhibiting the latest design of the Atlantic steam shovel. The hoisting machinery of this shovel is mounted directly on the boom, so that no guide sheaves are necessary, and the power can be applied with the least possible loss. The hoisting is done by direct wire rope with one sheave instead of by chain with from five to seven sheaves. In the construction of the dipper the bail and sheave have been discarded and the double hoisting rope attached directly to the back of the dipper in such a way that the lines of force meet in line with the strain applied to the teeth. This shovel is being exhibited with a patent

dump car made by the Oliver Manufacturing Company. The car is elevated on a trestle representing a bank, so that the shovel has a lift of over 16 feet.

Compulsory Block Signals in Indiana.

The State Railroad Commission of Indiana has ordered all railroads whose earnings are in excess of $7,500 a mile, to proceed to equip their lines with block signals and to have them completed by July, 1909. The Commission asks for an immediate reply. The Commission's expert will confer with the general managers as to the kind of systems that must be put in.

Erie Canal Contract.

The contract for enlarging the Erie Canal from Oneida Lake, N. Y., westerly to Mosquite Point bridge on the Seneca river, has been awarded to the Stewart, Kerbaugh & Chanley Company, of New York City, whose bid was $3,395,766. This was on the second call for bids. The first time bids were called for none were received. The accepted bid was in excess of the engineers' estimate but under these circumstances was accepted by the state of New York.

Twenty Passengers Killed in Germany.

According to a press despatch of August 6, a passenger train, drawn by two engines, was derailed near Posen, Prussia, on the evening of that day and 20 or more persons were killed; while a large number were injured.

University of Iowa Engineering Prize.

An annual prize of $100 has been established in the College of Applied Science of the State University of Iowa for the best thesis submitted for the first degree in engineering. The prize is to be known as the "Thomas J. Cox Prize in Engineering," in memory of the father of the donor, who is Arthur J. Cox, of Iowa City, a graduate of the engineering department.

Railroad Taxes in New Jersey.

The Supreme Court of New Jersey has sustained the constitutionality of the Perkins act of 1906, providing for the taxing of so-called main stem railroad property, including franchise and tangible personal property. Under the present act main stem property is taxed for state purposes at the average rate of the state tax, or [this year] $1.80 per $100 valuation. Prior to its passage, this class of railroad property was taxed at an arbitrary rate of 50 cents per $100 of valuation. In 1905 the main stem tax amounted to $950,991. In 1906, under the Perkins act, it was $3,503,529. Under the decision rendered a few days earlier on the "second class" property tax, combined with the present decision, the taxes on railroad property in the state will be increased between $4,000,000 and $5,000,000 a year.

British to Build Railroad in Africa.

Speaking in the British House of Commons, Winston Churchill, Under Secretary of the Colonial Office, announced last week that the government had decided to build 400 miles of railroad in northern Nigeria, from Baro by way of Bida, Zungeru and Zaria to Kano, with the object of developing the colony, and especially the cotton growing industry. The work of construction will be entrusted to Lieut.-Col. Sir Edouard P. C. Girouard and will take four years.

Japanese Railroad Visitors.

Seven engineers sent out by the Japanese government have recently arrived at San Francisco to study American railroads, with particular regard to methods of construction. This is because the Japanese government is to undertake the building of several thousand miles of new steam railroads. The party includes three railroad engineers, two railroad managers, one harbor engineer and one steamship engineer.

INTERSTATE COMMERCE COMMISSION RULINGS.

Higher Rates for Fast Service.

Commissioner Clark has announced the decision of the Commission in the case of the American Fruit Union, of Cincinnati, Ohio, v. Cincinnati, New Orleans & Texas Pacific. It appeared in this case that in conference between officials of the carrier and representatives of certain of its patrons, it was agreed that higher rates would be charged and paid for the transportation of strawberries in consideration of special expedited trains on which they would be hauled and by which they would be delivered for the early morning market; but on account of reconstruction and improvement work along the line of the carrier it was unable to furnish the expedited service agreed upon and which it had furnished for several years. The shipper contended that if the expedited service was not provided the higher rate should not obtain, and the Commission held that where an unusually high rate is charged because and in consideration of a special and expedited service it is the duty of the carrier to provide such service or to cease and desist from charging the higher rate. "This principle is recognized in contracts between the Federal Government and the railroads for fast mail service and by the railroads in connection with their excess-fare limited passenger trains. In both instances carriers forfeit a part of the compensation if they fail to make the time agreed upon." The defendant's rate on strawberries in carloads, under refrigeration, from Chattanooga and Oakdale, Tenn., to Cincinnati, Ohio, was found unreasonable and reduction was ordered. Reparation was also awarded to injured shippers because of such unreasonable rate on strawberries during the season of 1907. The rate of 27 cents per crate of 24 qts. was ordered to be reduced to 22 cents per crate.

Published Rates Are Laws.

The Commission, in an opinion rendered by Commissioner Harlan, has announced the decision of the Commission in the case of the A. J. Poor Grain Co. v. Chicago, Burlington & Quincy et al. In this case the Commission decided that a rate on wheat of 75 cents per 100 lbs. from Nebraska common points to California terminals via. the C., B. & Q. through Denver and thence via the Union Pacific and Southern Pacific to destination, is unreasonable and excessive. It is manifestly so, as compared with the through rate of 55 cents on corn over that route, and a through rate of 55 cents on both corn and wheat from Nebraska points via the Union Pacific and Southern Pacific to those destinations. Any rate on wheat over the route in question from these points of origin to California terminals in excess of 65 cents per 100 is held to be unreasonable. Complainant was awarded reparation on his shipments on that basis, but was not given an order of reparation on his shipment to Reno, Nev.

The published rate governing transportation between two given points, so long as it remains uncanceled, is as fixed and unalterable either by the shipper or by the carrier as if that particular rate had been established by a special Act of Congress. When regularly published, it is no longer the rate imposed by the carrier, but the rate imposed by law. Regardless of the rate quoted or inserted in a bill of lading, the published rate must be paid by the shipper and actually collected by the carrier. Failure on the part of the shipper to pay or of the carrier to collect the full freight charges, based on the lawfully published rate for the particular movement between two given points, constitutes a breach of the law and will subject either one or the other, and sometimes both, to its penalties. Not even a court may interfere with a published rate or authorize a departure from it when it has voluntarily been established by the carrier. If a carrier, contrary to shipper's instructions, forwards cars by a more expensive instead of a cheaper route, or, without any instructions, sends the cars by a more expensive route, such action is *prima facie* without justification and constitutes a fair basis for reparation; but if the shipper gives definite instructions to move the cars by the more expensive route, the carrier is relieved of the obligation to forward by the cheaper route. Shippers along the line of an interstate carrier are entitled to have their products moved in either direction at reasonable rates, and the Commission cannot agree that a carrier may establish prohibitive rates on any commodity on the ground that it is not desirable traffic for that carrier.

TRADE CATALOGUES.

Rock Island Employees' Magazine.—The second number of this monthly periodical of the employees of the Rock Island system is much larger than the initial number, and has an appropriate cover design. There are articles on "Growth of the Rock Island Lines," by Geo. H. Crosby, Treasurer; "Get the Business," by E. F. Strain, Division Freight Agent; "Chicago Terminal District Telephone System," by J. G. Jennings, Superintendent of Telegraph. There is also a plan of the organization of the Rock Island lines; a description of some new consolidation locomotives recently received; a roll of honor "for doing more than duty"; plans and a description of a moderate priced cottage, it being the intention to show one of these a month; miscellaneous items of interest, and notes from important points on the system.

Dominion Atlantic Railway.—"Nova Scotia, the Land of Summer Rest," and "Vacation Days in Nova Scotia" were recently issued by the passenger department. The first is the 1907 edition of a former publication. It is charmingly written and has excellent photographs. It describes the seacoast passed by the steamers on the trip from New York to Yarmouth, N. S., then the west coast of

Nova Scotia and across the Island to Halifax. The second booklet describes similar country from the standpoint indicated in the title, being rather a guide to those who spend some time in the region than for casual tourists.

Locomotive Cranes, Grab Buckets, Etc.—The McMyler Manufacturing Co., Cleveland, Ohio, has a new catalogue of locomotive cranes, bridge conveyors, grab buckets and car dumpers. This company designs and build locomotive stationary or revolving cranes; car dumping machines; clam-shell buckets, including special styles for ore, orange-peel buckets, railroad coaling and ash-handling stations, coal and ore unloaders, slag handling machinery and bridge conveyors. The catalogue illustrates and describes this product.

Reinforced Concrete.—Part IV. of "Trussed Concrete Illustrated," being published serially by the Trussed Concrete Steel Co., Detroit, Mich., shows the Kahn system of reinforced concrete construction as applied to hotels, residences and apartment houses. The illustrations include the Marlborough-Blenheim and Traymore hotels at Atlantic City, N. J.; the Murphy hotel and apartments, Richmond, Va.; Perry apartments, Seattle, Wash., and several large residences in different cities.

Ideal Power.—The July number of the Chicago Pneumatic Tool Co.'s magazine has for leading articles, "Rock Drills in Quarry and Tunnel Work" and "Locomotives for France Built in the United States on the Metric System." There are also pictures of the two new Cunard Line steamships "Lusitania" and "Mauretania," on which Duntley electric drills were used. Other matter includes notes of interest and reprints of articles from other journals.

MANUFACTURING AND BUSINESS.

The receivers of Milliken Brothers, Inc., are continuing in full operation the structural and ornamental departments of the company. The main office is at 11 Broadway, New York, and the works are at Milliken, Staten Island, New York.

F. D. Laughlin, formerly Vice-President of the Atlantic Brass Co., Richmond, Va., has been appointed eastern sales manager of the Pittsburg Pneumatic Co., Canton, Ohio, with office at 90 West street, New York City, succeeding Glenn B. Harris.

Isham Randolph, Consulting Engineer, and until recently Chief Engineer, of the Sanitary District of Chicago, and builder of the Chicago drainage canal, has opened an office as Consulting Engineer in the American Trust & Savings Bank Building, Chicago.

The Terry Railway Equipment Co., Monadnock Block, Chicago, has been organized by George N. Terry, formerly with the Safety Car Heating & Lighting Co., and recently with the Ryan Car Co., Chicago, to deal in second-hand cars and locomotives and in railroad supplies. George N. Terry is Manager and E. B. Terry, Secretary.

The American Locomotive Company has recently received an order for 101 4-wheel motor trucks for the Brooklyn Rapid Transit Company. They will follow closely M. C. B. standards, and embody as far as possible the practices of locomotive construction, thereby insuring strength combined with easy riding qualities, the two essential characteristics of the motor truck of the present day.

The Italian government has made a contract with the owners of the patent of the Rueping process for treating timber to have the ties used in future on the government railroad system of Italy, which includes almost all of the railroad mileage of the country, treated by that process. During the first year that the contract is in operation about 1,500,000 Rueping treated ties will be laid. C. Lembcke & Co., 78 Wall street, New York, are the American agents for this process.

Iron and Steel.

The Atchison, Topeka & Santa Fe is reported to have ordered 15,000 tons of rails from the Colorado Fuel & Iron Co., and 8,000 tons from the Maryland Steel Co., both for immediate delivery.

Orders are pending for about 25,000 tons of steel for railroad, bridge and track elevation work. The Chicago, Milwaukee & St. Paul recently gave an additional order for 1,700 tons for a viaduct to the McClintic-Marshall Construction Co.

The Northern Pacific has given a supplementary order for 5,000 tons of rails for early shipment. The Idaho & Northern has ordered 6,000 tons for 1908 delivery, and Chicago reports state that 10,000 tons for delivery next year have been ordered by a new road. Miscellaneous small orders from 1,000 to 3,000 tons have been given aggregating 10,000 tons for this year's shipment.

OBITUARY NOTICES.

Israel Munson Spencer, who was President of the Boston & Maine for 10 years from 1899 to 1909, died on August 9 at Marblehead, Mass., at the age of 61.

Dr William Thomson, the distinguished Philadelphia physician, ophthalmologist and pioneer in the field of automobile surgery, who died recently at the age of 71, was a pioneer in the testing of railroad men's eyes, having prepared the first regulations for this work on the Pennsylvania Railroad. He wrote important monographs on the subject, and devised the "Thomson stick" for use in testing for color blindness by means of yarns. Dr Thomson was a brother of the late Frank Thomson, President of the Pennsylvania Railroad.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Alabama & Vicksburg.—See New Orleans & North-eastern.

Cape Girardeau.—See Chester, Perryville & Ste. Genevieve.

Chester & Saline Valley.—See Chester, Perryville & Ste. Genevieve.

Chester, Perryville & Ste. Genevieve.—Ralph H. Schultz has been appointed Auditor and Assistant General Freight and Passenger Agent, with office at Cape Girardeau, Mo.

Cincinnati, New Orleans & Texas Pacific.—Thomas Carr Powell, Vice-President of the Southern Railway, in charge of the St. Louis-Louisville lines, who was recently elected Vice-President of the Cincinnati, New Orleans & Texas Pacific and of the Alabama Great Southern, returns to his native city and first railroad in taking up his headquarters at Cincinnati. There he was born on September 5, 1865, and at the age of 19 began railroad service as a mail clerk on the Cincinnati, New Orleans & Texas Pacific. He next became chief rate clerk and chief clerk to the Traffic Manager and, on June 1, 1893, was appointed Assistant General Freight Agent. In 1895 he went to the Southern Railway as chief clerk to the General Freight Agent in charge of the rate and tariff department. He was appointed General Freight Agent of the Southern Railway and of the Northern Alabama in 1898 and, in 1899, Assistant Freight Traffic Manager of those railroads. In 1902 he became Freight Traffic Manager and, in 1905, Fifth Vice-President of the Southern Railway in charge of traffic in the West and of the operating department of the St. Louis-Louisville lines. With the rearrangement of the executive officers of the Southern after the death of Mr. Spencer he became Vice-President at St. Louis in direct charge of the St. Louis-Louisville lines. He goes to the Queen & Crescent as Vice-President in charge of the operating, purchasing and traffic departments.

Thomas C. Powell.

Great Northern.—F. H. McGuigan, First Vice-President, has resigned.

New Orleans & North-eastern.—Larz A. Jones, Vice President, is also Comptroller of the New Orleans & North-eastern, the Alabama & Vicksburg, and the Vicksburg, Shreveport & Pacific. H. H. Leltoy, Assistant Auditor, has been appointed Assistant Comptroller.

St. Joseph & Grand Island.—Frederick C. Uhlman, Auditor, has resigned. See Virginian Railway.

Vicksburg, Shreveport & Pacific.—See New Orleans & North-eastern.

Virginian.—Frederick C. Uhlman, Auditor of the St. Joseph & Grand Island, has been appointed Auditor, with office at Norfolk, Va.

Virginia & Southwestern.—H. W. Oliver, assistant to the engineer of construction of the Louisville & Nashville, has been appointed Secretary and Treasurer of the Virginia & Southwestern and the Virginia Iron, Coal & Coke Co.

Operating Officers.

Alabama & Vicksburg.—See New Orleans & North-eastern.

Atlantic Coast Line.—G. B. McClellan, Superintendent at Rocky Mount, N. C., has been appointed Superintendent at Fayetteville, N. C. F. M Doar, Superintendent at Savannah, has been appointed Superintendent of Transportation of the new Second division. J. C. Murchison, Superintendent at Wilmington, N. C., has been appointed Superintendent at Charleston, S. C. G. D. Pugh, Superintendent at Charleston, S. C., has been appointed Superintendent at Savannah, Ga. R. A. McCranie has been appointed Superintendent at Waycross, Ga. S. B. Hennett has been appointed Superintendent at Montgomery, Ala. T. E. Hansell, Acting Superintendent at Waycross, Ga., has been appointed Superintendent at Newberry, Fla.

Birmingham Southern.—F. Kestler, Assistant Superintendent of the Louisville & Nashville at Birmingham, Ala., has been appointed General Superintendent.

Boston & Maine.—See St. Johnsbury & Lake Champlain.

Chicago & North-Western.—C. T. Dike, Resident Engineer at Pierre, S. Dak., who has had charge of the construction of the new Pierre-Rapid City line, has been appointed Superintendent of a new division, which consists of this new line, with headquarters at Pierre.

Chicago, Cincinnati & Louisville.—W. B. Allen, Superintendent of Telegraph and Chief Train Despatcher, has been appointed Trainmaster at Peru, Ind., succeeding G. S. Cooke, resigned. E. C. Murphy succeeds Mr. Allen, with office at Peru.

Houston & Texas Central.—W. E. Langley has been appointed Trainmaster, with office at Houston, Tex.

Illinois Central.—J. D. Brennan, Trainmaster at Carbondale, Ill., has been transferred to Champaign, Ill. George W. Berry succeeds Mr. Brennan, with office at Carbondale, Ill.

Louisville & Nashville.—James A. Morrison, Trainmaster at Birmingham, Ala., has been appointed Assistant Superintendent of the Birmingham Mineral division, the Alabama Mineral division and the South and North Alabama Railroad, with headquarters at Birmingham, Ala., succeeding F. Kestler, resigned. See Birmingham Southern.

New Orleans & North-eastern.—Edward Ford, Superintendent of the Alabama & Vicksburg and the Vicksburg, Shreveport & Pacific, has been appointed General Manager of the New Orleans & North-eastern, Alabama & Vicksburg and Vicksburg, Shreveport & Pacific, succeeding D. E. Curran, now President of these companies. Walter E. Harvey, Assistant Superintendent of the Alabama & Vicksburg and Vicksburg, Shreveport & Pacific, succeeds Mr. Ford as Superintendent of the Alabama & Vicksburg. H. B. Hearn, Assistant General Freight Agent of the three roads at Shreveport, La., succeeds Mr. Ford as Superintendent of the Vicksburg, Shreveport & Pacific. A. J. Chapman, Commercial Agent at Dallas, succeeds Mr. Hearn as Assistant General Freight Agent, with headquarters at Shreveport.

New York, New Haven & Hartford.—The office of Joseph H. Dunn, Assistant Superintendent of the Berkshire and Naugatuck divisions, has been moved from New Haven, Conn., to Waterbury.

Northern Pacific.—T. E. Coyle, Assistant Trainmaster at Tacoma, Wash., has been appointed Trainmaster, with office at Tacoma, succeeding F. E. Willard, promoted.

Oregon Short Line.—John McCarty has been appointed Trainmaster of the sixth, seventh and eighth districts of the Salt Lake division, with headquarters at Mina, Nev., succeeding F. C. Smith, resigned.

St. Johnsbury & Lake Champlain.—F. C. Mayo has been appointed Assistant Superintendent, succeeding George W. Cree, now Assistant Superintendent of the Boston & Maine at Lyndonville, Vt.

Seaboard Air Line.—S. B. Zartman, Trainmaster at Jacksonville, Fla., has been appointed Superintendent of Terminals at Jacksonville. E. R. Teague succeeds Mr. Zartman.

Vicksburg, Shreveport & Pacific.—See New Orleans & North-eastern.

Virginia & Southwestern.—Joseph W. Bailey has been appointed Car Accountant, with office at Bristol, Va.-Tenn.

Traffic Officers.

Alabama & Vicksburg.—See New Orleans & North-eastern under Operating Officers.

Atchison, Topeka & Santa Fe.—D. L. Meyer, Traffic Manager of the Southern Kansas Railway of Texas and the Pecos Valley & Northeastern, has been appointed General Freight and Passenger Agent of the Southern Kansas of Texas and of the Eastern Railway of New Mexico which recently bought the Pecos Valley & Northeastern. His office is at Amarillo, Tex.

Great Northern.—D. J. Black, General Agent of the Freight Department at Minneapolis, has been appointed General Agent at Spokane, Wash., succeeding A. H. Campbell, who went to the Spokane International. T. J. McGaughey, Commercial Agent at Cleveland, succeeds Mr. Black.

Gulf, Colorado & Santa Fe.—W. L. Alexander has been appointed General Claim Agent, with headquarters at Galveston, Tex., succeeding T. J. Lee, resigned on account of ill health.

Missouri Pacific.—Henry C. Townsend, General Passenger and Ticket Agent, has resigned on account of ill health.

C. E. Wager, Commercial Agent at Atchison, Kan., has been appointed General Agent at Pueblo, Colo., succeeding J. B. Trimble, now General Agent at Pittsburg, Pa.

New Orleans & North-eastern.—See New Orleans & North-eastern under Operating Officers.

Vicksburg, Shreveport & Pacific.—See New Orleans & North-eastern under Operating Officers.

Engineering and Rolling Stock Officers.

Chicago & Alton.—C. G. Delo, Engineer of Maintenance of Way at Kansas City, Mo., has been transferred to Bloomington, Ill., succeeding W. C. Causey, now Superintendent at Bloomington.

Chicago, Burlington & Quincy.—E. D. Andrews has been appointed Master Mechanic of the Sterling division, Lines West of the Missouri river, with headquarters at Sterling, Colo., succeeding F. Newton, resigned.

Hocking Valley.—M. A. Kinney, roundhouse foreman of the Baltimore & Ohio at Newark, Ohio, has been appointed Master Mechanic of the Hocking Valley, with headquarters at Columbus, Ohio, succeeding E. J. Powell, resigned.

Louisville & Nashville.—E. L. Trowbridge has been appointed assistant to the engineer of construction at Louisville, Ky., succeeding H. W. Oliver, resigned. See Virginia & Southwestern under Executive, Financial and Legal Officers.

Mexican Central.—B. F. Elliott has been appointed Assistant Master Car Builder, with headquarters at Aguascalientes.

Missouri Pacific.—M. M. Meyers, formerly on the Denver & Rio Grande, has been appointed Master Mechanic, with office at De Soto, Mo., succeeding A. S. Grant.

Santa Fe Central.—G. A. Baker has been appointed Superintendent of Motive Power, with office at Estania, N. Mex., succeeding T. J. Tonge.

Special Officers.

Chicago, Rock Island & Pacific.—Dr. Hermann von Schrenk has been appointed Supervisor of Timber Preservation, with headquarters at Tower Grove and Flad avenues, St. Louis, Mo. The Supervisor of Timber Preservation will have direct charge of the inspection of the preservative treatment given ties and timber, and will act in an advisory capacity in any and all matters pertaining to increasing their durability.

LOCOMOTIVE BUILDING.

The Northwestern Pacific has been figuring on buying new locomotives.

Edward Haynes, 18 Broadway, New York, is in the market for small locomotives for canal and plantation work.

The Temiskaming & Northern Ontario has ordered six six wheel switching locomotives from the Canadian Locomotive Co., Kingston, Ont., for February, 1908, delivery.

The Atchison, Topeka & Santa Fe is said to have ordered a number of 16-wheel Mallet compound locomotives to be used on the mountain grades of the La Junta division.

The Intercolonial Railway, as reported in our issue of July 19, has ordered 10 passenger locomotives from the Locomotive & Machine Co., of Montreal, and 22 consolidation and three switching locomotives from the Canadian Locomotive Co., Kingston, Ont.

CAR BUILDING.

The Canadian Pacific recently ordered 500 box cars from Barney & Smith

Edward Haynes, 18 Broadway, New York, is in the market for small cars for canal and plantation work.

The Toledo, Fostoria & Findlay (Electric) has ordered four interurban motor cars from the Niles Car & Manufacturing Co.

The New York City Railway has ordered 100 double-truck street cars of the "pay-as-you-enter" type from the J. G. Brill Co.

The Virginian is reported to have ordered 10 steel dump cars of 60 tons capacity from the Atlas Car Manufacturing Co., Pittsburg.

The Wisconsin Steel Company has ordered 15 steel underframe gondola cars of 100,000 lbs. capacity from the Western Steel Car & Foundry Co.

The Detroit & Toledo Shore Line denies having ordered 400 coal cars from the American Car & Foundry Co., as reported in the *Railroad Gazette* July 26.

The San Pedro, Los Angeles & Salt Lake, as reported in the *Railroad Gazette* of August 9, has ordered 100 tank cars of 100,000 lbs. capacity from the Pressed Steel Car Co.

The Erie is reported to have re-entered an order for 3,000 box cars placed last February with the American Car & Foundry Co., as reported in our issue of Feb. 15, and which was canceled in June.

The Chicago, Milwaukee & St. Paul is turning out 24 steel underframe box cars a day at its West Milwaukee shops, these cars being a part of an order for 3,000 cars placed last spring, as reported in our issue of March 15.

RAILROAD STRUCTURES.

Austin, Tex.—Local reports state that the Missouri, Kansas & Texas has plans made for extensive terminal improvements in a number of cities in Texas, including Fort Worth and Dallas, where about $600,000 is to be spent enlarging the present terminals. Two-thirds of this will be used for repair shops and a roundhouse, and for laying yard tracks at Fort Worth.

Chicago, Ill.—Preliminary work on the Chicago & North-Western's new passenger station has been begun. One-half of the property for the site has been bought, and the rest will be bought this year. Actual construction work will be begun early next year. The buildings are being removed between Canal and Clinton streets and north of Madison street, where the station will be built.

Globe, Ariz.—The Southern Pacific has plans ready for putting up a new passenger station, for which a site has been bought. The station is to be used by the Gila Valley, Globe & Northern. The cost of the improvement will be about $100,000.

Trinidad, Colo.—Final arrangements have been made by the Atchison, Topeka & Santa Fe to make improvements here at a cost of $60,000. The work includes a new freight house, a roundhouse and a coal chute. A new side track will also be laid.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

Atlanta, Birmingham & Atlantic.—This company is to build from Bone's Gap, Ala., to Adamsville, penetrating a coal district. This line is a companion to the line from Bessemer to the new coal town of Mulga, and the proposed line from Birmingham to Gate City, where a rolling mill district is entered. The Birmingham district branches of the A., B. & A. will cover about 25 miles, and will give an entrance into many important industrial centers.

Central Kentucky Traction.—This company has issued $300,000 bonds and executed a mortgage for $250,000 to secure funds to finish the construction of its lines from Lexington, Ky., east to Winchester, 20 miles, and south to Nicholasville, 15 miles.

Chicago, Burlington & Quincy.—According to reports, this company has filed plans for its proposed extension in Wyoming. The route is from Guernsey northwest along the North Platte river to Douglas, thence west to the Shoshone Indian Reservation, about 200 miles. Surveys reported under way.

Chicago, Milwaukee & St. Paul.—President Earling is quoted as saying that work on the Pacific extension will be pushed to completion as fast as men and machinery can accomplish the task. Several thousand additional men are to be put on work to have the line finished to Butte next May. He does not say when work will begin on the Seattle division. The company is soon to begin work on the 8,000-ft. Bitter Root tunnel and on the 10,000-ft. tunnel in Snoqualmie Pass.

Chicago, Rock Island & Pacific.—The Carrollton-Irving cut-off, it is expected, will be finished and ready for operation in a few weeks. The new line will be 11 miles long and will connect Irving, Tex., which is on the Fort Worth-Dallas line of the Rock Island, with Carrollton, on the St. Louis & San Francisco. (July 26, p. 111.)

Corvallis & Alsea River.—Incorporated in Oregon with a capital of $150,000 to build a line from Corvallis southwest via Alsea, thence south to Bicony in the Lake creek district, about 45 miles. Stephen Carver, B. W. Johnson, V. E. Watters, A. Fischer, E. R. Bryson and F. L. Miller, of Corvallis, are directors.

Fort Worth & Rio Grande.—See St. Louis & San Francisco.

Gulf, Colorado & Santa Fe.—Plans reported made for extensive improvements at Port Bolivar, Tex., which is to be an important lumber exporting point. A pier 300 ft. wide and 1,200 ft. long is to be constructed and barges are to be used to transport passenger trains across the bay to Galveston. The Gulf & Interstate division, which runs from Bolivar to Beaumont, connecting at this point with the line north to Center, is building a connecting line from Center to Timpson, which will give a connection with the Texas & Gulf. Plans are ready for extending the T. & G. north from Longview to a connection with the Santa Fe's Kansas City line at a point in the Indian Territory. When these connecting links are finished the Santa Fe will have a shorter route from Kansas City to Galveston.

Gulf, Plainville & Northern.—This company, chartered to build 60 miles of line from Plainville, Kan., north to the Nebraska state line, and which has an office at Plainville, is reported recently to have given a contract to the W. C. Ross Company, of Chicago, to build the line. It is said that sub-contracts for grading will shortly be let. (March 15, p. 384.)

Louisville & Nashville.—The work carried out by this company since January 1 of this year is as follows: Revision of line, Knoxville division, Corbin, Ky., to Saxton, Ky., 1.60 miles; revision of line, Henderson division, Greenbrier, Tenn., to Guthrie, Ky., 1.80 miles; Meadow Spur, Knoxville division, 1.30 miles; Chenoa branch extension, 1.82 miles; Skelton Creek extension, 6.25 miles, mine spurs, 3.33 miles. Extensions under way: Savoy, Ky., to coal mines, 19 miles; Mount Pleasant, Tenn., to Mayfield, Tenn., 17 miles; completion of work of revision of line, Greenbrier, Tenn., to Guthrie, Ky., 25.70 miles; revision of line, Kentucky division, Corbin, Ky., to Livingston, Ky., 31.70 miles.

Mexican Roads.—The concession granted to W. C. Palmer to build railroads in the state of Zacatecas, Mex., has been modified to include a line from a point between Gutierrez and Canitas, on the Mexican Central, west to Sombrerete, 60 miles. Surveys must be started within two months and the work finished for 30 miles within 18 months. Permisson has also been granted to build a line from Sombrerete, or a point on the above line, south to Chalchihuites, 35 miles, on which surveys must be started within six months, and the line finished within four years. The other stipulations of the concession as originally granted remain in force. (March 15, p. 396.)

Mississippi Roads (Electric).—A company is being organized with a capital of $90,000 in Mississippi to build an electric line from Scranton northeast via Orange Grove and St. Elmo, Miss., and Grand Bay, Ala., to Mobile, about 40 miles. The proposed line will parallel the Louisville & Nashville for most of the way. M. J. McDermott, S. Lowenstein, of the Bank of Mobile; J. D. Willoughby and R. C. Harris, of Scranton, are interested.

Pennsylvania.—An additional section of the Kensington branch of this road in northeast Philadelphia, which now extends from Frankford Junction to Front and Narrow streets, 2.9 miles, is to be elevated, contract for the work having recently been let to the James McGraw Co. The work includes raising three tracks over six streets. It is expected to have it finished next spring, when additional contracts will be let. The track elevation, which will cost when completed about $2,500,000, was begun in 1900 and continued to a point south of Venango street and then discontinued for about four years pending negotiations with the city. The city is to pay $900,000 towards the cost of the work.

This company, it is said, will spend $1,500,000 in the construction of a new yard at Williamsport, Pa. The new yards will be adjacent to the large yards of the Philadelphia & Reading and the New York Central, and also the new yards of the Susquehanna & New York.

Pensacola, Alabama & Western.—Bids are wanted by the Interstate Contract Co., 224 Brent building, Pensacola, Fla., for grading, masonry and bridges on 105 miles of railroad as mentioned on advertising page 22. At a meeting of the promoters of this company and the Pensacola & Northeastern the bids recently submitted by contractors to grade 20 miles of roadbed of each of these proposed roads were rejected. The work for which bids are now asked includes grading all of the Pensacola & Northeastern from Pensacola, Fla., to Andalusia, Ala., 85 miles, and also for 20 miles on the Atmore division of the Pensacola, Alabama & Western. (June 28, p. 949.)

Pensacola & Northeastern.—See Pensacola, Alabama & Western.

St. Louis & San Francisco.—Announcement is made that the Fort Worth & Rio Grande is to be extended from Brady, Tex., south-

east to San Antonio, about 150 miles; and that a west branch is also to be built from Brady to San Angelo, about 60 miles. Surveys reported made.

Southwestern Railway.—Application is to be made in Texas for a charter by a company being organized by Uriah Lott, with office at San Antonio. The promoters propose to build a line from Kingsville, Tex., on the St. Louis, Brownsville & Mexico, north to San Antonio, about 150 miles.

Sugarland Railway.—This company, which now operates 15 miles of road from Arcola, Tex., to Sugarland, will, it is said, build an extension north to Hempstead, about 45 miles. The road is ultimately to be extended north to Fort Worth or Dallas, 200 miles.

Texas Roads.—The Stone & Webster Syndicate, of Boston, Mass., according to local reports, has under consideration the question of building an interurban electric line from Austin, Tex., south to Lockhart, about 30 miles. Surveys have been made and most of the rights of way secured. Power is to be supplied from the works at the Colorado river of the Consolidated Construction Co., of New York.

Union Pacific.—Work has been resumed on the Athol Hill cut-off south of Cheyenne, Wyo. Starting on the main line of the Union Pacific between Denver and Cheyenne, near Carr, Colo., the cut-off is to run northeast to Borie, Wyo., connecting with the main line through Wyoming, 9½ miles west of Cheyenne. A branch leaves the main line between Carr and Borie three miles south of Corlett, connecting with the Wyoming division 4½ miles west of Cheyenne. The total length of the new lines under construction is 17 miles, and the saving in distance between Denver and Borie and points west by the cut-off is over 13 miles. Maximum grade on the present line between Carr and Cheyenne is 1.8 per cent. in both directions. This grade by the new line is cut down to 1.2 per cent. north or westbound, with no adverse grades south or east. The troublesome curves of the present line are also avoided. It is expected to have the cut-off completed and in operation this year. There will be 220,000 cu. yds. of roadbed excavation, about 30,000 yds. of which is solid rock, and 900,000 cu. yds. of embankment. The largest fill is 2,700 ft. long and 45 ft. high. Bridging on the new line consists of concrete arches, cast iron pipe culverts and pile trestles of 5, 8 and 10 spans. The longest arch is 135 ft. There will be three new stations on the line.

Wisconsin Central.—The suit between the Wisconsin Central and the Milwaukee Southern over the right of way in the Menominee valley has been withdrawn by the Milwaukee Southern, and the Wisconsin Central can now build into Milwaukee. The Milwaukee Southern had a franchise from the city council for entrance into Milwaukee, but it was unable to raise sufficient capital to carry out the project. Condemnation proceedings started and won by the Milwaukee Southern have been dismissed.

Wolfe, Megantic & Lotbiniere.—This company, which was chartered to build a line from Lime Ridge, Wolfe county, Quebec, north about 100 miles, has surveys made from Lime Ridge to Lyster, 60 miles. An officer informs us that nothing has been done towards constructing the line. W. H. Lamby, Inverness, Que., Secretary. (March 15, p. 396.)

RAILROAD CORPORATION NEWS.

Alabama Terminal Company.—See Atlanta, Birmingham & Atlantic.

Atlanta, Birmingham & Atlantic.—The Alabama Terminal Company, which represents the Atlanta, Birmingham & Atlantic in the Birmingham district, has increased its capital stock from $2,000,000 to $3,000,000 and is to issue $4,000,000 bonds.

Central of Georgia.—Since the sale of this road in June to Oakleigh Thorne and Marsden J. Perry there has been considerable agitation by holders of the first, second and third preference income bonds who fear that interest payments on these bonds will be sacrificed to the further building up of the road. A bill has even been introduced into the legislature of Georgia, now in session, providing that the income bond holders shall have the same voting rights as stockholders. It is said that the income bondholders may be given the chance to exchange their securities for fixed interest bonds.

Erie.—A plan is said to have been discussed by the directors for paying the dividend on Erie preferred stocks in scrip. At present prices Erie second preferred returns nearly 12 per cent to the investor.

Georgia & Florida.—The capital stock of this company, a consolidation of a number of small roads in Georgia and Florida, controlled by John Skelton Williams, has been increased from $1,000,000 to $8,750,000, of which $3,500,000 is preferred stock and $5,250,000 common stock.

Grand Trunk.—The dividend on the third preference stock has been passed. Three per cent. was paid from the 1906 earnings.

Houston Belt & Terminal.—The Houston Belt & Terminal Railway has filed a mortgage securing $5,000,000 first mortgage 5 per cent. bonds. The mortgage covers property in Houston to be used for passenger and freight terminals. This company is controlled by the Gulf, Colorado & Santa Fe, Trinity & Brazos Valley (Colorado & Southern-Rock Island Company), St. Louis, Brownsville & Mexico, and Beaumont, Sour Lake & Western (Colorado Southern, New Orleans & Pacific).

Interborough Rapid Transit.—Both tubes of the so-called Belmont tunnel from East 42d street to Long Island City have been joined. It was announced during the course of the investigation of the New York city transit lines now under way by the Public Service Commission of the First district that the Interborough Rapid Transit Company owns this tunnel.

Nashville, Chattanooga & St. Louis.—Gross earnings for the year ended June 30, 1907, were $12,238,472 against $11,120,982 in 1906. Operating expenses increased more than gross earnings, leaving net earnings $2,508,311 in 1907 and $2,766,069 in 1906. Surplus, after interest, taxes and rentals, was $713,980 against $971,537 in 1906.

New York Central & Hudson River.—The operating ratio in the quarter ended June 30, 1907, was 76 per cent., which compares with 83 per cent. in the preceding quarter. Gross earnings for the quarter and six months ended June 30, 1907, were as follows:

For the Quarter.			
Earnings	$25,142,126	Inc.	$3,555,155
Expenses	19,197,643	"	3,869,492
Net earnings	$5,944,483	Dec.	$314,337
Other income	2,551,561	Inc.	898,008
Gross income	$8,496,044	Inc.	$583,671
First charges and taxes	5,768,170	"	235,416
Available for dividend	$2,727,874	Inc.	$348,255
Quarterly dividend, 1½ per cent	2,679,480	"	814,507
Profit	$48,394	Dec.	$460,252
For Six Months.			
Earnings	$46,930,896	Inc.	$4,051,671
Expenses	37,400,514	"	6,624,601
Net earnings	$9,530,382	Dec.	$2,572,930
Other income	4,911,076	Inc.	1,665,842
Gross income	$14,441,458	Dec.	$907,088
First charges and taxes	11,494,091	Inc.	438,512
Available for dividend	$2,947,367	Dec.	$1,345,600
Semi-annual dividend, 3 per cent	5,358,960	Inc.	1,629,015
Deficit	$2,411,593	Inc.	$2,974,615

New York Central Lines.—Gross earnings for the month of July, 1907, were as follows:

New York Central & Hudson River	$8,769,318	Inc.	$1,040,096
Lake Shore & Michigan Southern	3,804,876	"	220,445
Lake Erie & Western	398,485	Dec.	34,754
Chicago, Indiana & Southern	235,225	Inc.	69,147
New York, Chicago & St. Louis	809,256	"	534
Michigan Central	2,386,844	"	267,872
Cleve., Cin., Chic. & St. Louis	2,312,464	"	109,099
Peoria & Eastern	234,676	Dec.	9,960
Cincinnati Northern	84,136	Dec.	4,216
Pittsburg & Lake Erie	1,433,695	Inc.	117,923
Rutland	286,276	Inc.	36,352
Total	$20,755,251	Inc.	$1,872,538

New York, Ontario & Western.—Gross earnings for the year ended June 30, 1907, were $8,202,361 against $7,265,058 in 1906, an increase of $937,303. Operating expenses increased $411,059, leaving net earnings of $2,558,015, an increase of $526,244. The surplus after charges was $1,654,782, larger by $467,281 than in 1906.

Northern Pacific.—For the month of July the estimated freight earnings were $4,816,901, an increase of 19 per cent. over the same month in 1906; passenger earnings, $1,885,006, an increase of 36½ per cent., and gross earnings, $6,955,407, an increase of $1,266,481, or 22 per cent.

Pere Marquette.—Subscriptions to the $5,000,000 five-year 6 per cent. notes, issued as part of the reorganization plan, have been received from over 90 per cent. of the preferred stockholders.

Southern Pacific.—The gross earnings of the Southern Pacific Company for the year ended June 30, 1907, were $124,942,527 against $105,632,550 in 1906. There were 9,350 miles operated last year, against 9,192 in 1906. Net earnings over expenses and taxes were $41,825,598 against $35,047,361 in 1906. Thus the increasea for the year were as follows: Gross earnings, $19,300,000; expenses and taxes, $12,500,000; net earnings, $6,800,000. Gross earnings for June, 1907 (9,432 miles operated), were $11,082,899, an increase of $1,852,252. The increase in expenses and taxes was almost as large, leaving net earnings over taxes of $2,641,391 against $2,530,469 in 1906.

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EDITORIAL ANNOUNCEMENTS.

THE BRITISH AND EASTERN CONTINENTS edition of the Railroad Gazette is published each Friday at Queen Anne's Chambers, Westminster, London. It contains selected reading pages from the Railroad Gazette, together with additional British and foreign matter, and is issued under the name Railway Gazette.

CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.

ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

OFFICERS.—In accordance with the law of the state of New York, the following statement is made of the office of publication, at 83 Fulton St., New York N. Y., and the names of the officers and editors of The Railroad Gazette.

CONTENTS

VOL. XLIII., No. 8. FRIDAY, AUGUST 23, 1907.

Exports of domestic products from this country during the fiscal year ended June 30, 1907, were valued at $952,000,000; $62,000,000 more than in the previous year. The value of the cotton exported was $481,000,000, an increase of $81,000,000, while that of breadstuffs and provisions was $391,000,000, a decrease of $18,000,000. In the last classification are found the most striking figures of the report. The value of the exports of canned beef dropped from $6,400,000 in 1906, to $1,600,000 in 1907, a reduction of 75 per cent., meaning a loss in wages paid to working people of perhaps $2,000,000. In Secretary Taft's eulogy of the President, a few days ago, he omitted mention of this instance of "his amazing quality for doing things on their (the people's) behalf." The President made the lurid charge that packing processes were disgusting and the product poisonous. The investigation and analyses failed to substantiate this, and independent investigators (see Hoff & Schwahach) expressed their opinion that American packing houses were the best in the world. Congress passed a law on the subject, however, and the President, having nearly annihilated one export industry, turned his attention to another subject with untiring versatility.

SECRETARY TAFT ON RAILROAD REGULATION

We print in another column a liberal extract from that part of Secretary Taft's Columbus speech which concerns railroads. Mr. Taft has a much clearer idea of the possibilities and desirabilities of corporation regulation by the government than a certain other redoubtable maker of speeches has, and his comments are worth reading. Mr. Taft believes, with the editor of the *Railroad Gazette*, that the chief benefit of the rate law is likely to be its influence in discouraging attempts to renew old abuses. He does not mention the secondary advantage, that the presence of a strong law and an intelligent commission will some day tend to lessen legislative action against railroads, on the same principle that mob rule decreases when efficient police power increases. He believes, further, that far too much pother was made about the court review provisions of the rate law, since the courts would in any case have had it in their jurisdiction to determine whether the administrative tribunal had followed correctly the limitations upon its course of action imposed by the act of Congress creating it, and also whether its order, taken as an authorized expression of the legislative power, deprived the railroad company of its right, under the Fourteenth Amendment, to derive a fair profit from the use of its property. Mr. Taft recommends an amendment which will enable the Interstate Commerce Commission to prescribe a uniform freight classification, and one which will make it impossible for a railroad company engaged in interstate commerce to issue stocks and bonds without the approval of the commission. He also favors legislation which will make it impossible for a railroad to own shares in a competing line, or for a single officer or director to serve on two competing lines. He is opposed to government ownership, for reasons which he clearly sets forth, and he believes that the supervision which he outlines as proper will work against it, and will not materially reduce individualism in railroad operation. He believes in legally sanctioned rate agreements; thinks the importance of fixing rates is much overestimated, and deprecates the assumption that a physical valuation can be a chief means for a great reform in rates. Finally, he believes in additional legislation to promote public safety, and may perhaps approve of the abolition of the fellow-servant rule, though he does not say so, in his guarded discussion of it.

It is both interesting and important that we should have Mr. Taft's creed thus set forth. He is likely to be our next chief executive, and, whether he is or not, he represents the sober thought of the present administration, as opposed to its wild words. The general impression obtained from a careful reading of his speech is that he believes in a simple, matter-of-fact application of government police power to check abuses. We do not concur in all that the Secretary says. We think that he has much exaggerated the existing over-capitalization of certain railroads. In one paragraph he says in effect that if securities had not been used for fraudulent purposes, and if the proceeds from the sale of them had been applied direct to the properties we should have had much less car shortage and other difficulties occasioned by physical defects in the railroad systems than we have had. We believe the impression conveyed by this statement is not quite correct. The manipulation of the Alton securities has frequently been cited as an example of the state of affairs to which the Secretary alludes, yet we know that the Alton securities were issued to cover improvements made to the property out of earnings during a series of past years, and if these improvements had been charged direct to capital at the time they were made, the Secretary's requirements would apparently have been fulfilled while the situation would have been unchanged, as regards the physical condition of the property.

But the speech as a whole is an uncommonly sound document. The comment on valuation of railroads to the effect that it is not necessarily objectionable if thought relevant to any issue, but that it cannot be used alone to reform rates, is thoroughly sane, and directly in line with what has often been said in the *Railroad Ga-*

zette; and the statement that tariff wars do not help either the public or the railroads by the violent fluctuations in rates which they occasion, and that rate agreements should be allowed, subject to the approval of the Interstate Commerce Commission, is good doctrine. We note, however, that the Secretary has apparently some fear that consolidation of railroad properties will go far beyond anything we have now seen, and he urges that a railroad should not be allowed to hold the stock of a competitor. We are not prepared to subscribe to this, principally for the reason that it is extremely hard to define the word "competitor," and also because a train of argument not unlike that used by the Secretary in referring to rate agreements can be applied equally well to the general competition between railroads. It is easy to overdo government by commission, and we think most thoughtful persons will agee that this country has been greatly over-governed in the last two years.

THE NEW HAVEN-BOSTON & MAINE SYSTEM.

The action of the Massachusetts Legislature against the merger of the New York, New Haven & Hartford and the Boston & Maine is suspensive and in no sense final. As the case stands, with the New Haven holding, through its agents, about two-fifths of the outstanding shares of the Boston & Maine, with many other of the Boston & Maine stockholding interests friendly to the merger, and President Tuttle and a number of the Boston & Maine directors also favoring the plan, the New Haven control is practically assured and waits only for details until the next meeting of the Massachusetts law-making body. The legislature may harass and delay but it cannot in the end check the union of the two systems. For purposes of analysis and description, the merger may therefore be treated as a completed fact and sanctioning, as a condition and not a hypothesis, the map of the combined systems, shown on another page, including the electric system of the New Haven in three states, never heretofore published, and a second map taken from the larger one, showing in larger scale these electric lines alone.

The double combination of electric and steam roads has no parallel or even analogy in the railroad systems of the world. Other systems have greater mileage, larger equipment, and penetrate more unique or more picturesque regions. New England has no counterparts of the snow-clad mountain ranges of the Canadian Pacific, nor, on the other hand, the features of the railroad lines of tropical Africa or sub-tropical Mexico. But nowhere will be found a region where industrial energy, dense population, great factory product, extensive coast line and sea traffic, and freight and passenger business in about equal proportions, and both large, absolutely, are controlled under equal conditions of territorial monopoly. Then, again, there is the great electric annex of the steam system. This alone, representing a field into which President Mellen has pushed as a venturesome pioneer, gives the new combinations an abiding meaning in the science of transportation. A very few years more, especially if they include a recession of prosperity, will not only try out in New England on a great scale the policy of joint operation of formerly competing steam and street railroads, but very likely also solve, positively or negatively, the problem of exchanged traffic with steam power, much more generally than roads superseded by electricity. On shorter lines and more restricted areas the test is being made elsewhere. But in southern New England its size and variations dwarf all others.

This electric ownership of the New York, New Haven & Hartford calls for special attention. Its location and wide sweep in Connecticut will first be noticed. That state contains 18 cities. Of these, New Haven, Hartford, Bridgeport, Waterbury, New Britain, New London, Norwich, Norwalk and South Norwalk, Stamford, Meriden, Willimantic, Ansonia, Derby, Middletown, Putnam and Rockville—17 in all—besides townships like Winchester, Greenwich and Torrington, that are more populous than some of the cities—are covered exclusively by the New Haven's street railway lines. Its reach along the populous western coast of the state and even more populous central region, with almost every cross-country line paralleling the steam road, as well as focussing at the cities, suggests those possibilities of "bunching" cars and retrainment which President Mellen has repeatedly forecast.

Turning next to Massachusetts, the striking feature is the electric paralleling of the Boston & Albany by the New Haven's electric lines. They already span the gap between Springfield and Worcester with a number of laterals; stretch nearly half-way between Springfield and Pittsfield, with power to build between the latter city and Albany; and complete parallelism of the Boston & Albany goes on apace, tending more and more to cut off its local passenger traffic and reduce it to a through line—a kind of long bridge between Boston and Albany. In Rhode Island the grouping of the acquired trolley system is evidently defensive rather than aggressive, protecting the populous Providence and Fall River region and Blackstone Valley against long-distance electric rivalry.

The great parallel electric mileage which the New Haven has acquired in the narrow valleys like the Naugatuck, upper Housatonic and Blackstone, suggests another feature of the Mellen policy likely to be realized ere long—reduction of local trains, the use of the valley steam roads chiefly for express service, and the transfer of purely local business to the trolleys. Joined with this are comprehensive plans for expansion of trolley, express and freight service already begun, and combinations of steam-trolley excursion service. The high potential for such purposes of a vast trolley system that represents some 1,300 miles of single trackage, market value of $100,000,000 or more, and gross earnings of some $18,000,000 a year, most of it in a densely populated region and touching seaside resorts at many points, goes with the statement.

Coming next to the import of the new merger itself, its magnitude in figures cannot be expounded accurately owing to recent changes in capitalization of the New Haven and unreported earnings of its now somewhat complex marine properties. But, as a rough statement, the steam mileage of the combination may be given as 5,700 miles, to which some 3,700 more would have to be added in terms of mileage for single track. Gross earnings of the system, counting in the New York, Ontario & Western, the Central New England, the Sound lines, the electric roads—which, by the way, show a constant increase—and the newly acquired coastwise properties, will hardly fall during the first year of joint operation below $150,000,000 a year, putting the system in absolute earning power in the front line of the great railroad systems of the country, and with exceptional earning power per mile of steam road operated. After the proposed issue of some $30,000,000 of new stock of the New Haven, the total steam road capitalization may be roughly estimated at about $150,000,000, calling for dividend requirement at the 8 per cent. rate of $12,000,000 a year. Since the last official annual statement charges of the New Haven system as a whole, ahead of dividends, have so shifted, and the charges themselves are so intricate, that no satisfactory estimate of debt—including in that term capitalized leases—can be made. Out of the whole steam mileage in New England, when the merger is completed, the New Haven will control about three-quarters, and of really profitable local traffic practically the whole, nearly all of the outside roads, except the Bangor & Aroostook, being of the through traffic or "bridge" type, like the Boston & Albany and the Canadian extensions into Maine.

The possibilities of the merger are many and some of them intricate. They are so numerous that they can here be stated only in condensed shape. They include:

(1) The unifying, acceleration and enlargement of service through central New England from New York city to Canada and coastal points in Maine.

(2) Closer connection for through business with the Canadian roads, which, incidentally, may deepen the New England cry for Canadian reciprocity and father ultimately an acute political issue in New England politics.

(3) Terminal improvements on a large scale at Boston, including subways to stations.

(4) Development of the coastwise business in connection with through rail lines to the southward, this possibly including ownership of southern coal mines as feeders of fuel to the amount of between 5,000,000 and 6,000,000 tons a year which the new system will consume.

(5) The application to the Boston & Maine system (a) of the steady and persistent policy of fiscal and physical consolidation which has already advanced so far in the New Haven system proper, and (b) a co-operative street railway policy applied to Boston & Maine territory.

(6) Possible transatlantic service.

(7) Last and largest, great outlays on the too dormant Boston & Maine group of roads, to improve roadbed, bridges and equipment, and increase train load after the Northern Pacific precedent.

Between these greater plans many sub-problems lie. Some of them are within the process of merger, some of them afterdate it. There are the legislative conditions to attend the consent of Massachusetts to a merger general and legal, as well as based on stock control. There is the attitude of that state, as well as others, to the system after the merger has been consummated. There is the question of the exercise or non-exercise of the New York Central option—now extended for six months—on the Ontario & Western,

and, along with it, the outcome of the new trackage rights acquired by the New Haven on the Boston & Albany, and the policy of the newly-merged corporation toward the Boston & Albany itself. How far will the greater New Haven avail itself of its territorial monopoly to "trade" business with the through trunk lines and exchange high-class freight for low class on long haul? What will be its policy on the question of car detention and per diem? Will it change its prolix and localized name for a briefer and more descriptive one like "The New England Railroad?" and will it shift its administrative center from New Haven to Boston, and cease to be a Connecticut corporation?

The bold and highly condensed statement of the policies and plans ahead of the merger thus fills considerable space. Collectively, they vest the new railroad combination with absorbing interest and a value that reaches far beyond the bounds of New England.

CLASHES BETWEEN FEDERAL AND STATE AUTHORITY.

Whatever may be thought of the merits or demerits of the legislation and of the action of the southern governors which has threatened to bring about clashes between federal and state authorities in three southern states, there is reason for congratulation in the fact that the ultimate result will be to send to the Supreme Court of the United States a series of cases, the decision of which ought to settle, once for all, the question whether a state can close the doors of the United States courts in the face of any citizen, or obstruct in any way the orders of those courts issued for the preservation of rights guaranteed by the constitution. It is to be hoped that the decision of these cases will also make clearer the dividing line between federal and state authority over railroads doing both interstate and intra-state business, and that they will afford some guide for future legislators as to how far they can go in the direction of arbitrary reductions of railroad charges without their acts becoming confiscatory.

The railroads have applied to the federal courts in several states for protection against reductions in charges alleged to be confiscatory, but, thus far, the proceedings have followed the usual course, except in the three southern states of North Carolina, Virginia and Alabama.

In North Carolina the legislature prescribed a maximum passenger rate of two and one-quarter cents a mile for all roads over sixty miles long, without any attempt to differentiate between roads on account of relative density of traffic, and similarly arbitrary reductiona of about fifteen per cent. were prescribed on joint freight rates on routes wholly within the state.

In Alabama, the legislature prescribed a maximum passenger rate of two and one-half cents a mile, without taking into account differences in density of traffic, and prescribed reduced maximum rates on 110 commodities.

In Virginia, freight rates were not affected, and the Corporation Commission, by which the reduced passenger rates were prescribed, went about the matter more intelligently, prescribing a two-cent maximum for the principal lines, but prescribing two and one-half, three and three and one-half cents on certain minor roads and branch lines.

Although this legislation was resisted by all the principal lines the brunt of the fight in each state was borne by the Southern Railway Company. In North Carolina, the legislation was attacked on the ground that it was confiscatory, in that the rates prescribed would not yield fair compensation for the service performed. It was also contended that the penalties proposed to be imposed for failure to put the prescribed rates and charges in effect were excessive and would operate to deny to the railroads the equal protection of the laws and due process of law. It was further contended that the arbitrary exception of roads not over sixty miles long was a denial of the equal protection of the laws.

In Virginia, the action of the Corporation Commission was alleged to be unconstitutional on three grounds. It was contended that the provision of the state constitution creating the Corporation Commission was in violation of the constitution of the United States in that, by proposing to give to the Corporation Commission legislative, executive and judicial authority over transportation and transmission companies, it sought to deny to those companies due process of law and the equal protection of the laws. It was contended that the order of the commission, so far as it applied to the Southern Railway Company, was unconstitutional on the ground that it was an impairment of the obligation of the contract entered into by the state of Virginia in granting the charter of the Southern Railway Company, there being in effect at that time, and forming a part of the charter, a legislative provision whereby the state was precluded from changing the rate of the company without its assent. It was further contended that the rates prescribed were confiscatory.

In Alabama it was alleged that the rates prescribed were confiscatory and that a separate act, providing that if any railroad company should contest these rate laws in the federal courts or attempt to move from the state courts to the federal courts, any act relating to rates, its license to do business in the state should be revoked, was unconstitutional.

At the instance of the Southern Railway Company and other companies, sweeping injunctions against the enforcement of the acts of the North Carolina and Alabama legislatures were granted by United States Circuit Judges Pritchard and Jones, and Judge Pritchard also enjoined the enforcement of the order of the Virginia Corporation Commission. In both Virginia and North Carolina, the orders of Judge Pritchard, at the request of the railroads, required the giving to each purchaser of transportation evidence of his payment in excess of the prescribed rates and the deposit in the registry of the court of sums sufficient to repay these amounts if the rates should be finally sustained.

The orderly procedure in all of these cases would have been to allow them to take the usual course to the Supreme Court of the United States, and this would have been done but for a violent outbreak of states' rights sentiment in North Carolina, led by Governor Glenn and some of the radical newspapers. The railroads and Judge Pritchard were denounced for their alleged defiance of the laws and authority of the state of North Carolina, and the governor sent a circular letter to each of the superior court judges of the state, asking them to instruct the grand juries to indict the agents and employees or the higher officers of the railroads for "openly acting in defiance of law." The Southern Railway Company was singled out by the governor as the object of attack. Its agents were arrested—two of them being sentenced to thirty days' imprisonment—and President Finley, who was at Asheville, was taken into custody on a police court warrant. Justice Pritchard promptly ordered the release of all prisoners, as soon as they could be brought before him on writs of habeas corpus. In the meantime, all efforts made by the railroad officials, supplemented by a special representative of the department of justice, to reach an agreemnt whereby the rights of the railroads could be protected, pending proceedings in the courts, were rejected. The governor would agree to nothing that did not involve putting the reduced passenger rates into effect, and he threatened to call an extra session of the legislature to enact laws, including new railroad tax laws, that would still further harass the railroads, and to continue the policy of indicting and arresting the agents and employes of the Southern Railway.

The contest had been carried to a point where it ceased to be a question of rates, and was a question of whether the United States would enforce the process of its courts against the opposition of a state government. Judge Pritchard showed no sign of yielding, but the Southern Railway Company was unwilling to be the cause of a conflict of authority between the state and the United States, and, with the consent of Judge Pritchard, yielded the protection of his interlocutory injunction so far as to put the passenger rates into effect, the other still standing as to the freight rates and the pending litigation being left so as to carry the constitutional questions at issue to the Supreme Court of the United States. The other resisting roads followed the lead of the Southern in putting in the passenger rates.

Governor Glenn having achieved his "victory," the states' rights fever broke out in Virginia. The publication of the order of the Corporation Commission had been enjoined by Judge Pritchard, but Governor Swanson threatened to call an extra session of the legislature to enact a law prescribing the rates ordered by the commission. This would have meant a repetition of the same fight that had been made in North Carolina, and, having yielded in that state, there was nothing to do but yield in Virginia.

Up to this time, the only action that had been taken in Alabama had been the appropriation of $50,000 for the expense of the contest in the United States courts, but an accidental occurrence gave Governor Comer his opportunity to get into the lime light. Judge Jones had held the act attempting to prevent the railroads from instituting suits under the rate laws in the federal courts, or removing such suits to those courts, to be unconstitutional, and had enjoined the secretary of state from cancelling the license of a railroad for disregarding this act. Another act had been passed, however, applying to corporations generally and providing for the cancellation of the license of any corporation of any other state which should attempt to remove any suit to a federal court. A subordinate at-

torney of the Southern Railway Company, without the knowledge of the general officers, and as a routine matter of business, filed a petition to remove to the federal courts a suit for damages for personal injury, had no relation to the rate laws, and which was filed several months before their passage. The secretary of state at once cancelled the license of the Southern Railway Company to do intra-state business in Alabama, acting under the law forbidding corporations generally from removing suits to the federal courts. This law, though clearly unconstitutional, if Judge Jones was right in holding the act applying specifically to railroads to be so, was not directly passed upon in his decision. The Southern Railway Company, notwithstanding the cancellation of its license, continued to do business in the state, pending an effort to arrange a settlement with Governor Comer. This governor was even more uncompromising than Governor Glenn had been. He insisted upon the railroads putting in the reduced freight rates as well as the passenger rates, and to force the railroads to his terms, he threatened wholesale arrests and a special session of the legislature. For the sake of the object lesson that would have been given, it is unfortunate that the officials of the Southern Railway did not stand firm and force the governor to compel them to stop their intra-state business, thus giving the people along their lines a practical demonstration of the wrongheadedness of the policies of their governor and their legislators. However, pursuing that policy of conciliation that has marked the administration of President Finley, and preferring to suffer injustice rather than antagonize its patrons, the company yielded, and applied to Judge Jones for such a modification of his order as would permit it to put the rates into effect pending the determination of their reasonableness and justice. Judge Jones, with much reluctance, consented to this modification, but, in so doing, took occasion to leave no room for doubt as to his opinion that the course of Governor Comer tended to anarchy and declared that he would be unfaithful to the high trust confided in him if he did not utter "words of warning against the extraordinary course which has been pursued to drive a suitor from the courts."

The net results of these proceedings will be that the railroads will be subjected to loss of revenue pending the final determination of the pending litigation, and the question as to whether the rates prescribed in each instance are confiscatory or not will be settled. It is to be hoped that a still more important result will be a clear and unmistakable decision as to the power of a state government, directly or indirectly, to place limitations on the right of any individual or corporation to seek in the courts the protection of every legal and constitutional right, for, in the words of President Finley, "if an appeal to a court of justice is a violation of law, then all our courts should come to an end."

Train Accidents in July.[1]

Our record of train accidents occurring on the railroads of the United States in July includes 26 collisions and 14 derailments and one other accident, 41 accidents in all. This record is not published in full as was formerly done, except in the cases of the few accidents which are especially prominent—in the present instance eight collisions and one derailment. The record of "ordinary" accidents —which term includes, for our present purpose, only those which result in fatal injury to a passenger or an employee or which are of special interest to operating officers—is given in the shape of a one-line item for each accident, showing date, location, class and number of deaths and injuries. This record is based on accounts published in local daily newspapers, except in the cases of accidents of such magnitude that it seems proper to send a letter of inquiry to the railroad manager. The official accident record published quarterly by the Interstate Commerce Commission is regularly reprinted in the *Railroad Gazette*.

The most disastrous accident in the present list, the collision at Salem, Mich., on the 20th, was reported in the *Railroad Gazette* of July 26 and August 2. It was due to misreading of a despatcher's order.

The collision at Johnson City, Tenn., on the 14th, occurred at 7.30 p.m., and was due to the carelessness of a hostler in charge of a locomotive in the yard, who occupied the main track on the time of eastbound passenger train No. 42. He had accepted incorrect information from a telegraph operator when he should have had a written despatcher's order. He was running toward the passenger train. He saw the passenger engine in season to reverse and jump off. The engine and first three cars of the passenger train were knocked off the track and overturned, but the switching engine was not derailed and it immediately ran back to Carnegie, where it was stopped, without damage, by the opening of a switch. Six passengers were killed in the collision and eight passengers and three trainmen were injured, two of the passengers fatally. All of the passengers killed were riding in the second class car.

In the rear collision on the Chicago Great Western at Bethel, Kan., on the 16th, one passenger in the sleeping car of the leading train was killed. Only two other persons were injured, both of these being also on the leading train. This train was No. 22 of the Burlington road, its presence on the Chicago Great Western track being due to a blockade on the Burlington line. The train which ran into it was C. G. W. passenger train No. 4.

The passengers killed in the rear collision on the Chicago & North-Western near Belle Plaine, Iowa, on the 22d, were two drovers, riding in the caboose of a freight train. This train was run into at the rear by an express passenger train which had run past distant and home automatic signals set against it. One drover and the engineman and fireman of the passenger train were injured.

The butting collision just north of Greenville, Pa., on the 23d, was between a northbound special passenger train and a southbound empty engine, both of them running as second sections of regular passenger trains. The empty engine was overturned and its conductor was killed. The empty engine had absolute right of way and a clear block under the telegraph block system, to Greenville. It had just left its train, consisting of seven cars of excursionists, at Osgood, a non-block telegraph station, for delivery to the Lake Shore road. The switch of the siding into which the train was backed is a considerable distance south of the telegraph office. Being delayed in switching the excursion cars, this train was delaying the northbound train and the despatcher attempted to meet the two trains at this place (Osgood), placing the restricting order with the Osgood operator. But without waiting to receive the signatures of the conductor and engineman he completed the order to the inferior northbound train. Momentarily forgetting the importance of treating directly with the conductor and engineman at this non-block station, he accepted the erroneous assurance of the operator that he could hold the train for the delivery of the order. But the southbound engine was within its rights, being in a clear block, and, there being no semaphore facilities at Osgood to govern movements of trains, it got away. When too late, the operator found that the cars had been left at the south end of the siding, and that the engine, instead of coming to the station as is customary, had departed.

The butting collision of passenger trains at Stony Creek, Va., on the 27th, about 9 p.m., was caused by the mistake of the engineman of the southbound train, who mistook a freight, standing on the side track, for the northbound passenger which he was to meet.

The collisions at Campello and Middleboro, Mass., on the 28th and 29th are notable from the fact that in both collisions the foremost train, a freight, was the same. Two different empty trains (passenger crews) ran into it.

In the boiler explosion at Milan, Tenn., on the 30th, the length of the casualty list is explained by the fact that the explosion occurred just as the train—a northbound fast fruit train—was passing another freight train standing on a side track. Two of the killed were trespassers.

[1] Abbreviations used in Accident List:

re . . . Rear collision.
bc. . . Butting collision.
xc. . . Other collisions, as at crossings or in yards. Where only one train is mentioned, it is usually a case of a train running into a standing car or cars, or a collision due to a train breaking in two on a descending grade.
b. . . . Broken.
d. . . . Defective.
dr. . . . Defect of roadway
eq. . . . Defect in car or engine.
n. . . . Negligence.
unf. . . Unforeseen obstruction.
unx . . Unexplained.
derail. . Open derailing switch (negligence of engineman or signalman).
ms. . . . Misplaced switch
acc obst . Accidental obstruction
ma . . . Malicious obstruction of track or misplacement of switch.
boiler . . Explosion of boiler of locomotive on road.
fire. . . . Cars burned while standing
Pass . . Passenger train.
Ft. . . . Freight train (including empty engines, work trains, etc.).
*Wreck wholly or partly destroyed by fire.
†One or more passengers killed.

Train Accidents in the United States—July, 1907.

Date.	Road.	Place.	Collisions. Accident.	Kind of Train.	No. persons reported— Killed.	Injured.
2.	Pennsylvania	Sunbury	xc	P. & Ft.	3	10
2.	Denver & Rio Grande.	Bingham.	bc.	Ft. & Ft.	2	4
4.	St. Louis & San Fran.	Birmingham	bc.	Ft. & Ft.	1	2
6.	Southern	Straw Plains.	xc.	Ft. & Ft.	1	2
8.	Atlantic Coast Line	Blue Springs.	bc.	Ft. & Ft.	2	5
11.	C. N. O. & T. P. . .	Somerset	re	Ft. & Ft.	0	10
12.	Great Northern . .	Brookston	bc	Ft. & Ft.	1	5
12.	Gulf & S. I. . . .	Hattiesburg	bc.	P. & Ft.	1	9
13.	St. Louis & San. Fran.	Purdy	bc.	P. & Ft.	0	3
†14.	*Southern* . . .	Johnson City	xc.	P. & Ft.	6	11
†16.	*Chic. & G. Western* . .	Bethel.	re.	P. & P.	1	0
19.	Central of New Jersey	Freemansburg.	bc.	Ft. & Ft.	2	0
19.	Pennsylvania	Allegheny.	re.	Ft. & Ft.	1	1
†20.	*Pere Marquette* . . .	Salem.	bc.	P. & Ft.	33	70
22.	*Chic. & N. W.* . . .	Belle Plaine.	re.	P. & Ft.	2	3
23.	Pennsylvania	E. Ferney	re.	P. & Ft.	0	12
23.	*Bess. & Lake Erie* . .	Greenville.	bc.	P. & Ft.	1	4
25.	Chic. Pk. Isld. & Pac.	Shawnee.	re.	Ft. & Ft	0	2
26.	B. & M.	N. Wilmington.	re.	P. & P.	0	4
27.	*Atlantic Coast Line* . .	Stony Creek.	bc.	P. & Ft.	1	9
28.	Lehigh Valley . . .	Waverly.	re.	Ft. & Ft	1	0
28.	N. Y., N. H. & H. . .	Campello.	re.	Ft. & Ft.	3	3
29.	N. Y., N. H. & H. . .	Middleboro.	re.	Ft. & Ft.	0	1
29.	N. Y., N. H. & H. . .	Danbury.	re.	P. & Ft	1	5
31.	Missouri Pacific . . .	Atchison.	re	Ft. & P.	4	2
31.	Southern	Evington.	bc.	Ft. & P.	0	1

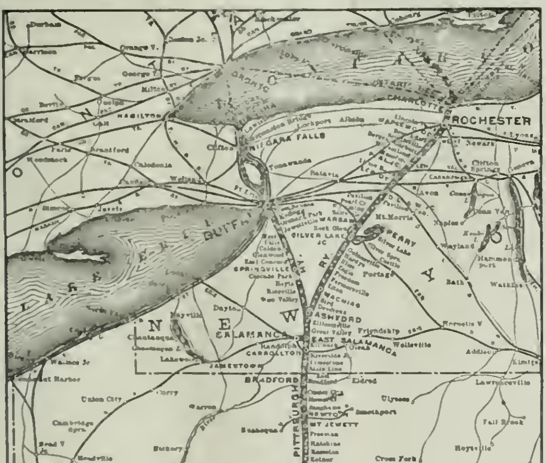
[illegible]

Date	Road	Place	Kind of [illegible]	Cause of [illegible]	No. persons [illegible] Kil'd	Inj'd
8	Chi. [illegible] & [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
10	Atch., Top. & S. [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
10	Pennsylvania	[illegible]	[illegible]	[illegible]	1	[illegible]
15	Southern	[illegible]	[illegible]	d. t. & h.	[illegible]	1
19	Ches. & W. [illegible]	W[illegible]	[illegible]	d. engine	[illegible]	[illegible]
20	Rutland	[illegible] R[illegible]	[illegible]	washout	[illegible]	[illegible]
21	El P. [illegible] & S. W.	[illegible]	[illegible]	unx.	[illegible]	[illegible]
21	Int. & [illegible] N. [illegible]	M[illegible]	[illegible]	unx.	[illegible]	[illegible]
21	[illegible]	[illegible]	[illegible]	unx.	[illegible]	[illegible]
27	Southern	[illegible]	[illegible]	d. switch	2	1
27	Penn. & [illegible]	[illegible]	[illegible]	b. rail	[illegible]	2
31	Mobile & Ohio	W[illegible]	[illegible]	unx.	2	[illegible]
31	Illinois Central	M[illegible]	[illegible]	boiler	[illegible]	1[illegible]
29	Southern Pacific	[illegible]	[illegible]	boiler	0	2
31	Baltimore & Ohio	McKeesport	[illegible]	[illegible]	2	1
31	Chic. Burl. & Quincy	B[illegible]ken [illegible]	[illegible]	boiler	4	0

Of the 15 serious electric car accidents reported in the newspapers in July eight resulted in one or more fatalities each. These occurred at Alexandria, Va.; Bellingham, Wash.; East Providence, R. I.; North Tonawanda, N. Y.; Clarksburg, W. Va.; Schenectady, N. Y.;* New York, N. Y. (Third Avenue Elevated line), and Watson, Ind.

Buffalo, Rochester & Pittsburgh.

The Buffalo, Rochester & Pittsburgh is the first of the coal mining railroads to separate itself from its coal properties since the Federal law which requires such segregation by August, 1908, went into effect. Previous to the passage of the law the Baltimore & Ohio had sold control of the Consolidation Coal Company, the most important shipper of bituminous coal on its lines. The Buffalo, Rochester & Pittsburgh controlled the Rochester & Pittsburgh Coal & Iron Company, which has large coal and iron mining interests. Last fall the Mahoning Investment Company was incorporated in the state of Maine, and to it was sold the stock of the Coal & Iron



Buffalo, Rochester & Pittsburgh.

Company owned by the railroad. In return for this giving up of the railroad's investment, the stockholders of the Buffalo, Rochester & Pittsburgh received all but a small fraction of the stock of the Mahoning Investment Company. Meantime the railroad's profit and loss account was debited with a little more than $1,000,000 of extra dividend payments, on this account.

Under this arrangement the railroad's common stockholders receive the same income returns that they formerly did on their holdings, but part on their railroad stock and part on their Mahoning Investment stock. The [illegible] has been [illegible] [illegible] Mahoning Investment Company [illegible] to the B., R. & P. [illegible] Preferred stockholders [illegible] their railroad stock, and in addition [illegible] which [illegible] railroad earnings, from 6 to [illegible] are maintained, while the company [illegible] as the same [illegible] the railroad stock and the [illegible] company's stock [illegible]. Yet there is always the possibility [illegible] of the investment company may pass to different [illegible] those who hold the railroad stock. In the case of [illegible] by the Iselin family, this is not likely to happen, but the possibility is interesting particularly in case a similar arrangement should be adopted by some of the other coal roads. The action of the Buffalo, Rochester & Pittsburgh, however, cannot be taken as a precedent for the anthracite carriers, which are the railroads most vitally affected by this provision of the rate law. The road is organized not under a special charter specifically permitting it to operate coal mines, but under the general railroad law of Pennsylvania. Most of the anthracite roads, on the other hand, have charters antedating the Pennsylvania railroad law empowering them to operate coal mines. At least one of them, the Lackawanna, has announced that its rights to mine coal cannot be impaired by the Interstate Commerce Law, and it is probable that all the other companies which possess charters specifically granting the rights to mine coal will take the same ground.

The financial record of the Buffalo, Rochester & Pittsburgh during the year brings out clearly the present difficulty of securing capital for railroad use. On August 1, 1906, the company issued three-year construction and improvement notes to the amount of $1,500,000, bearing $4\frac{1}{2}$ per cent. interest. Six months later more funds were needed and on March 17, 1907, a new issue of $1,000,000 one-year notes was made; these bore 6 per cent. interest, a rapid jump in interest rate. On May 1 a new consolidated mortgage was created, covering $35,000,000 50-year bonds, of which $3,000,000 are to be turned over to the company for immediate use, $18,145,000 to be retained for retiring underlying obligations and $13,855,000 to be issued after July 1, 1908, at a rate not exceeding $1,500,000 a year, for the future needs of the company. The $3,000,000 immediately available will, no doubt, be sold as soon as they can be at a reasonable price in order to provide funds for the $1,000,000 notes payable next March and the additional $1,500,000 payable in two years. These note issues are carried in the balance sheet as current liabilities. As a result current liabilities stand at $4,603,052, against current assets of $4,573,286, of which only $3,419,513 is cash. The showing therefore is better than it appears, but it is obvious that the road could well have a larger supply of working capital.

In increase in tax payments the company came off worse than did the Lehigh Valley with its tax increase of 25 per cent. The B., R. & P.'s taxes for the year, with no change in the amount of mileage owned and leased, were 35 per cent. larger than in 1906. The increase in the tax burden of the company during recent years may be even better shown by the fact that in the last three years, with an increase of only 43 miles of road owned and leased, a gain of 11 per cent., taxes have increased from $115,200 to $212,858, a rise of 85 per cent.

The road is a small low-grade bituminous coal carrier which brings coal from the Pennsylvania fields east and northeast of Pittsburgh, north to Buffalo and Rochester and by a car-ferry owned jointly with the Grand Trunk, to be opened in October, to Cobourg, Ont. It also competes with the Buffalo & Allegheny Valley division of the Pennsylvania for traffic between Pittsburgh, which the B., R. & P. reaches by trackage over the Baltimore & Ohio, and the two New York State cities. Coal furnishes nearly two-thirds of the tonnage moved, and coal, coke, iron ore and iron over three-quarters. The revenue train load last year was 543 tons and the revenue locomotive load 435 tons. The locomotive department has lately been strengthened by the addition of six decapod engines for pushing service over the maximum northbound gradient. These were described in the *Railroad Gazette* of August 9, 1907.

Gross and net earnings for 1907 both stand at record figures. Gross earnings were $8,666,[illegible] and net earnings $3,524,237, the former an increase of $837,129, and the latter of $253,809, over 1906. There was $103,965 spent on extraordinary expenses and improvements against $92,2[illegible] in the previous year.

The freight tonnage increased 14 per cent. and the freight earnings 10 per cent. The number of passengers carried increased 11 per cent., but owing to a reduction in passenger fares over the whole road on November 1, 1906, to a rate similar to that of the Pennsylvania, earnings from passengers show a small decrease.

No detailed figures under the different groups of operating expenses are given. Maintenance of way works out at $1,7[illegible]5 per mile owned and leased against $1,547 in 1906, figures which are probably much too high as they take no account of the 127 miles of trackage. Without facts as to the arrangements for maintenance

of the lines used under such contracts it is impossible to show the unit maintenance of way expense with any accuracy. The figures given bring out little more than the increased amount spent on this account over the previous year. Operating expenses as a whole increased 12 per cent. over 1906.

The following table summarizes the principal operating results of the last two years:

	1907.	1906.
Mileage owned	442	442
Mileage worked	569	568
Passenger earnings	$1,143,444	$1,154,089
Freight earnings	7,382,345	6,603,112
Gross earnings	8,666,580	7,829,452
Maint. way and structures	775,929	688,158
Maint. of equipment	1,279,986	1,099,368
Conducting transportation	2,882,251	2,606,693
Operating expenses	5,142,343	4,559,113
Net earnings	3,524,238	3,270,339
Net income	1,435,239	1,417,391

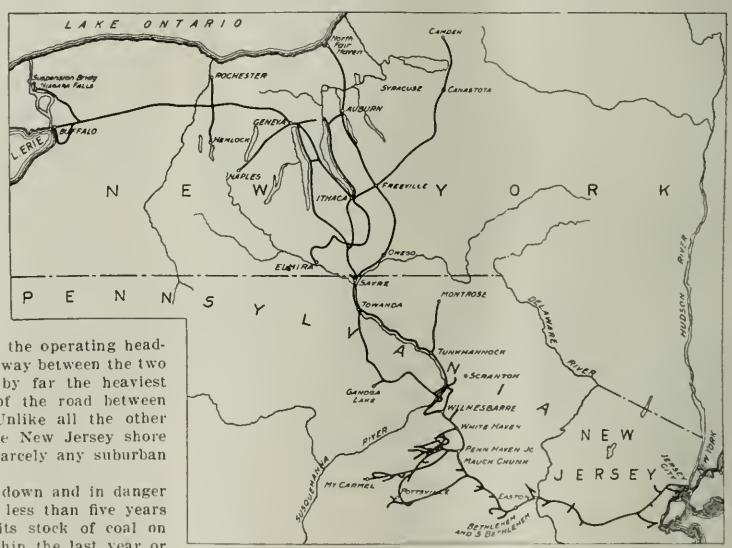
Lehigh Valley.

The annual report of the Lehigh Valley for the year ended June 30, 1907, the first to be received of the large number of railroad reports covering that same period, is likely to be typical of many of the others. It shows the largest gross earnings in the company's history, a large increase in operating expenses, particularly in conducting transportation, and a tremendous increase in tax payments—in other words, more business and smaller profits.

The Lehigh Valley is a combination anthracite coal road and New York-Buffalo trunk line. As shown by the map, it has a large mileage of branches tapping the anthracite coal fields about Pottsville, Shenandoah, Hazleton, Tomhicken and Mauch Chunk, most of which have their principal connection with the main line at Penn Haven Junction. In the region about Cayuga and Seneca lakes and south of them as far as the Pennsylvania state line the road has a number of branch lines serving this farming and manufacturing territory. The through line of the road is double tracked and equipped with automatic block signals all the way between Jersey City and Buffalo. There are over 100 miles of double track besides this. Included in the main line are 56 miles of three tracks and 20 miles of four tracks. Bethlehem and South Bethlehem, Pa., the junction point with the Philadelphia & Reading, which gives the Lehigh Valley a Philadelphia connection, is the operating headquarters rather than some point like Sayre, half way between the two terminals or Jersey City or Buffalo, because by far the heaviest business of the road is on the eastern end of the road between the coal workings and Atlantic tidewater. Unlike all the other trunk lines which have their terminals on the New Jersey shore of the Hudson river, the Lehigh Valley has scarcely any suburban traffic to New York.

Ten years ago the Lehigh Valley was run down and in danger of bankruptcy. As recently as January, 1903, less than five years ago, the company's credit was so poor that its stock of coal on hand was pledged as collateral for loans. Within the last year or two there have been numerous predictions that the Lehigh Valley would shortly come to be a second Lackawanna, paying dividends of 10 to 20 per cent. on its common stock. At the last annual meeting of the road in January, a strong effort was made by a large minority interest to secure larger dividend payments on the common stock. The first dividend on the stock was 1 per cent., paid in 1901. At the beginning of 1905, 4 per cent. was established as the regular rate; it has remained so since that time, but the last two semi-annual dividends have each included an extra 1 per cent., which raises the rate last paid to 6 per cent. The preferred stock amounts to only $106,300 par value. It receives 10 per cent. annually. In 1904, when dividends on this issue were begun, a suit was brought to secure payment of back dividends from 1893 to 1901 inclusive, on the ground that dividends during that period were cumulative. The Supreme Court of Pennsylvania sustained this contention, and back dividends with interest amounting to $10,000 more than the par value of the preferred stock were paid from net income during the last fiscal year. After this unusual deduction, the net income for the year 1907 was 15 per cent. on the common stock, against 15½ per cent. in 1906. In spite of this showing, President Thomas last January, answering the malcontents, referred to the uncertainty as to the future cost of operation, the effect of recent laws and the heavy demands for shorter hours and increased wages as well as the shortage of freight cars, and declared that a conservative policy in dividend payments was to the best interest of the stockholders. He further pointed out that the two branches of the company's business represented respectively by the Lehigh Valley Railroad and the Lehigh Valley Coal Company together had gross earnings of $65,000,000 annually and that for current improvements, whether they were ultimately to be charged to capital account or to income, and for ample working capital, it was imperative to have large cash balances constantly on hand. The attempt to secure a larger dividend was defeated.

The results of the year just passed bear out these contentions. Gross earnings have increased $3,278,575, or 10 per cent., but operating expenses have also increased 10 per cent., or $1,962,042. Among the operating expenses, the non-productive expense of conducting transportation increased $1,208,728, or 11 per cent., "due to an increased volume of traffic, increased rates of wages paid employees and greater cost of all materials and supplies." Taxes increased 25 per cent. over the previous year. At the same time, the item of cash on hand as of June 30 has decreased from $11,676,966 in 1906 to $6,612,849 in 1907. Furthermore, the net results of the coal department were seriously affected by several unfortunate events, such as a cave-in at one of the mines resulting in a gas explosion that set it on fire and made it necessary to flood the whole operation; the destruction of a breaker by tornado; the loss of seven months' time at another breaker due to necessary repairs long postponed during the recent series of prosperous years for the anthracite industry, and the destruction of the coal-handling plant and storage yard at South Chicago with 40,000 tons of coal, by fire. Car shortage also made it necessary to close down collieries at a time when coal could have been sold at the greatest profit. All these facts, added to the present strain and doubtful condition of the money market, commend the stand taken by the directors in paying a smaller dividend than could be justified by the earnings.



Lehigh Valley.

It is by no means to be assumed, however, that the year has been on the whole an unsatisfactory one for the Lehigh Valley. The gross and net earnings were each the largest in the company's history. In spite of the increase in cost of conducting transportation and maintenance expenditures even slightly more liberal than in 1906, the operating ratio shows a slight decrease. It was, of course, natural to expect a gain in coal freight earnings in comparison with a year when anthracite mining was suspended for two months, as in April and May of 1906. Earnings from coal increased $1,862,334, or 14 per cent. The loss that the suspension of mining brought on the railroad may be judged from the fact that in April, 1906, gross earnings decreased 45 per cent., and net earnings 70 per cent., while in April, 1907, gross earnings increased 69 per cent. and net earnings 288 per cent. over the low figures of the same month in the previous year. The decrease in production of anthracite fell more heavily on the Lehigh Valley than on any other of the large railroads. The Lehigh Valley's normal proportion of the anthracite traffic is about 16 per cent.; it suffered 27 per cent. of the loss in anthracite shipments during 1906.

Merchandise freight earnings, which increased 12 per cent. in 1906, gained 8 per cent more last year. Passenger earnings, following an increase of 13 per cent. in 1906, were 10 per cent. larger last year. Maintenance of way cost $2,215 a mile, against $2,207 in 1906. Maintenance of equipment was charged $3,266 per locomotive in 1907, against $3,020 in 1906, $744 per passenger car, against $685 in 1906, and $62 per freight car, against $61 in 1906. This account, as a whole, increased 13 per cent. There were bought from this account 15 new locomotives.

Large quantities of equipment were bought and charged to other accounts. Forty locomotives and 500 steel underframe box cars of 80,000 lbs. capacity were charged to capital account. Five hundred more cars of the same class, 1 dining car and 20 express cars were charged to additions and improvements. Five hundred steel gondola cars of 80,000 lbs. capacity, 102 steel underframe produce cars of 60,000 lbs. capacity, 25 steel underframe automobile cars of 60,000 lbs. capacity, and 10 steel underframe box cars of 80,000 lbs. capacity were charged to expenses and equipment renewal reserve. Two thousand steel underframe box cars of 80,000 lbs. capacity and 2,000 steel coal cars of 100,000 lbs. capacity were bought under a new equipment trust. Included in the company's equipment are many small wooden box and coal cars with capacities of from 20 to 30 tons. While perfectly serviceable for use under ordinary conditions of railroad operation 10 or 15 years ago, they are constantly damaged and frequently cause wrecks when placed between modern heavy steel cars. In order to retire such cars, a special appropriation of $1,250,000 out of the net earnings of the year has been made under which as many cars as this appropriation will provide for are to be condemned. In addition to all the equipment already bought, contracts have been placed for 5,000 modern box and coal cars to be delivered shortly. The tonnage of these new cars will exceed the total tonnage of the equipment to be condemned.

A number of considerable improvements have been made during the year. The Lehigh & Lake Erie Railroad, a new terminal line shown on the map around the city of Buffalo to the south, which was consolidated during the year with the Lehigh Valley Rail Way Company, the company which owns the lines in New York state, has one track laid and will be ready for operation as a double track line by the end of next month. In connection with this new line, $250,000 is to be spent for additional yard and terminal facilities.

A new double track steel girder bridge 1,800 ft. long has been built over the Susquehanna river during the year, a work which included reduction of curves and change of line for 6½ miles. The total cost of this improvement was $810,818. The work was described in the *Railroad Gazette* of February 8, 1907. The third and fourth tracks have been extended for short distances at various points between Mauch Chunk and Easton. As soon as some of this work now under way is finished, the company will have a continuous four-track line for 12.7 miles in the neighborhood of South Bethlehem and Easton. Three new transfer bridges and a freight yard of 1,000 cars capacity are to be built at the Jersey City terminal at a cost of $350,000. Work costing $140,000 is already under way at that point in extension of bridges and tracks.

The Lehigh & Lake Erie Railroad has already been mentioned as a subsidiary company through which the Lehigh Valley is extending its terminal facilities at Buffalo. This subsidiary company originally issued a first mortgage to secure $3,000,000 4 per cent. 50-year bonds. On March 1, 1907, a new mortgage was made, similar to the old one but with the rate of interest 4½ per cent. These first mortgage bonds on a modern terminal railroad, and presumably bearing the guarantee of the Lehigh Valley, appear to have been unsalable at the 4 per cent. rate, an event exceedingly typical of the financial developments of the year.

The following are the principal statistics of operation:

	1907.	1906.
Mileage worked	1,443	1,429
Passenger earnings	$4,363,452	$3,971,392
Coal freight earnings	15,110,899	13,248,565
Misc. freight earnings	14,996,673	13,934,127
Gross earnings	36,068,432	32,789,854
Maint. way and structures	3,196,854	3,153,245
Maint. of equipment	6,186,642	5,485,794
Conducting transportation	12,100,681	10,891,954
Operating expenses	22,114,253	20,152,213
Net earnings	13,954,179	12,637,646
Net income	6,136,204	5,770,073

CONTRIBUTIONS

Why We Have Late Trains.

New York, Aug. 19, 1907

To the Editor of the Railroad Gazette:

I have read with amusement mingled with pity the recent lucubration of Gulf in his Picked Up on the Road about the subject of late trains. To me it seems that Gulf utterly fails to grasp the real sense and humor of the situation. Of course there are a few hard-headed old thinkers like your contributor who want to know what they can do before they do it and never bet except on a "dead sure thing." They have no sporting blood in their veins, and are utterly devoid of that faith that would move mountains or make a tree of a mustard grain. Most people are of a different brand. They take as gospel truth what the time-table says, just as they take what the yellow journals have to say about the motives of railroad managers. They like the sensation of planning a railroad journey and getting there in no time. And the managers count on this faith. Besides, what difference does it make, any way? Trains on our lines always wait for a late connection and a man has no business wanting to make connections so as to travel on any other road. Why, [illegible] year [illegible] good policy to make him miss his foreign connections? It will teach him a wholesome lesson not to wander off on [illegible] gets.

I have heard it suggested that managers do not expect to run on fast schedules. When they are making out the time-table they draw the string up pretty close to the vertical and ask: "Do you think she can make it?" Well, she may if everything goes our way, including the wind. If she can make it once that's enough, and so the string remains on the steep slant.

Here is where Gulf fails to appreciate the humor of the situation. He would know at a glance, if he had the size of the engine, weight of train, number of passengers and tonnage of express and baggage, that that particular schedule is one grand joke and laugh. Instead of that, he, too, accepts the time-table on faith and then gets mad because his faith is misplaced. If he were a philosopher and had any sporting blood he would drop in the smoker and form a little pool on the run, as on a transatlantic liner, and knowing the general probabilities, would guess high, rake in the pool, and be happy. Having done this once or twice, he would stop his howling about late trains and would be writing to you in glorification of the magnificent service he always gets. He simply doesn't know how to take advantage of the situation.

P. D. Q.

The Settlement of Freight Claims

New York, Aug. 20, 1907

To the Editor of the Railroad Gazette:

Your interesting editorial, August 9, on this subject, is deserving of thoughtful consideration by all who are directly interested in the investigation and adjustment of these numerous and often troublesome differences between shippers and carriers. Several features of the article, however, invite comment, and since my recent paper on the subject is referred to, you will perhaps allow me space for a few remarks.

If there are any freight claim agents who would intentionally delay or endeavor to evade the payment of a just claim, be the amount large or small, they are as great an injury to the carrier they serve as is the "surly agent who curtly tells the consignee that the other road is to blame for the delay," for neither practice represents the true policy of the management of the average transportation company. Every act of discourteous or unfair treatment of shippers or consignees by carriers' employees tends to engender resentment against the entire management, as do the injudicious or arbitrary decisions of claim investigators reflect upon the claim agent. In part, Colonel Prout's remarks upon the incivility of certain railroad employees are undoubtedly justifiable, and too much cannot be said on this subject, for in the saying others than railroad employees may profit thereby. Only those who represent corporations employing large forces can fully appreciate the unreasonable and selfish demands made upon them by many who only have regard for their personal interests, and are unwilling to apply the "square deal" principle in their business dealings.

As to Colonel Prout's protest against "being considered a swindler until, at great pains, he proves himself an honest man," there doubtless are many claim offices which are over-zealous for the carriers' interests, in consequence of which unnecessary investigations are pursued and unreasonable demands or inquiries made upon claimants. If all claimants conducted their affairs upon the methods employed by the Colonel's firm, the claim office would perhaps enjoy a better reputation for expeditious settlements instead of being at all times congested with claims possessing every character and condition demanding consideration.

Delays in the settlement of freight claims most frequently occur through efforts to determine their merits, and in ascertaining how and where the irregularity occurred, and since this can only be accomplished through the medium of correspondence with agents located at more or less distant points, under the best of circumstances, much more time must necessarily be consumed than the average claimant, with limited understanding of transportation methods, is willing to accord. Then, too, a large percentage of the freight claims made against carriers are not accompanied by documents or data to enable the claim office to locate the particular shipment in question or verify the account, consequently additional papers or information must be requested. Claimants not infrequently send in their bill without such necessary documents as the bill of lading or freight receipt, and when these are requested they often either object to furnishing them in support of their claim or say they have been returned to shipper or destroyed; in fact, few claims except those made by large concerns are reasonably substantiated when first received. Thus it will be seen that the subject of prompt settlements has another phase which has not been developed in your article or my paper.

In the general criticism of freight claim methods and tardiness in claim settlements, the above conditions, being unknown to the critic, are not usually considered, nor is the fact that the majority of claims are promptly adjusted to the entire satisfaction of claimants. It is the few claims, particularly those on account of interline traffic, which are so often subject to unreasonable delay, and

which create annoyance and criticism on the part of claimants, and to this class of claims it is the duty of every freight claim office to give serious thought, and employ every possible measure to minimize the time necessary for their adjustment.

Referring to the four features of my paper which you classify:

(1) By "thorough system, devoid of circumlocution," is implied the practice of deciding, in the most direct manner possible, the question of liability, and without further considerations effect settlement of the claim, taking up for investigation questions of cause, location of fault and remedies thereafter. It likewise implies the careful examination of all claim papers by investigators; also prompt, intelligent and courteous replies to letters, qualities which can only be secured by constant supervision and insistence upon by those in charge.

(2) Prompt investigations may be conducted by one claim office, but good results therefrom can easily be defeated by dilatory tactics or actual neglect by others, and especially is this fault experienced in connection with the adjustment of claims in which distant roads are involved, the only effective remedy being for the claim representatives of every carrier to give the same consideration and prompt treatment to foreign claims that they apply to those in which they are alone involved.

(3) Claimants have the right to expect from claim offices uniformly business-like communications, although they should perhaps make some allowance for the difference between the dictation of a claim investigator and the composition of officials of the company. However, according to my experience, there never is any excuse for curt, random or evasive letters, and the investigators who appreciate this are the kind always in demand for more responsible positions.

(4) Your comment upon this seems to be based upon the assumption that all small claims are valid, and should be paid without the carrier "standing on its rights," i. e., investigating to determine liability. If this were attempted, even with claims from people of known repute, would there not be great danger of violation of commerce laws, and would not claimants of less repute demand similar treatment of their claims? Even if insurance companies have practiced the payment of certain claims in advance of confirmation, is it a good business principle, or one which can be safely adopted by corporations whose every act is closely scrutinized by the public?

Your suggestion that an experienced claim clerk be located at every large freight station is a most excellent one, and should receive the consideration of all freight claim and other officials, for here is a plan which has had but limited trial, and, if generally adopted, has excellent possibilities in the direction of accurate information and proper papers for the claim office, intelligent explanations to claimants, and all with a promptness that is otherwise difficult to obtain.

Freight claim methods are steadily improving, and with the assistance of our friend the claimant, the claim office may yet be regarded with favor and even with acclaim.

R. L. CALKINS,
Freight Claim Agent, New York Central & Hudson River R. R.

Cross-Rolled Steel Ties.

New York, Aug. 17, 1907.

To the Editor of the Railroad Gazette:

I read with much interest your editorial in your issue of Aug. 9, in which you give a suggestion from the chief engineer of a leading railroad that the 60 per cent. discard of 25 per cent. from top of ingot, in the recently proposed rail specifications, could be profitably utilized by rolling into steel ties and other sections by the York transverse rolling. I endorse what you say in reference to the improvement of the physical qualities by cross rolling, also the possibility of being able to roll any form of steel tie that will meet the necessary requirements in modern railroad practice. I have submitted my steel ties of various designs, with fastenings, to the chief engineers of the leading railroads of the United States and England, and invariably they have said they seemed to cover every requirement. Because they are strong, cheap, elastic and have perfect fastenings, and because the system of rolling permits any modification desired by the railroad engineers to suit any special condition they received their thorough endorsement. The ties presented to the engineers referred to were my designs, rolled from old scrap rails, but I can roll, from new steel, any design desired, either beam or trough sections, with flanges 24 in. wide, if called for.

I respectfully disagree with your statement that no steel tie has been devised that will give the resiliency of a wooden tie. I claim to roll a tie that will give the necessary resiliency, under light or heavy axle loads. I refer you to the editorial in your issue of Nov. 24, 1905. The question of lateral movement in the ballast is entirely overcome, in the opinion of railroad engineers, by my corrugating the lower flange of the tie.

I can best answer the question of ties rusting by quoting from the experience of engineers, who have had the supervision of railroads on which metal ties were used. In your issue of August 30, 1901, under the caption of "Steel Railroad Ties in Europe" by Foster Crowell, C.E., I find the following quotations from the report of Mr. J. W. Post, Chief Engineer of the Netherlands State Railroads, referring to iron ties of beam sections that had been in gravel and sand ballast for 35 years. The original weight of the tie was 125 lbs. They decreased in weight from rust and wear one-quarter of a pound per year, or 8¾ lbs. in 35 years. Mr. H. L. Porter, Chief Engineer of the Bessemer & Erie Railroad, states that the breaking of a steel tie of the trough type after six years service does not indicate that rusting under ordinary conditions should cause any anxiety.

The question of insulation can be successfully met by the adoption of the York steel tie.

JAS. E. YORK,
President York Rolling Process Co.

Curve Mechanics and the Woodlawn Wreck.

London, July 27, 1907.

To the Editor of the Railroad Gazette:

The Woodlawn wreck on the New York Central last February can only be explained as being due to a violation of the fundamental principles of mechanics: (1) in the design of the New York Central electric locomotives and (2) in the application of the brakes when

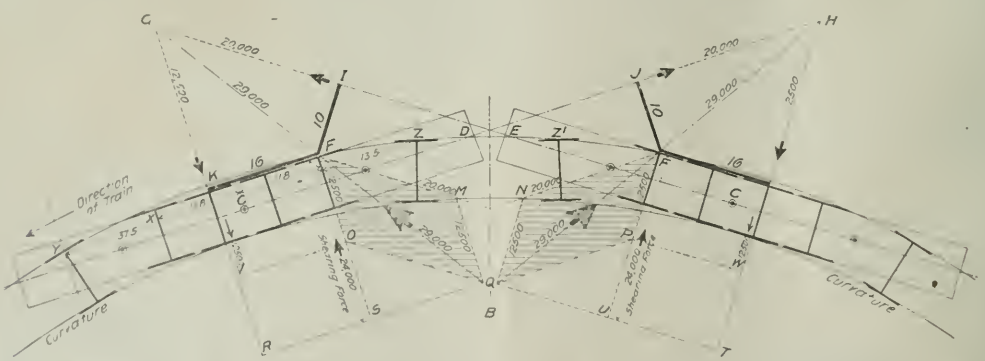


Fig. 1.—Diagram of Forces Acting to Derail Electric Locomotives When Rounding a Curve with Brakes Applied.

rounding a curve. When running around a curve at high speed with brakes applied, large buckling forces are set up throughout the train, acting obliquely to each other at every coupling, but the direct cause of the derailment was the forces set up in the first engine. Centrifugal force played only a small part—so small as almost to be ignored when compared with the powerful leverage exerted by the first engine tending to force the rails apart and to shear the spikes, due to the short, rigid wheelbase and the long, projecting rear and fore parts which were actually made all the more dangerous by the use of spring-centered pony trucks. In rounding the curve these pony trucks are always tending to derail each other and to break the locomotive in two. A similar accident can happen at any time if the same mistake is made on the part of the driver.

Referring to the diagram, Fig. 1 represents an exaggerated curve with two locomotives shown thereon. When rounding the curve the driver applied the brakes on the train, with the result that an enormous buckling force was set up at the coupling between the first and second locomotive acting in the direction I. G. This

oblique force tended to revolve the first locomotive about the center of moments, F. The rigid wheelbase became cramped and binding hard against the inside and outside rails greatly increased the retarding force on the first locomotive and simultaneously increased the effect of the momentum of the following locomotive and cars acting in an oblique line. When this force, I G, became sufficiently great it caused the rear trailing truck of the first locomotive, the second locomotive and the first coach to be derailed to the outside and at the instant of the derailment increased the binding on the rigid wheelbase enormously, due to the velocity with which the rear driving wheel of the first locomotive was thrown against the outer rail. At this instant the spikes holding the rails were sheared by the enormous wedging force exerted on them by the rigid wheelbase. The action of these forces and their result was of course, almost instantaneous, but it seems to be pretty well established that the driver partially released his brakes when he felt the train riding roughly behind him and again applied power. The effect of this was to straighten out the two locomotives and pull the second or derailed one to the inside, leaving its front pony truck on the track. No forces other than these could have produced the effects, which are a matter of record.

The direction of the forces acting are shown on the diagram, the magnitude of the forces being assumed for purposes of demonstration. It is necessary first to determine the mechanical lever I F K constituted by the first engine. This is found by projecting the tangent, C. E., indefinitely and as F (the rear driving wheel of the first locomotive) is being pressed against the outer rail, that point becomes the fulcrum. Therefore, draw F. I. to and at right angles with the projected line, C. E. Then F. I. will represent one arm of the lever. The other arm is determined by drawing F. K. parallel with the tangent, extending it to the second driving axle, the inner wheel of which is bearing hard against the inside rail. The line F. K. represents the second arm. This enables us to resolve the forces exerted outwardly at both the inside and outside rails. Assume that 20,000 lbs. (it may be 60,000 or 100,000 lbs.) is exerted through C. E. at I. The ratio of the two arms, K. F. and F. I. is as 16 10, therefore the inward thrust at the second inside driving wheel, represented by K. V., is 16:10::20,000—12,500 lbs. To find the resultant outward thrust at F., which becomes the center of moments, draw F. O. equal to and parallel with K. V., then draw F. M. parallel with C. E. I., lay off on this line at any convenient scale 20,000 lbs. and complete the parallelogram F. M. Q. O. The diagonal F. Q. (29,000 lbs.) represents the magnitude and direction of the force exerted at F. on the outside rail. To find the square thrust of the rear wheel at F., draw Q. S. parallel with the tangent C. D. Completing the triangle, F. S. (24,000 lbs.) represents the square outward thrust against the rail at F.

To make the explanation still clearer, suppose the rigid wheelbase had been much shorter. The lever arm, F. K., would be shorter and more powerful. If, for example, the wheelbase was only 6 ft., no track construction yet proposed would be strong enough to resist the enormous shearing forces exerted.

The action of the second locomotive under the forces exerted was entirely different from that of the first locomotive. The tendency of the second locomotive was to be forced bodily outward without turning about its center of gravity so long as the retarding force of the first locomotive remained equal to the momentum of the following cars. The destruction of the train would have been even more complete had not the driver acted as he did in applying the power at the moment the train [illegible]. Whether he knew or did not know what the effect of this would be, [illegible].

In the foregoing no consideration was [illegible] to the [illegible] effect of centrifugal force. It [illegible] that if we consider the centrifugal force as acting through the center of gravity the resultant shear on the spikes of the [illegible] rail is much less than the centrifugal force set up by the locomotive, because the resultant of the centrifugal force and the weight of the locomotive even at high speed [illegible] without the angle of repose of the rail on the tie plate. The force exerted by the short wheelbase of the locomotive acting as a [illegible], however, acts as a direct shearing force on the spikes.

The lesson to be derived from the accident is obviously the danger of building a locomotive with a short rigid wheelbase and long overlap from the wheelbase to the couplings. Also the danger of applying the brakes when rounding a curve. The fact that two locomotives were placed at the head of the train was primarily responsible for the derailment because their long overlapping parts gave the buckling forces a much more powerful leverage than would have been the case with a coupling between the locomotive and a passenger car of the ordinary dimensions and construction. In rounding the curve the mechanical levers are constituted in every engine with the greatest effect at that point which becomes the center of moments—on the inside rail when the engine is pulling and the outside rail when the engine is retarding.

Before concluding allow me to correct Mr. G. R. Henderson, who in his article on "Moment of Inertia and Curvature" in your issue of June 7, says, in referring to the effect of a locomotive or car entering the curve: "Our attention was called to this by Mr. T. H. Brigg, but, as far as known, the writer is the first to work out the actual calculation of the amount of this force." It seems scarcely fair that opinions which I submitted to him, more or less in confidence, should have been published without my consent. If I did not present figures in his way I did in my own way, and these figures, together with diagrams illustrating my ideas, were compiled and copyrighted as far back as May. Furthermore, my views are not correctly implied by Mr. Henderson. I disagree with him that the rear driving wheel becomes the center of rotation, and also with his statement that the same forces are exerted in the opposite direction when an engine is leaving the curve and entering a tangent. The locomotive, when running around a curve, tends at all times to leave the curve at the tangent. The instant the curve ceases to affect its diverting force centrifugal force ceases and the locomotive continues on the tangent. If Mr. Henderson means by angular acceleration that the locomotive, once diverted to a curve, will in the slightest degree follow that curve of its own accord, he is mistaken.

T. H. BRIGG, C. E.

Union Pacific Gasolene Motor Cars.

The Union Pacific Railroad is operating at the present time four regular motor car services. A motor service has been in operation between Kearney and Callaway, Neb., a distance of 65 miles, since October, 1905. This car makes a round trip of 130 miles daily except Sunday. On the Leavenworth, Kan., branch a regular motor car service has been maintained since February, 1906. This car hauls a trailer for baggage, mail and express, and makes one round trip daily between Lawrence and Leavenworth, 34 miles. The services on the Beatrice branch, 40 miles, between Beatrice and Lin-

Union Pacific Gasolene Motor Car No. 10 Hauling Ten Empty Freight Cars.

coln, Neb., and on the Loup City branch, 39 miles, between Loup City and St. Paul, Neb., have been in operation since September, 1906.

There have been scarcely any interruptions in the services on these branches; in fact, the motor cars have performed so successfully that the Union Pacific is now arranging to increase considerably the use of these motor cars on branch lines. Twenty-two cars are now being built at the Omaha shops. They are a l-steel cars, of the latest design, having the round windows and side-door entrance, and equipped with the Union Pacific 200-h.p. engine.

Motor car No. 10, the first of this new order, has recently been tested out by Mr. McKeen, Superintendent of Motive Power of the Union Pacific and designer of the cars, who personally supervises their breaking-in as they are turned out of the shop. In one of the photographs this car is shown hauling 10 empty freight cars on a 0.5 per cent. grade, on July 29. The motor car demonstrated its efficiency by switching these cars back and forth. The car is not recommended for this sort of service, but this test showed the ability of the gasolene engine to start heavy loads. The driving wheels of the motor cars slip very readily, and it was only by the constant use of sand that the car with this load could be got in motion. The other photograph shows the car pushing a 40-ton coal car up a coal chute incline of 7.6 per cent.

Motor Car No. 10 Pushing a Loaded 40-Ton Coal Car Up a 7.6 Per Cent. Incline.

Secretary Taft's Columbus Speech.

In opening his own campaign as a presidential candidate at Columbus, Ohio, August 19, Secretary of War William H. Taft reviewed the present situation and spoke with great clearness about some of the new problems involved in corporation regulation. We quote the following paragraphs, believing that they add a much needed tone of conservatism to the discussions which are rife:

The opponents of the measure (the rate law) continue to denounce it, but now, instead of pointing out its disastrous effect, they say it is a failure and that in the year since its passage it has not helped a single shipper. They insist that the only effective and an all-sufficient law to regulate railroads is the Elkins act, passed in 1903, and that this is shown by the fact that all the prosecutions in which convictions have been had against railroad companies and favored shippers in the last two years have been under the Elkins act and not under the rate bill. Let us look into the facts in regard to this allegation. The chief prosecutions which have been instituted have been criminal indictments against the sugar trust and the Standard Oil Company and certain railroads and their agents and officers for taking and giving secret money rebates. They could not have been brought under the rate bill, because the acts prosecuted were committed before the passage of the rate bill.

It is true that these prosecutions were instituted under the Elkins act, but it is also true that had the Elkins bill never been passed the same acts could and doubtless would have been prosecuted as giving and receiving unjust discriminations against the persons committing them under the amendment to the interstate commerce act of 1889, which the Elkins law supplanted. The Elkins law was really an amendment to the interstate commerce act, enlarging and making more effective the procedure for prosecuting violations of the prohibitions of that law and describing them in more comprehensive form. It gave greater latitude in respect of the district where the offence would be prosecuted and it made the company necessarily responsible in a fine for the act of its agents, without other proof of direct complicity than the agency. Under the 1889 amendment, however, the individuals convicted could have been sent to the penitentiary, whereas under the Elkins act the punishment by imprisonment was taken away, while the fine was increased. The chief effect the Elkins law had on these particular prosecutions which have been given so much prominence was to make it easier to convict the corporation and to increase its fine but to save the guilty individual perpetrators from imprisonment.

In the rate bill Congress amended the Elkins bill and restored imprisonment as part of the punishment for secret rebates. Had the rebating and dishonest practices of the railroad companies and the trusts, been as clearly known to Congress and the public, when the Elkins bill was considered as they were when the rate bill was passed the Elkins bill would not have passed so smoothly.

Scope of Elkins Bill as Compared with Rate Bill.

I do not wish to decry the merits of the Elkins bill because, aside from its elimination of imprisonment as punishment, it is a most useful measure, but its scope is so narrow in respect of the regulation of railroads that it cannot be compared in importance of operation and effect to the rate bill. The increase by the rate bill in the powers of the commission in supervision, investigation, rate fixing and effective order making to prevent discrimination is great. Elaborate machinery for making it difficult to violate the law without discovery and for discovering violations when they exist and for affording affirmative and mandatory relief in requiring railroads to furnish equal facilities to all is found in the provisions of the new rate bill. Criminal prosecutions will continue to be under the Elkins law, but as amended by the new rate bill. This is because the Elkins law, as amended, contains the part of the interstate commerce legislation which prescribes the punishment for violations of the law and so, in ordinary practice, comes into operation after the violations have been discovered under the other provisions of the rate bill.

The rate law has not been in operation a year, and the beneficial results from its operations, though clear, are not ready to be presented in statistical array. Moreover, the chief benefit of the act is likely to be its influence in discouraging attempts to renew the old abuses and such benefits do not appear in statistics. The immediate effect of the act has certainly been to compel railroads to regard the commission now as the important tribunal whose views they must follow. They are manifesting every outward disposition strictly to comply with the law and to avoid prosecution or complaint. The time has gone by in which the action of the commission can be ignored or laughed at. The commission itself has taken up its duties with renewed energy, has proceeded, without awaiting the intervention of the railroads or the filing of complaints, to construe the act by administrative rulings in order to assist the railroads in complying with the law. With the large powers for correcting evils which the commission now has we may reasonably expect a marked improvement in the conduct of the railroads of the country.

Court Review.

Mr. Bryan contends that the law was greatly weakened in authorizing, or recognizing, judicial intervention to restrain the orders of the commission. This criticism has not the slightest foundation. There can be no judicial appeal in the nature of a complete review on the merits from the commission to the Supreme Court or to the Circuit Court of the United States, for the commission is not a court of first instance, but only a mere administrative tribunal. The only power a federal court could validly exercise would be to decide first, whether the administrative tribunal had followed correctly the limitations upon its course of action imposed by the act of Congress creating it; and, secondly, whether its order taken as an authorized expression of the legislative power deprived the railroad company of its right, under the Fourteenth Amendment, to derive a fair profit from the use of its property. Whether the federal courts were expressly given this power in the law or not, they would have had it under their general jurisdiction. If their power had not been recognized and a purpose of Congress had been expressed to prevent an appeal to the courts, the law would have been invalid. The extent of the judicial remedy could not be either diminished or enlarged by Congressional action, with due regard to the validity of the act. Congress was wise, therefore, in not attempting to define what the court should or should not do, and in merely recognizing the right of the companies to appeal to

the federal courts to test the validity of the action of the commission. No victory was gained by either the conservative or the radical party in this regard.

AMENDMENTS TO THE RATE BILL NEEDED.

The rate law does not go far enough. The practice under it has already disclosed the necessity for new amendments, and will doubtless suggest more. Such is the true method—the empirical and tentative method—of securing proper remedies for a new evil. The classification of merchandise for transportation is a most important matter in rate fixing; for by a transfer from one class to another the rate is changed and may work injustice. With the power of rate fixing it would seem should go the power in the commission to classify and to prescribe rules for uniform classification by all railroads.

Recent revelations have emphasized the pernicious effect of the so-called over-capitalization of railroads which aids unscrupulous stock manipulators in disposing of railroad securities at unreasonably high prices to innocent buyers. This evil would not of itself justify federal restraint or control, because such stock and bonds are usually issued under state charters. The practice, however, has a tendency to divert the money paid by the public for the stock and bonds which ought to be expended in improving the roadbed, track and equipment of railroads into the pockets of the dishonest manipulators and thus to pile such an unprofitable debt upon a railroad as to make bankruptcy and a receivership probable in the first business stringency. This result in an interstate railroad necessarily interferes with and burdens interstate commerce and justifies the exercise of the regulative power of Congress to stop the practice. A railroad company engaged in interstate commerce should not be permitted, therefore, to issue stock or bonds and put them on sale in the market except after a certificate by the Interstate Commerce Commission that the securities are issued with the approval of the commission for a legitimate railroad purpose. The railroads that are honestly conducted would accept the certificate of the commission as a valuable one in the markets of the world, and only railroad stock manipulators who look to the floating of watered securities as their best source of profit would have reason to complain.

A much used means of eliminating competition among interstate lines serving the same territory is the acquisition by one company of the stock in another and the election of directors to represent that stock. This process is facilitated by the uncontrolled power to issue securities beyond the needs of the company for its legitimate business and would be curbed by the restriction proposed. The evil ought further to be directly restrained by making it unlawful for an interstate railroad to acquire stock in a competing line. This is a simpler remedy of meeting the evil than by recourse to the anti-trust law under the Northern Securities case. In addition to this, competing lines should be prohibited from having common directors or officers.

These suggestions of additional legislation in respect to the supervision and control of interstate railroads have been made by the Interstate Commerce Commission, and I heartily concur in them. They are plainly within the federal jurisdiction under the interstate commerce clause. I do not think that in order to accomplish a good which the federal government with its greater resources and wider geographical reach can bring about more quickly and efficiently the constitutional limits upon federal action should be blurred out or an undoubted federal power should be expanded by doubtful construction into a field which really belongs to the state. But the right of Congress to take any action, not confiscatory, in the most rigid control of interstate commerce cannot be denied.

The measures taken and proposed are radical perhaps, viewed from the standpoint of the *laissez faire* doctrinaire whose ideas have been allowed to prevail in respect of railroad management down to the present; but no one can read the report of the commission on the history of the union of the Southern Pacific and Union Pacific systems with the Illinois Central system without trembling at the enormous power that one man, by the uncontrolled use of the stock and bond issuing power of interstate railroads under state charters, has acquired in respect of a vital power of the country's business and without looking for some means of remedying such a dangerous tendency which, if not stopped, will lead to the absorption of all the railroads of the country into one hand.

RATE BILL NOT SOCIALISTIC.

The contention on behalf of the railroads, already noticed, that such supervision as the rate bill and these suggested amendments afford is socialistic and tends to government ownership is utterly without basis. Efficient regulation is the very antidote and preventive of socialism and government ownership. The railroads until now have been permitted to wield without any real control the enormously important franchise of furnishing transportation to the entire country. They have constructed 230,000 miles of road. In certain respects they have done a marvellous work and have afforded transportation at a cheaper rate per ton, per mile and per passenger than in any country in the world. They have, however, many of them, shamelessly violated the trust obligation they have been under to the public of furnishing equal facilities at the same cost to all shippers. The watering of stock and bonds and the over-capitalization of some of them for the profit of their managers have prevented the needed improvement of their railroads in construction and equipment. The tremendous demand for increased facilities due to the enormous growth of business shows the inadequacy of their equipment and construction. While they might not have been expected to meet in full such an extraordinary demand the obligations some of them have assumed in the form of stocks and bonds leave no doubt that had the money they represented been put into the roads in good faith the shortage of cars and equipment and inadequacy of roadbed and track would not be so great. They discharge a public function. They have been weighed in the balance and found wanting. The remedy for the evils must be radical to be effective. If it is not so then we may certainly expect that the movement toward government ownership will become a formidable one that cannot be stayed.

OPPOSED TO GOVERNMENT OWNERSHIP.

I am opposed to government ownership.

First, because existing government railroads are not managed with either the efficiency or economy of privately managed roads and the rates charged are not as low and therefore not as beneficial to the public.

Second, because it would involve an expenditure of certainly twelve billions of dollars to acquire the interstate railroads and the creation of an enormous national debt.

Third, because it would place in the hands of a reckless executive a power of control over business and politics that the imagination can hardly conceive and would expose our popular institutions to danger.

The supervision proposed need not materially reduce the legitimate operation of individualism in railroad enterprise. It will indeed limit the opportunity to accumulate enormous fortunes through overcapitalization or secret rebates, but the legitimate profit which comes from close attention to operation, to efficiency of service and economy in details and from broad conceptions of new methods of reducing cost without impairing the service will not be disturbed in the slightest. There is no attempt to take away the property of the railroad companies; there is no furnishing of public money to the enterprise and no public officers are required to administer the property. There is no more attempt in this law to make transportation a government business than there is in the national banking act to making banking a government business.

SANCTION OF RATE AGREEMENTS.

The movement of competing railroad companies to consolidate arose originally from fear that the anti-trust act forbade them to make agreements as to uniform tariffs. If they were now permitted to make such agreements subject to the approval of the Interstate Commerce Commission such a tendency would lose much of its force. It is impossible to prevent competing railroads from seeking to make their tariffs uniform in order to prevent an unending and disastrous tariff war, and though such agreements are against the law it is perfectly apparent that tacit arrangements for uniformity exist. These arrangements do not prevent the operation of competition from time to time, as one company finds that it may acquire new business without loss by a reduction of rate and insists on it, but they do prevent a tariff war which helps neither the public nor the railroad by violent fluctuations in rates. As the public now asserts the right to fix maximum rates and thus to eliminate one phase of competition, it is logical to permit an agreement on rates, if approved by the Interstate Commerce Commission, tribunal appointed to fix rates. The President and the commission both recommend a provision permitting such agreements. In this way there would be restored that respect for law which many railroad men in the last decade seem to have lost. Moreover, every company under such a system would be a policeman to see to it that every other company obeyed the agreement and the law and strictest obedience would be secured.

PHYSICAL VALUATION.

Mr. Bryan is most insistent in discussing rate regulation that the present physical value of all roads in the country should be ascertained for the purpose of fixing rates by allowing to the railroad companies only a fair profit on such valuation. Whenever the Interstate Commerce Commission deems it important as an aid in fixing rates to determine what it would cost now to rebuild any railroad it has complete power to do so, but it would doubtless be found in respect to most of them that in spite of overcapitalization and lack of economy in construction, land for terminals and right of way and the cost of construction have increased so enormously that the total of their securities upon which they pay dividends and interest is not much if any in excess of present physical value. More than this, physical valuation, as the President pointed out in his Indianapolis speech, and as the Supreme Court had in effect said before him, is only one of a number of data to be considered in reaching what is a fair profit upon the investment; and in determining a particular rate, the proper relation between that rate and the total net profit of operation is so complicated with an infinite variety of other circumstances that it is most difficult

in rate fixing to use the latter to affect the former. The importance of fixing rates, complained of as too great in and of themselves, is much exaggerated; for the overwhelming evidence is that on the whole, rates in this country, especially as compared with those of all European railroads, many of which are owned and operated by the government, are low. The chief evil consists in unjust discrimination in rates between individuals and localities. I do not object to valuation, if thought relevant to any issue, but I merely deprecate the assumption that it is to be the chief means of a great reform in rates.

SAFETY REGULATIONS.

The frightful loss of life and limb among the railroad employees of this country, reaching more than 4,000 killed and 65,000 injured in one year, has properly attracted the attention of Congress and the legislatures. It makes apparent that service in connection with trains of a railroad is an extra hazardous business and may well call for government supervision and exceptional rules to secure the safety of the passengers and reduce the danger to employees. Congress, years ago, passed stringent laws for the adoption of safety devices to protect both employee and passenger on interstate railroads. With the same purpose it has recently limited the hours of continuous service for which employees on such railroads may be engaged.

Finally, it has regulated the rules for the liability of an interstate railroad company to an employee injured in its service. This is an important measure, for an unfortunate lack of uniformity has existed heretofore in respect to the rules of liability in such cases, dependent on the court in which the case has been tried. The new statute makes everything uniform as to interstate railroads. It has introduced into federal law what is called the comparative negligence theory by which if an employee is injured proof of negligence on his part does not forfeit his claim for damages entirely unless the accident was due solely to his negligence. If there was negligence by the company, the jury is authorized to apportion the negligence and award compensation for the proper part of the damage to the employee, and the question of negligence is always for the jury.

ABOLITION OF FELLOW SERVANT RULE.

The most important provision of this law, however, is that abolishing what is known as the fellow servant rule, by which an employee injured cannot recover from his employer for injury sustained through the negligence of a co-employee. This rule was incorporated into the law by Chief Justice Shaw, of Massachusetts, on the ground of public policy. It was acquiesced in by the courts of England and of this country. Whatever may have been the wisdom of the rule originally, a change of conditions justifies its abrogation. Public policy can be changed by statute, so that this exemption from liability is not secured by the Constitution to the railroad companies. The abolition of the exemption certainly furnishes a strong motive to the railroad companies for the exercise of greater care in the selection, supervision and control of all of their employees, which tends not only to the safety of their employees but also to the safety of their passengers.

With these changes all claim by employees against railroad companies except in a few extreme cases will doubtless be settled by the railroad companies without litigation, just as they now settle without suit substantially all claims for injuries to passengers. The validity of this law is under consideration by the Supreme Court. The only serious doubt in regard to its constitutionality grows out of some carelessness of language in limiting its application to interstate railroads, and therefore even if the present law should fall, there will be no difficulty in re-enacting it in proper form.

South Boston Coaling Station of the New York, New Haven & Hartford.

A construction view and description of the large coaling station being built for the New York, New Haven & Hartford at Northern avenue and B street, South Boston, Mass., was given in our issue of March 15. The station has been finished and a view of it is shown herewith. It is 1,071 ft. long, divided as follows: Main storage pocket, 379 ft.; wharf, 480 ft. long, carrying trestle 20 ft. wide and 30 ft. high containing shipping bins, and between main pocket and wharf a steel bridge of 175 ft. span and 40 ft. of trestle. An endless cable railway extends from end to end of the structure. The two Mead Morrison, Boston type unloading towers, which traverse the entire length of the wharf, are unloading a vessel in the view. They discharge into the cars of the cable railway, and these empty into the shipping bins or carry the coal to the main storage pocket, as desired. The shipping bins occupy 250 ft. of the central part of the trestle and have capacity for 500 tons. They discharge directly into trains of gondola cars. The main storage pocket has capacity for 13,000 tons. The capacity of the unloading towers is 150 tons per hour each, and of the cable railway 300 tons per hour.

There is a power house containing 250 h.p. of boilers, a cable road engine, pump etc., and in the main pocket the necessary power equipment for driving the elevators and conveyors it contains. The plant was designed and built by Roberts & Schaefer Co., Consulting Engineers and Contractors, Chicago.

Panoramic View of South Boston Coaling Station; New York, New Haven & Hartford.

The Tidewater and the Deepwater Railways.

II

VIADUCTS AND BRIDGES

In the first article of this series attention was called to the heavy viaduct work that is required all along the line, especially on the Deepwater section. Viaducts are used, not on account of the large streams that have to be crossed, but because they are cheaper than the excessively high fills that would otherwise have to be built, though the latter are sometimes used, as in the case of the one at Micajah's Gap, illustrated in the first article on page 345 of the *Railroad Gazette* of March 15.

Three-Story Wooden Trestle; Deepwater Railway.

As in the case of the smaller openings of drains and culverts, the general type of the viaduct structure has been standardized so that the work of designing individual pieces has been greatly simplified. Ordinarily the viaduct is formed of 30-ft. towers with 60-ft. spans, with the legs of the former carried on concrete piers. The same care has also been taken in the standardization of the wooden trestles that are used at the northern end of the Deepwater section, and which were put in before it was decided to use steel at all such points. In the review of the line, that has already been published, the places where high trestles are used were mentioned, and two of these on the section of the line already in operation are shown in the accompanying illustrations. Both of these are upon curves, one a three- and the other a five-story structure; the latter was located about $1\frac{1}{4}$ miles north of Harper, and was 112 ft. high, but has recently been filled in.

The standardization of these trestles consists in the establishment of designs for the bracing and the heights of the bents. The standard in itself applies only to bents of 32 ft. or less, and the characteristics are the same for all above 18 ft. in height. One uniform batter of one in five is used for all bents, and, where they are less than 18 ft. in height, single bracing may be used as in the illustration of the 17-ft. bent. Where the height is greater than 18 ft. intermediate horizontal braces are used as shown in the illustration of the 21 ft. bent. The greater heights differ only in the length of the posts and sills, both increasing with the height. Where the bents rest upon a rock foundation they are carried on subsills; in all other places they are supported on piles or piers. The dimensions of posts and sills are 12 in. x 12 in., the bracing is of 3 in. x 10 in., and the caps of 12 in. x 14 in. x 14 ft. long for all bents. The superelevation of the outer rail on all curves up to 2 deg., is taken care of by dapping the ties. Above 2 deg. it is taken care of in the [illegible] and [illegible] [illegible] in the square timber trestles and in the piles in pile trestles. The amount of superelevation is fixed at [illegible] in. per degree of curvature up to 8 deg., beyond which it is constant.

The longitudinal bracing of trestles is cared for by erecting the bents of single-deck trestles in 14-ft. towers measured between centers of posts, with a 14-ft. span between the bents. The towers are braced with diagonal braces only up to a height of 18 ft., beyond which horizontal braces are inserted as shown in the picture. Where more than one deck is used a [illegible] bracing is put in between the towers, as shown in the reproductions of the photographs.

There are no timber trestles south of the first 40 miles at the north end of the Deepwater section. Beyond this steel only is used. The general type of the steel viaducts and bridges has also been reduced to a standard to assist not only in the duplication of parts for different structures, but also for the sake of maintaining uniformity in the work.

The regular system is to erect the bents in towers and connect them by plate girders whose span is twice the width of the towers. Usually the tower width is 30 ft. and the span between 60 ft., though, in some of the larger structures, the dimensions are raised to 40 ft. and 80 ft. respectively.

A typical example of this viaduct construction is given in the details of the one over Black Lick creek at milepost 453. It is formed of two 30-ft. towers at each end, connected by 60-ft. spans, and four 40-ft. center towers with 80-ft. spans, to which must be added two 45-ft. spans carried by a single bent, making a total length of 910 ft. between abutments. The height of the base of the rail is 179.17 ft. This viaduct is on a tangent and grade of 0.4 per cent., and is shown in outline in the engraving. A general outline of the towers is also given in the engraving of the highest one. The posts have a uniform batter of 1 in $5\frac{3}{4}$ regardless of the height. These posts are formed of four 4-in. angles and three plates. For the lower ends of the columns the thickness of the web plate is ⅝ in., while it is but ⅜ in. at the top. In the same manner the thickness of the metal of the angles decreases toward the top, from ⅝ in. to ⅜ in. For the diagonal bracing the same weight of angle is used for each bent, and measures 5 in. x $3\frac{1}{2}$ in. x ⅜ in.

Five-Story Wooden Trestle; Deepwater Railway.

All structures of this class that are erected are proportioned to carry, in addition to the weight of the structure, which is estimated at 450 lbs. per lineal foot of each track, a live load on each track, consisting of two (Cooper Class E 50) engines, coupled and followed by a uniform train load of 5,000 lbs. per lineal foot, as

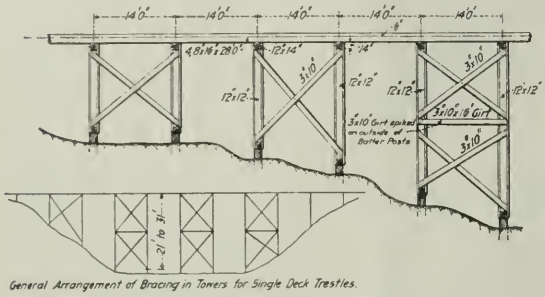
shown on the diagram. Then, in proportioning the members of the structure, the minimum strains from this live load are increased for the effect of impact, vibrations, etc., by the amount given by the formula:

$$I = S\left(\frac{300}{L + 300}\right)$$

in which

I = effect of impact.
S = maximum live load strain.
L = loaded length of single track in feet, producing live load strain.

Liberal allowances are also made for the wind pressures. These are taken at 30 lbs. per sq. ft. on the exposed surface of the entire



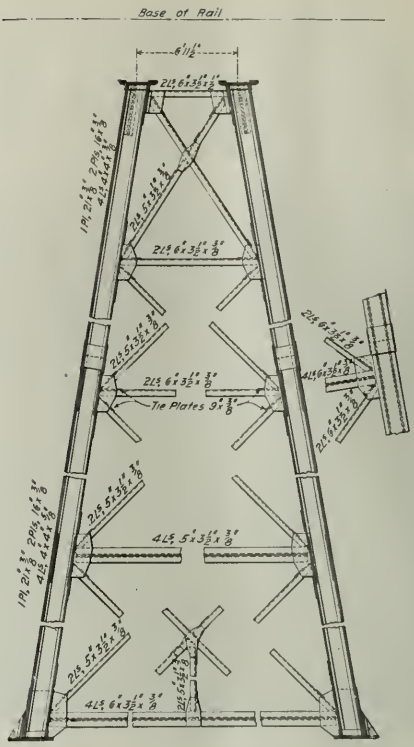
General Arrangement of Bracing in Towers for Single Deck Trestles.

Longitudinal Bracing, Single Track Trestle.

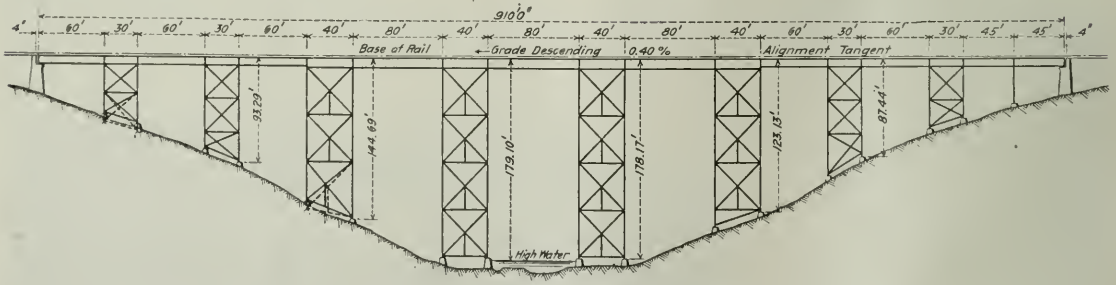
structure, as seen in elevation, in addition to a train of 10 ft. average height, beginning 2 ft. 6 in. above the base of the rail and moving over the bridge; and also at 50 lbs. per sq. ft. on the exposed surface of the entire loaded structure, as seen in elevation.

In the determination of the requisite anchorage for the loaded structure, the trains are assumed to weigh 8,000 lbs. per lineal foot.

As many of the viaducts and bridges along the line are located on curves, provision for the additional effect of centrifugal force was also incorporated in the specifications. This is based on the effect of as many trains as there are tracks, and is calculated by



Details of Black Lick Creek Viaduct.



Viaduct over Black Lick Creek; Deepwater Railway.

a simple formula and added to the live load strains. This formula is:

C = .02 W D for curvature up to 5 degrees,

in which

C = centrifugal force in pounds.
W = weight of train in pounds.
D = degree of curvature.

Where the curvature is sharper than 5 deg., the coefficient .02 is reduced by 0.001 for each degree above five.

Variation in temperature to the extent of 150 deg. Fahrenheit is also provided for.

Finally, all parts of these standard structures have been so proportioned that the sum of the maximum live and dead loads, together with the impact, shall not cause the tensile stress to exceed 17,000 lbs. per sq. in; while, in compression members, the permissible stress of 17,000 lbs. per sq. in. is reduced in proportion to the ratio of the length to the least radius of gyration of the section by the formula:

$$p = \frac{17{,}000}{1 + \frac{l^2}{10{,}000\ r^2}}$$

in which

p = permissible working strain per sq. in. in compression.
l = length of member in inches between centers of connections.
r = least radius of gyration in inches.

To this is added the proviso that no compression member shall have a length exceeding 100 times its least radius of gyration, except lateral struts, which may have a length not exceeding 120 times the least radius of gyration.

The specifications under which the bridges and viaducts are

Standard Diagram of Train Loads; Deepwater and Tidewater Railways.

built also include not only the physical but the chemical properties of the metal to be used. These requirements are as follows:

	Bridge steel.	Rivet steel.
Maximum phos. basic, per cent	0.04	0.04
" phos. acid, per cent.	0.08	0.04
" sulphur, per cent.	0.05	0.04
Desired ultimate strength in lbs., per sq. in.	60,000	50,000
Minimum elongation in 2 in.	22 per cent.	

In this there is no specification as to carbon, that being left to the manufacturer.

These are the main features of the specifications under which the bridge work has been done, and apply to all of the work on the line as well as that of the Black Lick viaduct with which they are especially associated here.

In the plate girders there are two lengths used in the standard structures of 60 ft. and 80 ft. respectively. The 60-ft. girder has a depth of 72½ in. at the ends and is built up with a ⅜ in. web. At the top two extra cover plates are used, 29 ft. and 40 ft. long respectively, and at the bottom in addition to two of [illegible] length, there is one of 48 ft. The 80-ft. girders have a depth of 96½ in., have a ⅜ in. web and cover plates of the same arrangement as the 60-ft. girders, except that they are 36 ft., 52 ft. and 64 ft. long respectively.

Bridge 68; Deepwater Railway.

The piers for the viaduct towers are of a rich concrete (1-3-6) in which the broken stone varies from 1½ in. to 6 in. in diameter. Great care has been exercised in the construction of all of these piers to see to it that the foundation is of a proper character to carry the load, and the specifications for the Portland cement that is used are very rigid.

What has been said of the viaducts applies with equal force to all other bridge construction, and the matter has been taken up in this detail in order to show that the thoroughness that characterized the surveys and other work, as set forth in the first article, has been carried in the details of the execution. This again means the execution of work with the courage of one's convictions, for a great portion of this fine viaduct work is hidden away among the mountains of West Virginia on the Deepwater section of the line. What the character of this country is, is shown in part by the reproductions of the photographs. The concrete work and the construction of the pedestals was done on the steep slopes of the mountain hollows of which those for the bridge at Herndon, known as No. 70, may be taken as typical examples. Naturally, too, in such a rough country, where the grade is so strictly limited, it frequently happens that the viaduct must be on a curve of greater or less radius. This occurs with some frequency north of the passage of Micajah's gap, as shown by the pictures of bridges Nos. 65 and 66. It will be noticed, too, that in all of these heavy viaducts, provision has been made at the tops of the towers for double tracking, though only the single track has yet been laid. This is done in the expectation that as soon as the road is opened, the coal traffic will develop so rapidly that it will only be a matter of a short time before the second track will be required; hence provision has been made, regardless of present cost, to meet that requirement when it comes.

It is needless to show the profile and outline of more than one of these viaducts, as they are all of the same character, differing only according to the profile of the valleys which they cross and in height and number of spans.

The construction is carried on from the north. The road is opened for traffic to Mullens, and beyond this the grading has been completed on to Matoaka, and the viaducts are following rapidly

Pedestals of Bridge 70; Deepwater Railway.

Bridge 65; Deepwater Railway.

As soon as one is erected, the rails are laid on to the next opening and construction begun immediately, sometimes with an interval of not more than from 24 to 48 hours.

After the passage of Clark's gap the road enters a more open country, though this can only be said of it in comparison with that lying to the north, and finally it reaches a branch of the Norfolk & Western north of Matoaka. It follows this road as far as Rock, at which point there is a high viaduct, and in the meantime crosses it. The character of the foundations for the crossings at Widemouth creek and Matoaka are well shown by the engravings.

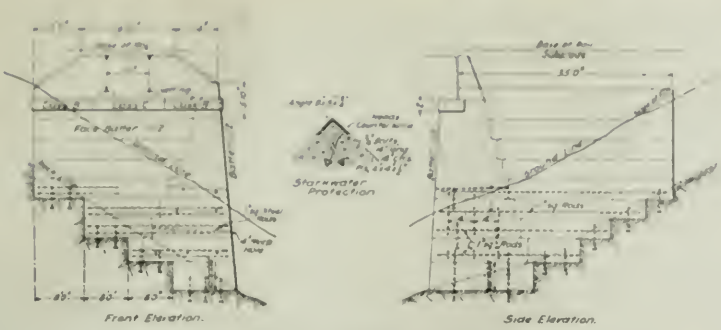
The same features are characteristic of the bridge as well as the viaduct work. There are some notable examples of bridge work along the line, of which the most remarkable is that of the New river bridge at Glen Alen. Reference has already been made to the spectacular features of the location of this bridge in the previous article, where, abandoning the first location that followed the bend of the East river, crossed the New river at right angles to the flow of that stream, about 45 ft. above the water, it strikes through a bluff on the south shore and runs in an air line diagonally across the river at a height of 122 ft. above the low water line to a bluff on the other side that marks a bend in the stream. The character of this leap is but faintly shown by the photograph of the location in which the camera was located near the site of one abutment, and the location on the opposite shore is marked by the black line which shows the path trodden by the engineers in running through a cornfield and up the slope to the bluff that road is to round and follow.

The outline of the bridge is shown in the engraving, and will there be seen to consist of two approach spans at the east end of 57 ft. 8 in. and 60 ft. respectively, carried by a single bent, followed by eleven 60-ft. tower spans; then five river spans of 136 ft. each, a span of 125 ft over the Norfolk & Western Railway, ending in two spans of 60 ft. and 51 ft. 8 in. respectively. The 60-ft. spans are of the plate girder type and identical with the standard viaduct construction and are carried by 30-ft. towers as already described. The river spans are trussed and designed especially for this work, and are carried on concrete piers. Owing to the diagonal location of the bridge above the stream these piers stand at an angle of 55½ deg. to the center line of the tracks, and No. 1, or that nearest the west bank of the river, is illustrated as typical of the whole. It rises to a height of nearly 62 ft. above the extreme high water, and is carried down to rock beneath the bed. As the total rise of water in the river at this point amounts to 25½ ft., with a very swift current, there must be an ample provision for starkwater protection. From the high-water level to the rock is about 33½ ft., so that the latter is but 8 ft. below extreme low water and 6 ft. below the bed of the stream. The starkwater protection rises 2 ft. above extreme high water and is provided throughout its whole height with a steel fender made of an 8 in. x 8 in. x ¾ in. angle anchored to the concrete by ¾-in. bolts 14 in. long. The whole pier is formed of what is known as the standard class B concrete of the road set in a batter of ¾ to 12 on all sides except on the broad sides of the upper part where it is ½ to 12. This class B concrete is 1-3-6 Portland cement mixture and is used for retaining walls and bench walls of arches, abutments and other similar places. The specifications for this class of concrete also permit the use of irreg-

Bridge 66; Deepwater Railway.

Bridge Piers at Matoaka, W. Va.; Deepwater Railway.

Piers for Widemouth Creek Crossing, Bridge 78; Deepwater Railway.



Abutments of New River Bridge; Tidewater Railway.

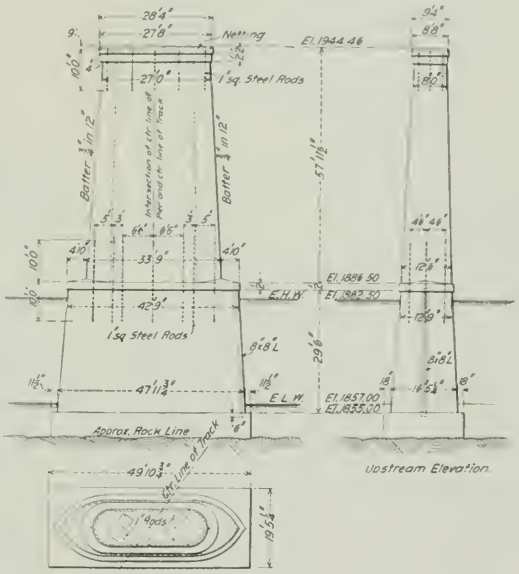
Elevation of Deck Girder Bridge over New River; Tidewater Railway.

ular shaped rubble stones of sizes not exceeding 1¼ cu. ft. to be laid in each course of concrete, provided they are so arranged that spaces of at least 12 in. are left between adjacent stones, which spaces must be thoroughly filled with concrete. An exception to this is made in the case of concrete that is deposited under water, where the use of rubble stones is not permitted.

While the class B concrete is used for the main body of the

Matoaka, W. Va., Showing N. & W. and Deepwater Railways.

pier, one that is much richer and known as the class C is used for the coping. This is a Portland cement (1-1-2) mixture and is used for copings, pedestals and bridge seats. In laying this the top surface is floated and rubbed smooth and hard and true to grade and line, and is tied together by wire netting. In case it is to be called upon to sustain an extra heavy concentrated load it is reinforced by I beams or rails so embedded as to distribute the stresses. In



Piers of New River Bridge; Tidewater Railway.

Site of Bridge over New River; Tidewater Railway.

This reinforcement consists of 1 in. straight square steel rods 20 ft. long and 20 in number. Reinforcement is also used between the coping and the pier, in addition to the netting used near the top of the coping itself.

The abutment of the bridge, of which the drawings of the one at the west end are reproduced are built of the same materials and in essentially the same manner as the piers. The slope of the natural surface of the rock at these points renders stepping necessary, and this is done in order to secure a horizontal footing for the concrete. The reinforcing is also somewhat different, and it will be seen that the lower courses are anchored to the rock and that each succeeding course is anchored to the one below it. The anchors to the rock are of steel 1 in. square, and extend 18 in. into the same and are leaded and rise 24 in. into the concrete. The horizontal reinforcing is placed in each course up to the highest step in the rock and runs in two directions at right angles to each other the longitudinal rods being placed near the top and bottom of each course on 4-ft. centers with those at right angles to them between with a

vertical distance between the several rows of 12 in. Weep holes are also carried from the back to the front on an incline to provide drainage, as shown.

The roadbed immediately back of the abutment is made 16 ft. wide with a gradual increase to 18 ft.

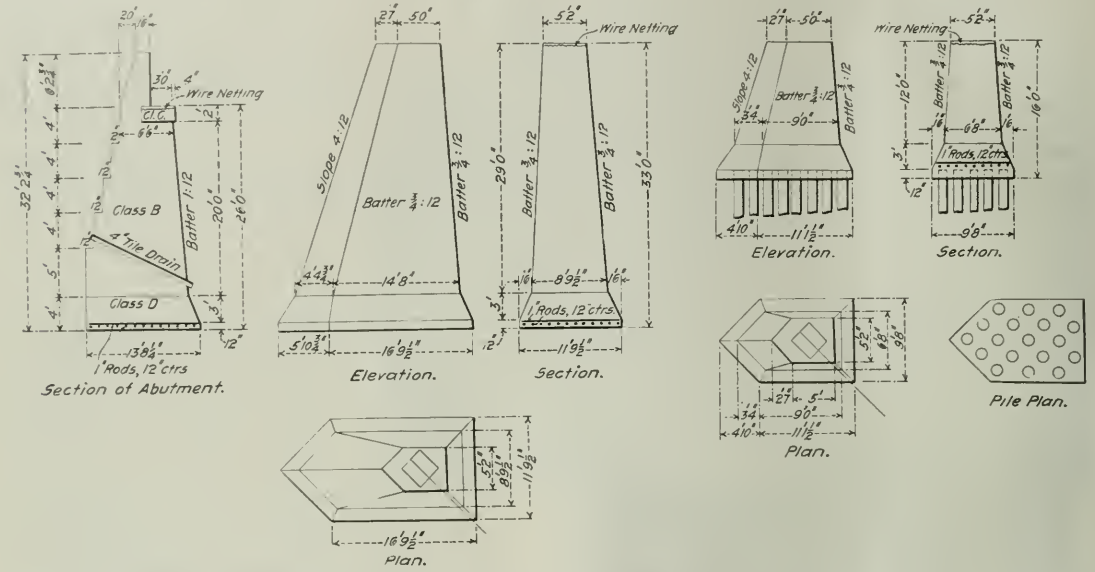
While the New river bridge is, perhaps, the most interesting on the line owing to the boldness of its location, there are a number of others that are possessed of interesting engineering features.

One of these is that over Falling river and the Norfolk & Western Railway at Brookneal, about 174 miles from Sewall's Point. This is a tangent structure with an approach over a 5 deg. curve from the east. It has a total length between back walls of 1,650 ft. 8 in. and consists of two 45-ft. spans at the eastern end followed by fourteen 60-ft. spans, then one of 90 ft.; one of 50 ft. and two of 45 ft., or 20 spans in all. These are supported by the usual 30-ft. towers of the standard type already described, with the exception of the short spans at the ends, where single bents are used. The usual plate girder is used for all spans, and the grade has a rise of 0.16 per cent. from west to east. The structure comes more probably perhaps under the classification of a viaduct in that it crosses, for the greater portion of its length, over the flats at the east of Falling river, though one small stream is crossed. These flats are, however, subject to overflow, so that the pedestals are carried well up above the ground and high water mark. The tops of these pedestals are set about 61 ft. below the base of the rail, and the latter is about 80 ft. above extreme low water in Falling river. Borings were made along the center of the structure, and the rock was found to average from 8 ft. to 13 ft. below the surface, though at the edge of the river borings were run down 21 ft. without finding rock. In places where the depth of the rock was excessive the pedestals were set on piles. Where this was done they were driven in nests of 16 on 2-ft. 6-in. centers, and their tops extended up into the pedestals for 12 in., as shown, and the first layer of reinforcement was 6 in. above that. This rule applies to the ordinary pedestals away from the river, but in the case of the bent at the water's edge, where the pedestals stand at an angle with the center line of the bridge, they are given a starkwater protection and the pile plan is that shown.

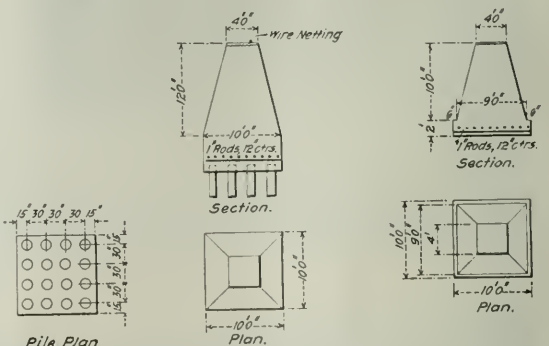
As in the case of the New river bridge piers, the class B (1:3:6) concrete is used for the pedestals, with a wire netting reinforcement near the top and bottom. The batter used is ¼ to 1, and the sizes of the pedestals vary with the height to which they are carried in order to raise the foot of the tower above high water.

The abutments for this bridge may be taken as example of the standard type of this structure used all along the line. In it the class B concrete is used for all of the wall and upper portion, with the exception of the seat, which is class C. It rests on a foundation of a somewhat poorer mixture. This is 1-4-7½ Portland cement concrete and is used for foundations only. As in the case of the class B, the use of rubble stones not more than 1¼ cu. ft. in volume is permitted, provided a spacing of 12 in. well filled with concrete is allowed, and none used in that deposited under water. Such foundations are usually reinforced with 1-in. square steel rods set near the bottom on 12-in. centers.

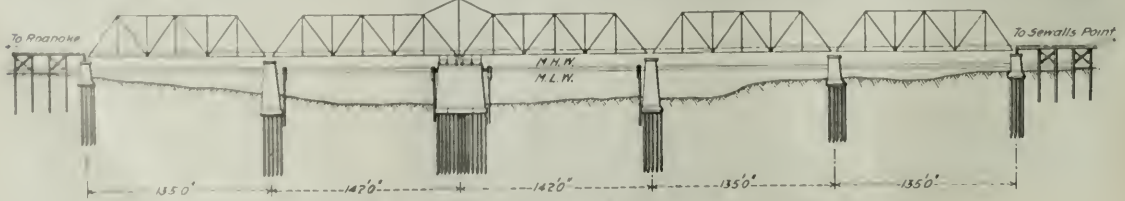
These abutments are provided with drains formed by 4-in. tiles set in the body of the concrete and dropping sharply down from



Masonry Details of Bridge over Falling River and Norfolk & Western; Tidewater Railway.



Masonry Details of Bridge Over Falling River and Norfolk & Western; Tidewater Railway.



Elevation of Drawbridge over South Branch of Elizabeth River; Tidewater Railway.

the back to the front. On the front face there is a batter of 1 in to the foot, and the back of the wall is stepped as shown.

The back filling at all abutments is of cinders or other porous material, and the back face of each wall is waterproofed. This consists of five-ply No. 28 tar roofing felt, mopped together with straight run coal tar pitch.

At the front the slopes are well rip-rapped, and this is also done at any pedestals where it is considered that there is any liability to washing.

Finally, on reaching tidewater, the road crosses two navigable streams as it swings around the outskirts of Norfolk in its approach to Sewall's Point. These are the southern and eastern branches of the Elizabeth river. Here at the edge of the Great Dismal swamp the soil is a soft alluvial deposit where dredging can best be done by pumping, and where the bearing capacity is below that which would be required for carrying the foundations and piers of a heavy railroad bridge. These are, therefore, carried on piles cut off well below the bottom line of the river, and on them a cribwork is built and above it the concrete piers for span and drawbridge supports. They do not differ in the general features of construction from those of the New river bridge already described except in the details of the dimensions.

The superstructure of the bridge over the western branch is shown in outline. It is a double track, through, riveted girder construction, and has the same general appearance as the other work along the line. The skyline of the trusses is straight except for a rise at the center of the draw, represented by the location of the operating cabin. The draw opening is 110 ft. in the clear on each side. The elevation of the rail is but 16½ ft. above mean low water, a condition resulting from the low character of the ground on each side of the river over which the approach is made.

The New Haven-Boston & Maine System.

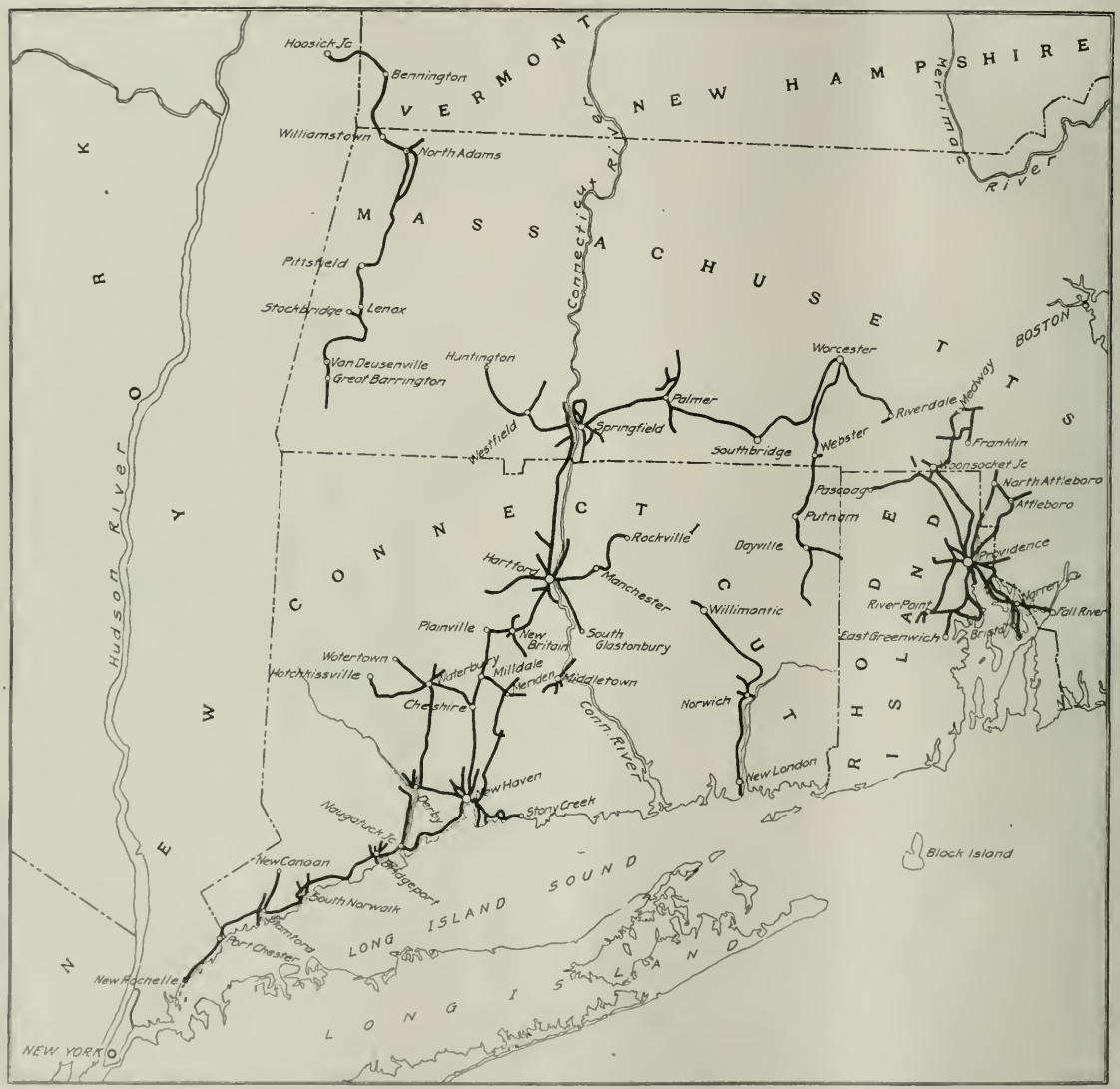
Of the two maps published herewith, the first shows the steam railroad mileage owned by the New York, New Haven & Hartford, not including the New York, Ontario & Western, which it controls but which it is likely sooner or later to relinquish, and the mileage of the Boston & Maine and its controlled roads in Maine, the Maine Central, the Somerset Railway and the Washington County Railway. The electric lines owned by or associated with the New York, New Haven & Hartford are shown on this map by light lines. The trackage rights obtained not long ago by the New Haven over the

The New York, New Haven & Hartford and the Boston & Maine.

Boston & Albany and the northern end of the Harlem division of the New York Central as well as the running rights which the Boston & Maine has long exercised on its Connecticut River Line over two short stretches of the Central Vermont, are also indicated. The steamboat lines of the New England Navigation Company are shown but not the Merchants & Miners lines which the New Haven controls, from Boston, Fall River and Providence to Philadelphia, Baltimore, Norfolk, Newport News and Savannah. In a word, the map represents the New England system of the combined New Haven and Boston & Maine companies and gives an accurate idea of the property involved in the pending consolidation.

The other map, which is official and published for the first time, is a reproduction separately and on a larger scale of the New Haven's electric railways shown on the first map but there obscured at many points by the thickly clustering steam railroad lines. All the electric lines except those in Massachusetts are controlled through the Consolidated Railway Company. The New England Investment & Security Company holds all the Massachusetts lines. It will be noticed that the electrified steam line from New York to Stamford is not included among the electric lines; on the other hand, the Stamford-New Canaan line and the road from Providence to Warren and Bristol, both usually shown on maps of the steam lines of the road, are included. The extent of the New Haven's electric railway interests may be judged from the fact that with one or two unimportant exceptions the electric system represents all of the street railways in the cities of Providence, Worcester, Springfield, Hartford, Waterbury, Bridgeport and New Haven, as well as numbers of smaller cities, besides all of the interurban mileage shown. The total mileage represented is about 1,300 miles.

Further comment on the consolidated New Haven-Boston & Maine system will be found in the editorial columns.



The Electric Railway Interests of the New York, New Haven & Hartford.

Foreign Railroad Notes.

In Barcelona and in northwest Spain, the chief industrial regions of the country, a movement has begun in favor of reducing the Spanish broad gage to the standard. This would have been done long ago, doubtless, but that the interchange of freight between Spain and the rest of Europe is effected mostly by sea, near which are all the productive parts of Spain.

The Wurtemberg State Railroads are about to reconstruct the Stuttgart terminal, with a great deal of heavy earthwork, masonry, etc. When the matter came up in the Parliament, a socialist member moved that the contractors be required to employ only citizens of the German Empire. The Minister of Railroads and the General Manager both declared this to be not only inadvisable but impossible, if the work is to be completed within a reasonable time. The latter said "You all know that great earthworks can't be made without Italians. For tunnel work there are no more skillful workmen."

GENERAL NEWS SECTION

NOTES.

The Seaboard Air Line has decided to comply with the Virginia law reducing passenger fares to two cents a mile

The Railroad Commission of Nebraska has ordered reductions in freight rates on corn and wheat, but will, in September, hear railroad companies which have objections to offer.

At Montgomery, Ala., August 14, the Federal Court, acting on the application of the Louisville & Nashville, enjoined all state officers from enforcing the 2½ cent passenger-fare law against the L. & N.

The Chicago, Burlington & Quincy has been found guilty, at Chillicothe, Mo., of violating the eight-hour law as applied to telegraphers, and fined $200. An appeal was taken. This is the first conviction under the law passed at the last Missouri legislature.

Local newspapers report that block signal operators on the New York Central, in central New York, now receiving from $52 to $65 a month, have received notice of a reduction of wages on October 1, when, under the new state law, their working time will be reduced to eight hours a day.

The Pittsburg & Lake Erie, according to a local paper, has placed its telegraph operators on an eight-hour basis. While the company is not required by the Federal law to make this change until March 4 next, the officers thought it best to provide the road with a full force of competent telegraphers.

In the month of July the Bessemer & Lake Erie carried 781,000 tons of ore, or 74,000 tons more than in any one previous month. During the season, to the first of this month, the total weight of ore carried by the road was 2,978,780 tons, which is 16.5 per cent. more than the total for the same period last year.

The New York State Public Service Commission, Second district, has called upon all railroads and street railroads to send in by September a statement showing all mileage books or mileage tickets of any description on sale, with prices, and all rules or regulations governing the sale, use and redemption of such tickets.

In a fire at Kingston, N. Y., on Sunday evening last, the freight house of the New York Central, 800 ft. long, together with 40 freight cars, both house and cars being filled with merchandise, was completely destroyed. Some of the cars contained black powder and others many barrels of oil, so that the fire was uncontrollable almost from the start. Loss about $300,000.

Complaint is being made in Wisconsin that since the two cent fare law went into effect the railroads have abolished certain low commutation rates from cities to manufacturing establishments a few miles out of the city; an advance in rates which imposes a hardship on workmen engaged in these factories and living in the city. The low commutation rates were originally established to encourage the building of the factories.

The Railroad Commission of Wisconsin on an application of the Rib River Land Company, holds that the road of the Wisconsin Central from Goodrich to Athens, formerly a logging road, must be put in first class shape and opened to the public for the transportation of freight. The Wisconsin Central claimed that the line in question was only a logging road and that the company, therefore, was not bound to operate it as a common carrier.

The State Railroad Commission of Oregon has issued an order requiring the maintenance of bulletins at all passenger stations showing the probable arrival of trains, including, apparently, those on time as well as trains which are delayed; another requiring applications for cars to be recorded at each station, in a book open to shippers, with a view to enforcing impartiality. A third order requires clean and otherwise satisfactory waiting rooms at all stations. This last order is the result of a formal finding that on all of the principal roads of the state the service in this respect is unsatisfactory.

The Novelty Souvenir Company, of Marinette, asked the Wisconsin State Railroad Commission to order the American Express Company to accept packages addressed to the American District Telegraph Company at its different offices. The packages contain a number of different parcels to be delivered by the messenger boys of the telegraph company. The express company answered that it was engaged in local delivery as well as train delivery business, and that it could not be compelled to carry the packages on its train routes and turn them over to a rival delivery company at the terminal. The Commission dismissed the petition, holding that it is entirely within the province of a common carrier to require that all goods shipped in a single package shall be for a single consignee.

The New York State Public Service Commission, First district, has issued rules to prevent overcapitalization of corporations and designed to prevent not only stock watering transactions but merging of railroad companies except where such amalgamations would be in the public interest. Another rule adopted relates to the procedure companies must follow in seeking to increase their capital. Three applications have already been made to this commission for permission to increase bonded indebtedness. The Brooklyn Union Railroad Company wants to borrow $20,000,000, the Nassau Electric Railroad $5,000,000 and the Queens Electric Light & Power Company $1,000,000.

The Public Service Commission of the Second district of the state of New York has issued a circular of questions concerning demurrage on freight cars, and all roads are required to send answers by September 9. The Commission will go very thoroughly into the whole matter. For example:

"Give names and titles of all officers or agents who are authorized to control and direct the distribution of cars. Are consignees permitted to select and load cars for shipment, from those delivered to them with freight, irrespective of strict application of rules for car distribution? State the practice in the past.

"Submit a statement showing the aggregates for each operating division, separately, of the following items of demurrage account during the year ending June 30, 1907: Number of stations reporting; number of cars reported; average detention; percentage released in limit; earnings; collections; total uncollected; agents' relief; refunds; . . ."

Trade Catalogues Wanted.

The Technology Department of the Carnegie Library of Pittsburg announces that it is endeavoring to make an extensive collection of trade catalogues and will be glad to receive catalogues from any of the advertisers in the *Railroad Gazette*. These catalogues will be given a prominent place on the shelves, carefully catalogued under both firm name and subject, and made accessible to the public. They should be addressed care of H. W. Craver, Technology Department, Carnegie Library of Pittsburg.

United States Express Company Statement.

The minority stockholders of the United States Express Company have been trying to have the dividend rate made larger than the 4 per cent. now paid on the $10,000,000 capital stock. The income account for the six months ended June 30, 1907, which has just been sent to the stockholders, shows, however, that the company is earning less than the present dividend rate. The company has not been issuing regular reports. Gross earnings increased 7 per cent. over the corresponding period of 1906, but net decreased 63 per cent.; the net income was $137,097, or 1⅜ per cent. on the capital stock, an annual rate of only 2¾ per cent., while during the same period last year the net income was at the rate of 7½ per cent. yearly on the capital stock. The balance sheet as of July 1, 1907, shows total assets of $13,700,000, over half of which consist of investments in other companies. Current liabilities were $569,000 larger than current assets. The profit and loss surplus was $639,000.

The South and the Railroads.

It might be well enough for Alabama to drive the Southern Railway out of the transportation business within the limits of that state, so that the people may realize what a grand and glorious thing it is to have no railroads to grind them to the earth. It seems to be the determination of Alabama to test the thing and make a serpentless Eden by turning the state into a railroadless Alabama. The law of Alabama requires a foreign corporation to abdicate its rights under the constitution before it can be licensed to operate a railroad in that state.

If the railroad mileage of Alabama were double what it is, the transportation facilities of that state would not be equal to those enjoyed by the people of Indiana. No state is more abundantly endowed by nature than Alabama. Soil and climate are all that could be desired. Her mountains and hills are full of iron, coal and stone. Birmingham is one of the marvels of American energy and the product of railroads. The northern part of the state should abound in manufacturing cities, aggregating millions of inhabitants, busy in the hives of industry. All that is lacking is for the corporations and the people to practice justice in their mutual intercourse and be friends.

And friends they would be if it were as odious for politicians to practice demagogy in Alabama as it now is for corporations to operate railroads in that state. No other section is so sorely in need

of more and better roads as the South. It is a blind, fatuous folly for the South to discourage the railroad business, but that is what the South is doing, and at a time when that region was never so prosperous and its destiny never so promising.—*The Washington Post.*

Rogers Journal Box with Wick Oiling Device.

The Rogers journal box with wick oiling device is shown in the accompanying illustrations. The construction is best shown by the longitudinal section, Fig. 1. The lower part of the box is in two parts, the forward one of which is the oil tray of Fig. 2. Within the latter is a wick holder, which fits over four pins in the tray and contains a central longitudinal opening in which the wicking is placed and held by six transverse pins in the holes shown. The

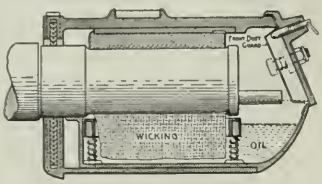


Fig. 1—Rogers Journal Box; Lateral Section.

oil springs over the oil-tray pins keep the wicking pressed against the journal. The oil tray, or cellar, with the contained wick holder and wicking may be removed readily for examination and necessary attention. The wicking is the ordinary cotton variety, such as used in lamps, woven in widths to suit, several layers being used for a box.

The journal box has front and rear dust guards. The front guard is made of sheet metal and formed to fit into the lid opening. It is secured to the lid. This guard is not only for the exclusion of dust and other foreign matter, but to prevent oil being thrown out around the lid by the rotating journal. The rear guard is made in two sections, which slip into openings cast in the sides of the box. The inner edges are rabbeted to overlap each other, and on the outer edge of each is a flat spring which presses against the vertical strip inserted in suitable slots to close the opening and retain the guard.

The claims made for the device are, a substantial saving in oil, elimination of the use of waste, prevention of hot boxes and reduced wear on journals and brasses. It has been tested in service for some time on equipment of different kinds, including freight cars

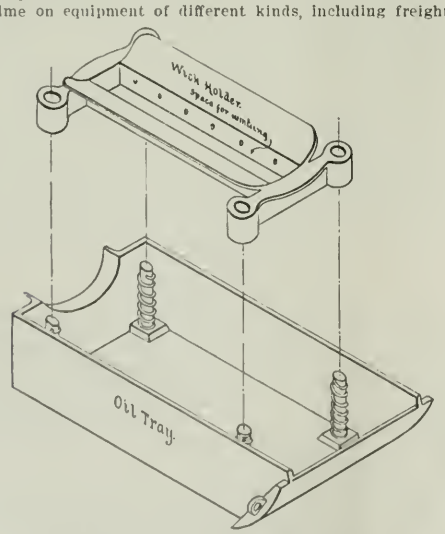


Fig. 2—Oil Cellar and Wickholder.

on the Stock Island, suburban passenger cars on the Illinois Central and switching engines of the St. Louis National Stock Yards, with good results, the superintendent of terminals of the last-named company stating, for example, that on two switch engines on which the boxes have been in service for over a year, there were no hot journals, no perceptible wear on brasses, no driving-box cellars to pack, and no trouble of any kind. Two more engines are being equipped. The Kansas City Railway Foundry Co., Kansas City, Mo., is the maker, and Hotchkiss, Blue & Co., Chicago, are sole agents.

Lines in Italy to be Electrified.

The following is a list of the various electrification projects for which the Italian government has obtained sanction:

		Length, miles.
1.	Pontedecimo to Busalla	6
2.	Savona to San Giuseppe	13
3.	Bardonecchia to Modane	4
4.	Milan to Monza and Lecco	31
5.	Usmate to Bergamo	16
6.	Caloizlo to Ponte San Pietro	11
7.	Gallarate to Arona	31
8.	Gallarate to Laveno	20
9.	Domodossola to Iselle	11
10.	Pistoia to Porretta	25
11.	Naples to Torre Annunziata and Salerno	33
12.	Torre Annunziata to Castellammare	4
	Total	205

Of these, the Italian Westinghouse Company is equipping No. 1 with three-phase current, while Nos. 4, 5, 6 and 9 will probably be direct-current. The first project, which is to give additional facilities to Genoa, is intended to take full advantage of the regenerative possibilities of the three-phase system. There are to be three short up-trains at intervals of 10 minutes, for each one coming down at intervals of 30 minutes, the latter weighing five times that of the former. Two engines, one pushing and the other pulling, will be used on the up grade. A power station of 7,500-k.w. capacity, generating current at 13,000 volts and a frequency of 15 cycles, is being erected at Genoa. Current will be transformed in static sub-stations to the line pressure of 3,000 volts.

TRADE CATALOGUES.

Boiler Compound.—The H. W. Johns-Manville Co., New York, distributors of the "Magic" boiler compound made by John Callahan & Co., Chicago, are sending out a small folder with the title "How to Clean a Boiler," in which are set forth the things which the "Magic" compound will do and will not do in a boiler. The compound is put in the boiler with the feed water and it is claimed that it will remove scale and prevent its formation without causing foaming or attacking the boiler plates or steam packing.

Road Treatment.—The Barrett Manufacturing Co., New York, describes in a handsomely illustrated pamphlet a system of macadam road treatment with a coal tar compound for the prevention of dust. The compound is known as "tarvia," and it is poured and swept over the surface of the road while hot. It forms an efficient binder for the stones and preserves the surface, making it smooth and dustless. One treatment is said to last for at least a year.

Structural Steel.—The Bethlehem Steel Co., South Bethlehem, Pa., has had prepared for the use of architects, structural engineers and others a small handbook of tables of properties of the special structural shapes which will be rolled in the new universal mill at South Bethlehem. These shapes include wide flange I-beams, special girder beams and H-columns.

Belt Conveyors.—A 4-page pamphlet, issued by the Robins Conveying Belt Co., New York, illustrates and describes a package conveyor system in a new large department store. The installation includes three 30-in. conveyors varying in length from 71 to 190 ft., and one 36-in. belt 75 ft. long. They are driven by electric motors.

Drills.—A 20-page booklet, issued by the Ingersoll-Rand Co., New York, describes the Temple-Ingersoll electric-air rock drill. The air compressor is portable, being mounted on a small steel truck and geared to a direct or alternating current electric motor. Armored cables connect the motor to the feed wires.

Roofing Slates.—A pamphlet entitled "The True Cost of Things," issued by the Genuine Bangor Slate Co., Easton, Pa., argues in favor of the company's product on the grounds of its durability, looks, fire protection and other features, as compared with metal, wooden and other roofings.

Variable Speed Motors.—A pamphlet issued by the Electro Dynamic Co., Bayonne, N. J., consists of half-tone illustrations of inter-coil variable speed motors as applied to different machine tools. These motors are made in sizes from ½ h.p. to 150 h.p.

Coal Handling and Storage Machinery.—Catalogue No. 70 of the Dodge Coal Storage Co., Philadelphia, Pa., describes more than 100 different types of coal handling and storage machinery which have been built by this company.

Pneumatic Tools.—Catalogue No. 8, of the Independent Pneumatic Tool Co., which supersedes all former issues, illustrates and describes all types and sizes of Thor pneumatic tools, including

hammers, drills, boring and grinding machines, hose couplings, rivet forges, flue rollers and other tools. Numerous illustrations reproduced from photographs show the various kinds of work to which these tools are adapted.

Asbestos Roofing.—A folder distributed by the H. W. Johns-Manville Co., New York, describes some of its asbestos products, including "J-M" asbestos roofing, "Asbestoside" for wall siding and Keystone hair insulator.

MANUFACTURING AND BUSINESS.

C. M. Mileham has been appointed Master Car Builder of the Doud Stock Car Company, Chicago.

The Stone & Webster Engineering Corporation, Constructing Engineers, Boston, Mass., now occupies its own building at 147 Milk street, Boston.

Carl R. Green, Consulting Mechanical Engineer, Dayton, Ohio, has designed a line of pneumatic hammers for the Columbus Pneumatic Tool Co., Columbus, Ohio. These hammers have been on the market for several months.

The Electric Storage Battery Co., Philadelphia, Pa., has removed its San Francisco sales offices from the temporary location, at 11 Hawthorne street, to the Crocker building, where they will be permanently located.

The Power Specialty Co., 111 Broadway, New York, has secured the exclusive selling rights of Duval metallic packing in this country, Canada and Mexico. It will carry a complete stock of this packing in standard sizes.

The Dayton Pneumatic Tool Co., Dayton, Ohio, has established an agency with Root, Neal & Company, 178-180 Main street, Buffalo, N. Y., who will carry in stock a complete line of "Dayton" and "Green" pneumatic hammers, repair parts and accessories.

John Reid, who for several years has been connected with the Consolidated Railway Electric Lighting & Equipment Co., New York, has resigned to become Assistant to the Vice-President in charge of sales of the Bliss Electric Car Lighting Co., Milwaukee, Wis., with office at New York.

The Wallace-Coates Engineering Co., Chicago and Portland, Ore., has been retained by the Portland & Seattle to design and supervise the construction of two large reinforced concrete structures to be built on the line of that road. One is a long viaduct in Vancouver, B. C., and the other is a 160-ft. arch over the Klickitat river. This will be the longest concrete bridge in the far west.

The Central Inspection Bureau, New York, recently inspected a large number of flat cars for the Parral & Durango Railway, at the Middletown Car Works; also a number of box, flat and stock cars at the Terre Haute plant of the American Car & Foundry Co.; a large number of interurban cars for the American Railways Company at the Jewett Car Works, and a number of interurban cars for the Eastern Pennsylvania Railway at the works of the Cincinnati Car Co.

Hiram J. Slifer has opened an office as Consulting Civil Engineer at 49 Exchange place, New York City. Mr. Slifer will specialize in steam railroad work and is prepared to make physical appraisements, examinations, surveys, analyses of transportation costs and maintenance of way economics and supervise construction. His long and varied experience makes him well qualified for this work. He is a graduate of the Polytechnic College of Pennsylvania, and for 20 years was engaged in location, construction and maintenance with the Mexican National Construction Co., the Pennsylvania and the Chicago & North-Western. From 1898 to 1905 he was Superintendent and General Superintendent on the Chicago & North-Western and the Chicago, Rock Island & Pacific. Since 1905 he has been construction manager on steam railroad properties for J. G. White & Co., New York. He is a member of the American Society of Civil Engineers, the American Railway Engineering and Maintenance of Way Association and the Western Society of Engineers.

Iron and Steel.

The New York, New Haven & Hartford is asking bids for about 200 tons of bridge steel.

The Panama Railroad, it is said, is in the market for 3,000 tons of Bessemer rails for immediate delivery.

The Erie has bids in for bridge material to be used on the structure over the Hackensack river and approaches.

The sale of 1,000 tons of rails is reported for a plantation line in Cuba and the same quantity for a line in Newfoundland.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Toledo, Angola & Western.—J. M. Kutner has been appointed Auditor and Traffic Manager, with office at Toledo, Ohio.

Operating Officers.

Baltimore & Ohio.—A. W. Thompson, Superintendent of the Wheeling division, has been appointed Chief Engineer of Maintenance of Way, with office at Baltimore, Md., succeeding J. B. Dickson, resigned to become Assistant to the General Manager of the Erie. O. Rickert, Division Engineer of the Monongah division, succeeds Mr. Thompson, with office at Wheeling, W. Va. W. C. Barrett, Division Engineer of the Wheeling division, succeeds Mr. Rickert, with office at Grafton, W. Va. F. J. Bachelder, Division Engineer of the Shenandoah division, succeeds Mr. Barrett, with office at Wheeling. J. B. Myers, Assistant Engineer of the Cumberland division, succeeds Mr. Bachelder. Mr. Thompson was born at Erie, Pa., in 1875. He was educated at Allegheny College, Meadville, Pa., and began railroad work in 1898 as a rodman on the Pittsburg & Lake Erie. From August, 1899, to September, 1900, he was a transitman on the Pittsburg division of the Baltimore & Ohio, he was then made Assistant Engineer. He was appointed Division Engineer of the Cumberland division in the fall of 1901, and in November, 1902, was promoted to be Division Engineer of the Pittsburg division in charge of maintenance and construction. The next month he was made Superintendent of the Cumberland division, and in February, 1904, was transferred to the Wheeling division, where he remained until his present promotion.

Thomas Jamison, yardmaster at Connellsville, Pa., has been appointed to the new office of Trainmaster of the Somerset & Cambria branch of the Connellsville division.

Buffalo & Susquehanna.—F. W. Allen has been appointed Superintendent at Galeton, Pa., succeeding S. P. Henderson, resigned.

Chicago, Rock Island & Pacific.—The authority of H. E. Allen, Assistant Superintendent of the Oklahoma division, has been extended over the Fort Worth division.

Erie.—J. B. Dickson, Chief Engineer of Maintenance of Way of the Baltimore & Ohio, has been appointed Assistant to the General Manager of the Erie.

New York Central & Hudson River.—M. E. Welch has been appointed Trainmaster at Batavia, N. Y.

Pacific & Idaho Northern.—W. M. Hauser, chief clerk to the Vice-President and General Manager of the Wheeling & Lake Erie, has been appointed Assistant General Manager of the Pacific & Idaho Northern, with office at Weiser, Idaho.

Southern Pacific.—T. R. Jones, Superintendent at Sacramento, Cal., has resigned. D. Burkhalter, Superintendent at Bakersfield, Cal., is Acting Superintendent, succeeding to the duties of Mr. Jones.

Traffic Officers.

Chicago & North-Western.—Samuel F. Miller, Assistant General Freight and Passenger Agent, has been appointed General Freight and Passenger Agent of the Nebraska and Wyoming divisions, with office at Omaha, Neb.

Intercolonial.—J. J. Wallace, General Freight Agent of this road and of the Prince Edward Island Railway, has retired.

Prince Edward Island.—See Intercolonial.

Trinity & Brazos Valley.—Harry Bronson, chief clerk to the General Passenger Agent of the Chicago, Rock Island & Pacific, has been appointed General Passenger Agent of the Trinity & Brazos Valley, effective September 1.

Engineering and Rolling Stock Officers.

Baltimore & Ohio.—See this company under Operating Officers.

Chicago, Burlington & Quincy.—J. Dietrich, Assistant Superintendent of Motive Power of the Lines West of the Missouri river, has been appointed Master Mechanic of the Lincoln division of the Lines West, with office at Lincoln, Neb., succeeding J. J. Buttery, assigned to other duties.

Chicago, Milwaukee & St. Paul.—M. J. La Court, foreman of the car department at La Crosse, Wis., has been appointed General Traveling Inspector of Cars.

Nashville Terminal Company.—E. G. Holladay, Engineer, has resigned to go into other business. H. R. Manby, Assistant Engineer, succeeds Mr. Holladay.

Seaboard Air Line.—R. P. C. Sanderson, Superintendent of Motive Power, has resigned. See Virginian Railway.

Virginian Railway.—R. P. C. Sanderson, Superintendent of Motive Power of the Seaboard Air Line, has been appointed Superintendent of Motive Power of the Virginian Railway, with office at Norfolk, Va.

LOCOMOTIVE BUILDING.

The Augusta Southern has been figuring on buying two locomotives.

The Mobile, Jackson & Kansas City is said to be in the market for 20 locomotives.

The Guantanamo Plantation, Cuba, has ordered one mogul locomotive from the American Locomotive Company.

The Tonopah & Goldfield, it is said, has ordered eight freight locomotives from the Baldwin Locomotive Works.

The Newburgh & South Shore has ordered two six-wheel switching locomotives from the Baldwin Locomotive Works.

The Hokkaido Railroad, Japan, has ordered 26 consolidation locomotives from the American Locomotive Company.

The Sabina Coal Company, Mexico, has ordered one four-wheel tank locomotive from the American Locomotive Company.

The Isthmian Canal Commission is receiving bids until August 30 on 12 four-wheel saddle tank 3-ft. gage switching locomotives.

The Hang Yang Iron & Steel Works has ordered one additional four-wheel tank locomotive from the American Locomotive Company.

The Illinois, Iowa & Minnesota has ordered two consolidation locomotives and one switching locomotive from the Baldwin Locomotive Works.

The Belgian Government is in the market for 300 locomotives and 200 tenders. Address Minister of Railways, Posts and Telegraphs, Brussels.

The Atchison, Topeka & Santa Fe has ordered 25 six-wheel switching locomotives and 10 additional simple consolidation locomotives from the Baldwin Locomotive Works.

The Russian Government has appropriated $47,000,000 to be spent for cars and locomotives during the next four years. Address Minister of Ways and Communications, St. Petersburg.

The Chilian Government Railroads have ordered 20 consolidation locomotives from the American Locomotive Company instead of 25 locomotives, as reported in the *Railroad Gazette* of August 9.

The Antioquia Railroad, a Colombian government railroad operated by a commission with headquarters at Medellin, Colombia, S. A., has ordered three consolidation locomotives from the American Locomotive Company.

The Las Vegas & Tonopah, as reported in the *Railroad Gazette* of August 9, has ordered one 10-wheel passenger (4-6-0) locomotive and three consolidation (2-8-0) locomotives similar to the San Pedro, Los Angeles & Salt Lake standard from the American Locomotive Company.

The Temiskaming & Northern Ontario, as reported in the *Railroad Gazette* of August 16, has ordered from the Canadian Locomotive Company six simple 10-wheel locomotives for February, 1908, delivery. The specifications for these locomotives are the same as those published in the *Railroad Gazette* of March 29 for the locomotives ordered from the Locomotive & Machine Company of Montreal.

The Wichita Falls & Northwestern, as reported in the *Railroad Gazette* of August 9, has ordered two simple mogul locomotives from the American Locomotive Company for December delivery.

General Dimensions.

Type of locomotive	Mogul
Weight, total	114,000 lbs.
Weight on drivers	97,000 lbs.
Diameter of drivers	56 in.
Cylinders	18 in. x 24 in.
Boiler, type	Straight top
" working steam pressure	180 lbs.
" number of tubes	240
" material of tubes	Charcoal iron
" diameter of tubes	2 in.
" length of tubes	11 ft. 2 in.
Firebox, length	96 "
" width	34¼ "
" grate area	23 sq. ft.
Heating surface, total	1,530 "
Tank capacity	4,000 gals.
Coal capacity	8 tons

Special Equipment.

Air-brakes	Westinghouse
Injectors	Nathan
Safety valves	Coale
Sight-feed lubricators	Nathan
Steam gages	Crosby

CAR BUILDING.

The Ann Arbor has asked prices on 100 freight cars.

The Pere Marquette has made an appropriation for 3,000 freight cars.

The Italian Government is said to be in the market for 200 baggage cars.

Wells-Fargo & Co. are said to be in the market for 10 refrigerator express cars.

The Northwestern Pacific has ordered 10 passenger cars from the St. Louis Car Co.

The Atchison, Topeka & Santa Fe is figuring on 10 combination automobile and horse cars.

The Mobile, Jackson & Kansas City is said to be figuring on buying some passenger equipment.

The Washington, Idaho & Montana has ordered one combination passenger and baggage car from the Pullman Co.

The City of Chicago is about to ask for an appropriation for 40 or 50 standard gondola cars of 100,000 lbs. capacity.

The Chilian Government, it is said, has ordered 42 motor cars and 175 other cars from the St. Louis Car Company.

The Middletown Car Works is said to be asking prices on specialties for 500 hopper cars of 100,000 lbs. capacity.

The Ontario Portland Cement Co., Blue Lake, Ont., is said to have ordered 12 flat cars, two of which are motor cars.

The United States Steel Corporation, it is said, is about to order 50 all-steel box cars similar to the Union Pacific design.

The Virginia & Southwestern is said to have ordered 500 freight cars of 80,000 lbs. capacity from the Western Steel Car & Foundry Company.

The Harriman Lines, as reported in the *Railroad Gazette* of May 17, having again revised plans for 30 steel postal cars, are now asking prices.

The Santa Fe, Raton & Des Moines has ordered 30 self-clearing flat bottom wood gondola cars of 100,000 lbs. capacity from the National Dump Car Co.

The Russian Government has appropriated $47,000,000 to be spent for cars and locomotives during the next four years. Address Minister of Ways and Communications, St. Petersburg.

The Isthmian Canal Commission, as reported in the *Railroad Gazette* of August 9, has ordered 115 dump cars from the Continental Car & Equipment Co., and 500 dump cars from the American Car & Foundry Co.

The Buffalo & Susquehanna is reported to have ordered 200 steel hopper cars, 200 steel underframe box cars, 500 gondolas of 100,000 lbs. capacity, and 100 cars for general service, all from the Pressed Steel Car Co.

The Pennsylvania is building at Altoona 35 all-steel passenger cars as follows: Seventeen 70-ft. postal cars, ten 70-ft. dining cars, two 60-ft. baggage cars and six passenger coaches, five of which are 70 ft. long.

The Canadian Pacific, as reported in the *Railroad Gazette* of July 26 and August 2, has ordered 1,000 box cars of 60,000 lbs. capacity; 500 from the American Car & Foundry Co., and 500 from Barney & Smith. These cars will measure 36 ft. long, 8 ft. 6 in. wide and 8 ft. high, inside measurements, and 36 ft. 8 in. long, and 9 ft. 5⅜ in. wide, over all. Bodies and underframes will be wood. The special equipment includes:

Bolsters	Simplex
Brake-beams	Simplex
Brake-shoes	Steel back diamond S.
Brakes	Westinghouse
Center bearings	One malleable iron; one steel
Couplers	Tower
Door fastenings	"Positive"
Doors	"Security"
Draft rigging	Miner tandem
Dust guards	Harrison
Journal boxes	McCord
Paint	Mineral brown
Roofs	Chicago Winslow Improved
Side bearings	Susemihl roller
Springs	Canadian Pacific standard
Trucks	Barber roller Simplex
Wheels	Cast Iron

RAILROAD STRUCTURES.

Lethbridge, Alb.—John Gunn & Sons, Winnipeg, have been given the contract at $200,000 for the abutments and concrete superstructure for the Canadian Pacific bridge here. The steel work will cost approximately $900,000.

London, Ont.—The barns and five cars of the Southwestern Traction Co. have been destroyed by fire; loss $150,000.

Macon, Ga.—The Central of Georgia has let the contract for

car shops and power house only to the McKenzie De Leon Construction Co., Savannah, and not for the entire shops, as reported in our issue of Aug. 9. These buildings are part of the company's new shop scheme which will ultimately cost $1,400,000. Work has begun on the car shop, which will be a brick building 195 ft. wide and 300 ft. long. The power house will be of brick with steel framing 104 ft. by 92 ft.

MT. UNION, PA.—A contract for work on the bridge over the Juniata river, which is to be 618 ft. long and 16 ft. wide, has been let to Andrew Buchanan, of Chambersburg, at $17,000. Work has been under way for some time by L. A. Green, of Huntingdon, who has the contract for the piers and abutments. The Pennsylvania Railroad will pay $25,000 as its share of the work.

OTTAWA, ONT.—The plans for the new central station at Ottawa, to be built by the Grand Trunk, described in the *Railroad Gazette* of May 31, 1907, have been approved by the Federal cabinet. They include an office building 10 stories high, to be equipped with all labor saving conveniences. Work will be begun at once. The cost of the structure is estimated at $1,500,000 or possibly $2,000,000. The Grand Trunk is also prepared to build a hotel near the station, to cost $1,000,000. Plans have been submitted to the government for a hotel building in Major Hill Park.

PHOENIXVILLE, PA.—The Montgomery & Chester Electric Railway Company is to build a $14,000 bridge at Ironsides.

PRINCE ALBERT, SASK.—Arrangements have been made between the Canadian Northern and the Provincial Government of Saskatchewan whereby the former will build a bridge over the Saskatchewan river here.

SPRINGFIELD, MO.—The St. Louis & San Francisco, it is said, has begun work on shops here which are to be finished by March, 1908. There are to be six buildings, to include a machinery and erecting shop, 173 ft. x 566 ft.; forge shop, 102 ft. x 245 ft.; boiler and tank shop, 117 ft. x 344 ft.; coach shop, 207 ft. x 303 ft.; paint shop, 182 ft. x 183 ft., and a powerhouse, 117 ft. x 160 ft.

TWO HARBORS, MINN.—The Duluth & Iron Range, it is said, has begun work on a new steel ore dock here. The pile foundation is to be filled with rock, on which is to be laid concrete to a height of 5 ft. above water line.

VANCOUVER, B. C.—The authorities have presented a petition to the Premier for the erection of a combined highway and railroad bridge to connect the North Vancouver district with the city and districts south. Estimated cost $700,000 to $1,000,000.

WEST ALBANY, N. Y.—Contracts for the new shops for the New York Central are reported let to R. Richard & Son, of Utica, for the general work, and to F. Schoemaker & Co., of New York, for the steel frame work. It is proposed to have the work finished within four months.

WINNIPEG, MAN.—The plans for the new station at this place, to be used jointly by the Canadian Northern and the Grand Trunk Pacific, are being changed. The Canadian Northern will begin the work as soon as plans are accepted. Besides a union station, the plans include bridges over both the Red and Assiniboine rivers, each to carry two tracks.

Kelly Bros. & Mitchell have been given a contract by the Canadian Northern for building an erecting shop 600 ft. x 160 ft. with annexes, to cost $200,000.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

ATLANTA & ST. ANDREWS BAY.—This company now has 36 miles of road in operation from Dothan, Ala., south to Domer, Fla. The projected route is from Atlanta, Ga., via Opelika and Dothan, Ala., to Panama City, Fla., 290 miles. Work on the southern end, from Dothan to the gulf, 85 miles, it is said, is being pushed vigorously. The road has been built to Compass Bond, within 20 miles of Panama City, the southern terminus. This road is being built by the Enterprise Lumber Company, of Columbus, Ga. (March 15, p. 379.)

ATLANTIC, QUEBEC & WESTERN.—The first two sections of this road will shortly be opened for traffic. The road is now completed from New Carlisle, Que., north to Port Daniel, 23 miles. Active operations are under way from Port Daniel north to Gaspe Basin, 80 miles. At L'Anse au Gascon 100 men and teams are at work. Operations are shortly to be started at Grand River, Cape Cove and Gaspe Basin. Bids will soon be asked for ties, rails and the construction of bridges. Contracts will be let this fall and the whole line is to be under construction by spring. At Port Daniel the company will begin at once tunneling through Hell's Cape, 400 ft. (June 28, p. 948.)

CANADIAN PACIFIC.—Contract is reported let to J. G. McArthur for grading 73 miles from Moose Jaw, Sask., northwest. The contract is said to amount to about $300,000.

CANANEA, YAQUI RIVER & PACIFIC.—See Southern Pacific.

CHICAGO & NORTH WESTERN.—Surveyors who have been in the field since early spring are said to have found a grade which does not exceed 1½ per cent. through the mountains at the headwaters of the Salmon river, Idaho. The route as surveyed runs westerly to the Pacific coast. It runs northwest down the Lemhi and Salmon rivers to Lewiston, thence to Puget Sound or Portland.

CHICAGO & OAK PARK ELEVATED (ELECTRIC).—This company proposes to build a line to Elgin, Ill. At present it has a double track elevated line from Fifth avenue and Lake street, Chicago, to Oak and Lake streets, with a branch down Market street to Madison street, with a connection to the Chicago & Harlem, a total of 22 miles of track.

CHICAGO, ROCK ISLAND & PACIFIC.—Preliminary work is reported under way for double-tracking this road from Topeka, Kan., west to McFarland, 32 miles.

EAST ST. LOUIS & EASTERN.—Incorporated in Illinois with office at East St. Louis. The company is to build a line from a point near Belleville, St. Clair county, to the county line. The incorporators and first board of directors include L. C. Hayns, T. W. Gregory, G. C. Pierce, F. H. Thomas and F. H. Kruger.

EVANSVILLE & PRINCETON TRACTION.—An extension will be built from Princeton, Ind., north to Patoka, about five miles, and after this extension is completed a survey will be made for an extension from Patoka to Vincennes, 30 miles. It is the intention of the company to eventually have a through line from Evansville to Indianapolis.

GRAND TRUNK PACIFIC.—This company seems to be preparing to rush the construction of the western end of the line. In addition to building the branch from Kitamat Arm, B. C., north to Hazelton, 180 miles, the contract for which has been let to Foley Bros. & Larson, the main line work on the section from Prince Rupert, B. C., east up the Skeena river as far as Kitselas canyon, 100 miles, will be undertaken this fall. This includes a large amount of rock work and it is expected will take two years to build. Arrangements also have been made to start work this fall on 200 miles of the section west from Edmonton, Alb., to a point 60 miles east of the summit of the Rockies.

MINNEAPOLIS & ST. LOUIS.—The Minnesota, Dakota & Pacific, under construction from Conde, S. Dak., west to Le Beau, on the Missouri river, 115 miles, which was put in operation as far as Cresbard, 42 miles, last July, has recently been opened for freight service an additional 42 miles to Hoven. This leaves about 31 miles to finish the line to Le Beau. (July 5, p. 27.)

MINNEAPOLIS, KANSAS CITY & GULF (ELECTRIC).—Under this name a company is reported incorporated in Oklahoma with a capital of $50,000,000 to build an electric line from Minneapolis, Minn., south to Galveston, Tex. The names of the incorporators are not given.

MINNESOTA, DAKOTA & PACIFIC.—See Minneapolis & St. Louis.

NEW YORK SUBWAYS.—The Public Service Commission of the First district has taken action toward beginning work shortly on the proposed improvements in the subway of the Interborough Rapid Transit Company, which includes the laying of three additional tracks under Broadway between 96th and 102d streets. This work was approved by the Rapid Transit Commissioners before they went out of office, and now requires the approval of the Board of Estimate and Apportionment of New York city before it can be carried out.

RUSSELLVILLE & OZARK MOUNTAIN TRACTION, LIGHT & POWER COMPANY.—Incorporated in Arkansas with $200,000 capital by residents of Pine Bluff, Russellville, Ozark and Atkins. It is proposed to build an electric line between Russellville and nearby towns. The incorporators include Adam J. Robinson, President; J. C. Wilson, Assistant President; J. Gould, Secretary; W. N. Langford, Treasurer; T. D. Brooks, A. S. Hayes, A. B. Plaston, E. Stoneker, M. M. Bruce and J. C. Wilson.

SOMERSET & NASHVILLE.—Incorporated in Kentucky with $10,000 to build a line from Somerset to a point on the Cumberland river near Burnside, seven miles. The Commercial Club of Somerset, and local capitalists are interested.

SOUTH CAROLINA ROADS (ELECTRIC).—Application will shortly be made by a company in Georgia to build an electric line from Greenville, east to Spartanburg, about 31 miles. A. A. Gates, C. C. Good, H. H. Prince and O. K. Maulden are incorporators.

SOUTHERN PACIFIC.—Grading work on the Cananea, Yaqui River & Pacific has progressed as far as the right of way of the Kansas City, Mexico & Orient in the state of Sinaloa, which is to be crossed at a point east of the port of Topolobampo. Construction forces are working south towards this point. A large force of men are now at work on the Yaqui Valley, in Sonora, and on the Alamos branch. Grading work out of Orendain on the Guadalajara branch

is progressing rapidly, and a large force of men are at work. The Mexican Contracting Company, of Mexico City, is building this branch.

South Shore Traction.—This company recently obtained a franchise from the town board and highway commissioners of Hempstead, L. I., and now has an uninterrupted chain of franchises from Patchogue, L. I., to the New York city line. Among those interested in the company are: Arthur P. Heinze, J. T. Wood, W. P. Youngs, F. D. Kilburne and P. T. Brady.

Temiskamino & Northern Ontario.—The preliminary surveys for the proposed branch from Cobalt, Ont., to Sudbury have been made by the government engineers. The route is from the main line between Gillies and Cassidy west to Sudbury, 90 miles. From the junction point the road is to run west along the north shore of Portage bay, crossing the Montreal river at Park Rapids, thence southwest into the Temagami reserve district via Eagle lake, the west shore of Whitefish lake, and thence the north end of Oharika lake and along its west shore for 10 miles into the Sturgeon valley and down the valley to Sudbury. The proposed line will not only save 60 to 70 miles for ore shipments to the Copper Cliff smelters, but also will furnish another direct means of transportation between Toronto and Cobalt. (May 17, p. 695.)

Valley Railroad of West Virginia.—Under this name a company has been organized to build a line from Piedmont, W. Va., southwest into Pocahontas county, about 100 miles. The Tyrone Paper Company and a number of Tyrone and Huntingdon (Pa.) capitalists are interested.

Valley Transit Light & Power Co.—Incorporated in Ohio with $100,000 capital to build an electric line from Canton southwest via Dover, New Philadelphia, New Comerstown, Coshocton and Newark to Columbus, about 150 miles. The office of the company is at New Philadelphia, and the incorporators include C. J. Kneisely, M. Siebold, W. W. Snyder, T. F. Hynes, W. J. Wise, E. S. Rhoades, F. G. Knonzli and F. O. Richards.

White Deer & Loganton.—Passenger service was recently started on this narrow-gage road from White Deer, in Union county, Pa., west to Loganton, 24 miles.

RAILROAD CORPORATION NEWS.

Baltimore & Ohio.—See Chicago Terminal Transfer.

Birmingham Railway, Light & Power.—This company has made a mortgage to the Old Colony Trust Company, of Boston, for $25,000,000. The company operates 127 miles of electric road in and near Birmingham, Ala. Over a year ago it was reported that it would be consolidated with the street railways of Little Rock, Ark.; Memphis, Tenn.; Nashville, Tenn.; Houston, Tex., and Knoxville, Tenn. Extensions, including a new power house in Birmingham, are proposed.

Chicago & Illinois Western.—This company has increased its capital stock from $500,000 to $1,000,000. The road runs from Chicago 17 miles toward Joliet, Ill., and the remaining 34 miles into Joliet are under construction.

Chicago, Burlington & Quincy.—See Chicago Terminal Transfer.

Chicago Terminal Transfer.—An offer of $25 a share has been made for the preferred stock held by minority stockholders. It is understood that 70 per cent. of the $17,000,000 preferred stock is held by the Chicago, Burlington & Quincy, and that the present offer is made by Baltimore & Ohio interests. It is believed that the Chicago, Burlington & Quincy and the Baltimore & Ohio have reached an agreement for the joint control of the Chicago Terminal; the Baltimore & Ohio some time ago assumed the $15,000,000 first mortgage bonds of the terminal company.

Erie.—This company has applied to the New York Public Service Commission for the Second district for permission to issue $6,216,345 5 per cent. car trust notes. Of these notes, $156,345 run for five years and are secured on 60 passenger coaches; the remainder run for 10 years and are secured on 3,000 box cars, 3,000 steel hopper coal cars and 38 freight locomotives.

Cleveland, Cincinnati, Chicago & St. Louis.—Gross earnings for the quarter and six months ended June 30, 1907, were as follows:

	For Quarter.		
Earnings	$6,775,198	Inc.	$929,218
Expenses	5,022,615	"	192,062
Net earnings	$1,752,583	Inc.	$137,156
Other income	14,578	"	3,792
Gross income	$1,797,161	Inc.	$140,948
Fixed charges and taxes	1,137,359	"	29,126
Available for dividends	$659,802	Inc.	$391,522
Dividends*	595,561	"	114,703
Surplus	$64,241	Inc.	$276,819

	For Six Months.		
Earnings	$12,439,772	Inc.	$1,077,252
Expenses	9,716,709	"	866,672
Net earnings	$2,723,063	Inc.	$210,580
Other income	53,788	Dec.	21,375
Gross income	$2,776,851	Inc.	$189,205
Fixed charges and taxes	2,235,520	"	97,607
Available for dividend	$541,331	Inc.	$91,598
Dividends*	1,191,122	"	229,406
Deficit	$649,791	Inc.	$137,808

*At the annual rates of 5 per cent. on preferred and 4 per cent. on common.

Florida East Coast.—Work on the extension along the Florida Keys to Key West has been temporarily stopped because of the scarcity of labor.

Interborough-Metropolitan.—It is reported that the quarterly dividend of 1¼ per cent., payable in October, on the preferred stock of this company, which controls all of the traction lines in New York city, will be passed. The highest price of the stock for 1907 was 75, reached early in January; this week, influenced by the investigation of the company by the Public Service Commission of the First district, it sold down to 20. Metropolitan Street Railway stock, on which the New York City Railway in 1902 guaranteed 7 per cent. dividends for 999 years, is also to have its dividend passed, according to the same report. On Wednesday it sold at 39 from a high record of 107 on January 23.

Lake Shore & Michigan Southern.—Gross earnings for the six months ended June 30, 1907, were as follows:

Earnings	$21,589,538	Inc.	$982,442
Expenses	16,313,272	Dec.	97,842
Net earnings	$5,276,266	Inc.	$1,080,284
Other income	1,950,000	"	300,000
Gross income	$7,226,266	Inc.	$1,380,284
First charges and taxes	4,206,667	"	776,668
Available for dividend	$3,019,599	Inc.	$603,616
Dividend (6 per cent.)	2,967,990	"	989,330
Surplus.	$51,609	Dec.	$385,714

Metropolitan Street Railway.—See Interborough-Metropolitan.

Michigan Central.—Gross earnings for the six months ended June 30, 1907, were as follows:

Earnings	$13,833,982	Inc.	$1,214,839
Expenses	11,331,423	"	997,506
Net earnings	$2,502,559	Inc.	$217,333
Other income	250,637	"	50,206
Gross income	$2,753,196	Inc.	$267,539
Fixed charges and taxes	2,115,519	"	155,065
Available for dividend	$637,677	Inc.	$112,474
Dividend (3 per cent.)	562,140	"	187,380
Surplus.	$75,537	Dec.	$74,906

Pere Marquette.—A special meeting of the stockholders has been called for October 28 to act on the reorganization plan proposed last June. The plan includes the termination of the present receivership, the exchange of the present preferred stock for new preferred stock, the subscription by present preferred stockholders to an issue of $5,000,000 notes (90 per cent. of which have been subscribed to) and the abrogation of the Cincinnati, Hamilton & Dayton's lease of the Pere Marquette. (June 28, p. 949.)

Public Service Corporation.—A new company is to be formed under the name Public Service Street Railway Company, as a consolidation of the North Jersey Street Railway, the Jersey City, Hoboken & Paterson Street Railway and the United Street Railway Co. of Central Jersey. The new company is to have $38,000,000 capital stock. The capital stocks of the three companies to be merged are held almost entirely by the Public Service Corporation.

Southern Pacific.—In making application to the New York Stock Exchange for the listing of additional preferred stock, the company announces that the common and preferred stockholders subscribed to all but $64,588 of the $35,677,388 offered to them last June. The new issue is a capitalization of expenditures made by the company in retiring $38,500,000 securities as follows: $22,747,000 Southern Pacific Company two-five-year, 4½ per cent. bonds; $6,961,000 Southern Pacific Railroad Company 6 per cent. bonds, and $8,822,000 Central Pacific Railway Company 3 per cent. notes to the United States Government.

Winnipeg Electric.—This company is to offer at par to holders of the $1,500,000 capital stock, of record on August 31, $1,500,000 additional stock at the rate of one share of new stock for every three shares already held. The company operates 32 miles of road, consisting of all the street railways in Winnipeg, Man., and St. Boniface. It also does all the gas and electric business in both places.

LEHIGH VALLEY RAILROAD COMPANY—FIFTY-THIRD ANNUAL REPORT.

Philadelphia, August 14, 1907

To the Stockholders of the Lehigh Valley Railroad Company.

The Board of Directors herewith submit the fifty-third annual report of the business of your Company and its allied interests for the fiscal year ended June 30, 1907.

MILEAGE.

The mileage of railroads owned and operated by the Lehigh Valley Railroad Company, the main line of which extends from Jersey City, N. J., to Buffalo, N. Y., is as follows:

Owned or controlled by ownership of entire capital stock	1,295.48
Controlled by ownership of majority of capital stock	157.39
Controlled by leases	27.88
Total mileage operated (owned and controlled)	1,390.75
Trackage rights over railroads owned by other companies	49.47
Total mileage	1,440.22

—of which 579.14 miles, or 40.21 per cent., have second track, 56.18 miles have third track and 20.47 miles have fourth track. There are also 1,067.29 miles of yard tracks and sidings on the system.

The decrease of 4.74 miles of first track is due principally to the removal of various colliery branches and to the change of a portion of the old main line at Allentown to third and fourth tracks.

The decrease shown in miles of yard tracks and sidings is occasioned by withdrawing therefrom the fourth track mileage which, in view of additional construction, is now shown as a separate item. The more important increases are referred to elsewhere in the report.

EARNINGS AND EXPENSES.

The following statement shows the gross earnings, expenses and net earnings from the operation of the entire system for the fiscal year, not including other income.

For comparative purposes, similar figures are also given for the fiscal year of 1906.

GROSS EARNINGS.

FROM	1907	1906	Increase	Decrease
Coal freight	$15,110,899.38	$13,248,565.42	$1,862,333.96	.....
Other freight	14,996,672.62	13,934,127.10	1,062,545.52	.....
Passenger	4,363,452.12	3,971,392.05	392,060.07	.....
Express	373,953.30	367,706.36	6,246.94	.....
Mail	217,792.69	217,745.88	46.81	.....
Miscellaneous	1,005,661.40	1,050,319.82	.....	$44,658.42
Total earnings	$36,068,431.51	$32,789,856.63	$3,278,574.88	.....

OPERATING EXPENSES.

For	1907	1906	Increase	Decrease
Maint. of way and structures	$3,196,854.34	$3,153,245.22	$43,609.12	.....
Maint. of equipment	6,186,641.83	5,485,794.06	700,847.77	.....
Conducting expenses	12,100,681.44	10,891,953.73	1,208,727.71	.....
General expenses	630,075.28	621,217.71	8,857.57	.....
Total expenses	$22,114,252.89	$20,152,210.72	$1,962,042.17	.....
Net earnings from operations	$13,954,178.62	$12,637,645.91	$1,316,532.71	.....
Percentage of operating exp. to gross earnings	61.31	61.46	.....	.15

The gross earnings of the Company for the year amounted to $36,068,431.51, an increase as compared with the previous fiscal year of $3,278,574.88, or 10 per cent. The total operating expenses amounted to $22,114,252.89, an increase of $1,962,042.17, or 9.47 per cent. The ratio of expenses to earnings was 61.31 per cent., a decrease as compared with the previous year of .15 per cent.

EARNINGS.

COAL FREIGHT.

The transportation of coal, including coke, yielded a revenue of $15,110,899.38, an increase of $1,862,333.96, or 14.06 per cent., as compared with the previous year.

The percentage of coal earnings to gross earnings was 41.89 per cent., an increase of 1.49 per cent.

The coal and coke tonnage transported, not including supply coal, amounted to 14,374,216 tons, an increase of 1,621,163 tons, or 12.71 per cent., over the year previous.

The number of tons moved one mile amounted to 2,022,206,603, an increase of 209,028,261, or 11.53 per cent.

The average haul decreased from 142.18 miles to 140.68 miles, a decrease of 1.50 miles, or 1.06 per cent.

The coal tonnage was 51.06 per cent. of the total tonnage hauled during the year, as against 49.88 per cent. for the previous year, being an increase of 1.18 per cent.

MERCHANDISE FREIGHT.

The earnings derived from the transportation of merchandise freight amounted to $14,996,672.62, an increase of $1,062,545.52, or 7.63 per cent., as compared with the previous year.

The percentage of earnings derived from the transportation of merchandise freight to gross earnings was 41.58 per cent., a decrease of .92 per cent.

The tonnage moved, exclusive of Company material, was 13,779,764 tons, an increase of 964,506 tons, or 7.53 per cent.

The number of tons carried one mile amounted to 2,747,893,327, an increase of 218,194,304 tons, or 8.63 per cent.

The average haul increased from 197.40 to 199.42 miles, an increase of 2.02 miles, or 1.02 per cent.

Company's material amounting to 431,139 tons was transported during the year, being an increase of 23,923 tons, or 5.87 per cent.

GENERAL FREIGHT TRAFFIC.

The total earnings from both coal and merchandise freight amounted to $30,107,572.00, an increase of $2,924,879.48, or 10.76 per cent., as compared with the previous year.

The entire freight traffic amounted to 28,153,980 tons, being an increase of 2,585,729 tons, or 10.11 per cent.

The number of tons carried one mile was 4,770,099,930, an increase of 427,222,565, or 9.84 per cent.

The average distance carried was 169.43 miles, a decrease of .42 mile, or .25 per cent.

The average revenue per ton was 106.94 cents, as against 106.71 cents last year, being an increase of .63 cent, or .59 per cent.

Company's freight, not included in the above, amounted to 2,481,863 tons, an increase of 270,926 tons, or 12.25 per cent.

The total freight train mileage was 9,062,037 miles, an increase of 440,174 miles, or 5.11 per cent., while the volume of tonnage increased, as shown above, 10.11 per cent.

Revenue received per freight train mile was $3.32 as compared with $3.15, being an increase of 17 cents, or 5.40 per cent.

The average train load of revenue freight was 526.38 tons, an increase of 22.08 tons, or 4.50 per cent. Including Company's freight, the average train load was 546.28 tons, as against 523.34 last year, an increase of 22.94 tons, or 4.38 per cent.

The average number of tons of revenue freight in each loaded car was 21.83 tons, an increase of 1.37 tons, or 6.70 per cent. Including Company's freight, the average carload on the system was 22.66 tons, an increase of 1.40 tons, or 6.59 per cent.

PASSENGER TRAFFIC.

The revenue from this class of traffic amounted to $4,363,452.12, an increase of $392,060.07, or 9.87 per cent., as compared with the previous year.

Total number of passengers carried was 5,181,533, an increase of 191,544, or 3.84 per cent.

The number of passengers carried one mile increased 23,102,299, or 10.16 per cent.

The average revenue paid by each passenger was 84.21 cents, an increase of 4.62 cents, or 5.80 per cent.

The average revenue per passenger per mile was 1.742 cents, a decrease of .005 cent, or .29 per cent.

The average distance traveled by each passenger was 48.34 miles, an increase of 2.78 miles, or 6.10 per cent.

Passenger train mileage was 4,084,695, an increase of 175,385, or 4.49 per cent.

The earnings from passengers per passenger train mile were 106.82 cents, an increase of 5.23 cents, or 5.15 per cent.; the average number of passengers per train was 61.32, an increase of 3.16, or 5.43 per cent., and the average number of passengers per car was 17.88, a decrease of .03, or .17 per cent.

EXPRESS.

The earnings from this source amounted to $373,953.30, an increase of $6,246.94.

MAIL.

The revenue derived from the transportation of United States mails amounted to $217,792.69, an increase of $46.81.

MISCELLANEOUS.

Miscellaneous earnings amounted to $1,005,661.40, a decrease of $44,658.42. The details of these earnings appear in Table No. 8.

EXPENSES.

MAINTENANCE OF WAY.

Expenditures amounting to the sum of $3,196,854.34 were made for the maintenance of way and structures, being an increase of $43,609.12, or 1.38 per cent., as compared with the previous 12 months.

During the year 11 steel bridges, replacing lighter metal structures, and 17 steel bridges, replacing wooden bridges and trestles, were erected. Eight metal bridges and four wooden bridges and trestles were filled in.

97.55 miles of single track were fully ballasted and 29.70 miles partially ballasted with stone, for which purpose 307,637 cu. yds. of crushed stone and 46,379 cu. yds. of screenings were used. In addition, 36 miles were fully ballasted with gravel, and 41 miles raised and ballasted with cinders.

235,752 ft., or 44.65 miles, of Company's sidings, and 30,835 ft., or 5.84 miles, of private sidings were constructed.

19,743 tons of new 90-lb. rail, together with necessary frogs, switches, etc., were placed in the track.

373,985 tie plates were used.

569,272 cross ties, 1,606,213 ft. B. M. switch ties, 377,127 ft. B. M. bridge ties and lumber amounting to 3,906,278 ft. B. M., were used during the year.

Drain tile to the extent of 10,800 ft., or 2.05 miles, was used.

1.26 miles of portable snow fences were erected at various points.

A new 62-lever electrically operated interlocking plant was put in operation at Wyandotte street, South Bethlehem, replacing manual plants at North Penn Junction and Brodhead avenue. At Van Etten, a 25-lever electrically operated plant was installed, replacing a manual plant of 11 levers. Interlocking plants were installed at Cortland with 31 levers, Silver Brook 16 levers, Laurel Junction, 18 levers, Malone's Siding 2 levers, and additions made at Sayre of 4 levers, Pittston Junction 5 levers, Pine Junction 5 levers, and Coxton 6 levers.

Increased commissary and laundry accommodations for the dining car department were provided at South Easton.

At Scott street, Buffalo, additional team tracks and driveways were put in and the canal bridge removed. Two local delivery sidings were constructed

at Constable Hook. The local freight facilities at Allentown were increased by the construction of two sidings and a driveway.

Track scales of 100 tons capacity each were installed at South Plainfield, Delano and North Fair Haven.

2.25 miles of new telegraph and telephone pole line were constructed, 17.44 miles rebuilt and 81 miles reset. Telegraph wires were extended from Silver Brook Junction to New Boston Junction, a distance of 6.2 miles.

Copper metallic telephone circuits were extended from Roun to Lumber Yard, a distance of 6.75 miles; from Coxton to Ransom, 3.5 miles; and at the Tifft Farm Terminal, 2.3 miles. Iron metallic telephone circuits were erected between Rockport and Penn Haven Junction, a distance of 6.1 miles.

Grounded telephone circuits were installed between Treichler and Rockdale, a distance of 6.2 miles, and between Swartwood and Park Station, a distance of 3.8 miles.

115.6 miles of new copper, 1 mile of new iron and 37.45 miles of second-hand iron wire were used in extending telephone, telegraph and signal wires. 105.5 miles of copper wire were used in replacing worn out wires in the same service.

MAINTENANCE OF EQUIPMENT.

The sum of $6,186,641.83 was expended during the year for the maintenance of equipment, being an increase of $700,847.77, or 12.78 per cent., as compared with the preceding year. This increase is due to the necessarily greater expense of maintaining the larger number of locomotives and cars now comprising the Company's equipment, to the additional cost of labor and material and to the increased charges to this account for equipment condemned and taken out of the service.

Forty freight, 10 switching and 5 passenger locomotives were purchased, 40 of which were charged to Capital Account. Two 8-wheel locomotive cranes and 15 8,000 gallon capacity tenders were also purchased.

Ten locomotives, unfit for further service and too light to warrant rebuilding, were sold and Operating Expenses charged with their value.

The total number of locomotives at the end of the year was 857, having a tractive power of 22,777,258 lbs., an increase of 45 locomotives and 1,828,909 tractive power pounds.

The average tractive power per locomotive at the close of the year was 26,578 lbs., an increase of 780 lbs., or 3.02 per cent.

Nine locomotives were rebuilt. 63 new fireboxes, two new tender frames and two new cisterns were applied. Three 4,500-gal. capacity tenders were constructed.

There were purchased and placed in service during the year under Equipment Trust, Series I, two thousand 80,000-lbs. capacity steel underframe box and two thousand 100,000-lbs. capacity steel coal cars. Five hundred 80,000-lbs. capacity steel underframe box cars were purchased and charged to Capital Account. Five hundred 80,000-lbs. capacity steel underframe box, one dining and 20 express cars were purchased and charged to Additions and Improvements. Five hundred 80,000-lbs. capacity steel gondola, one hundred and two 60,000-lbs. capacity steel underframe produce, twenty-five 60,000-lbs. capacity steel underframe automobile and ten 80,000lbs. capacity steel underframe box cars were purchased and charged to Expense and Equipment Renewal Reserve.

Thirteen 4-wheel steel underframe caboose cars and one set of 285,000-lbs. capacity gun and armor trucks were built.

One combination passenger and baggage car, one express car, 998 freight equipment cars and 26 road service cars were condemned and destroyed during the year and the value thereof charged to Operating Expenses.

The total number of freight equipment cars in service at the end of the year was 41,810, having a capacity of 1,357,740 tons, an increase of 4,649 cars and 221,784 tons.

One café car was converted into a dining car, one chair car into a passenger coach and three coaches assigned to road service.

394 passenger equipment cars were painted and varnished and 15 equipped with wide vestibules and standard steel platforms.

Air brakes were applied to 397 freight equipment cars at a cost of $21,940.

CONDUCTING TRANSPORTATION.

The total expense of conducting transportation was $12,100,681.44, being an increase of $1,208,727.71, or 11.10 per cent., as compared with the previous fiscal year. Freight train mileage increased 5.11 per cent., and ton miles increased 9.81 per cent. Passenger train mileage increased 4.11 per cent., and passenger miles increased 10.16 per cent.

The ratio of conducting transportation to gross earnings was 33.55 per cent., as against 33.22 per cent. last year, an increase of .33 per cent.

The increase in this class of expenses is due to an increased volume of traffic, increased rates of wages paid employees and the greater cost of all materials and supplies.

GENERAL EXPENSES.

The total expenditures under this head amounted to $630,075.28, an increase of $8,857.57.

TAXES.

The taxes paid amounted to $885,008.95, or 2.46 per cent. of the Company's gross earnings, an increase of $178,869.05, or 25.30 per cent.

THE LEHIGH VALLEY COAL COMPANY

The financial condition of The Lehigh Valley Coal Company is indicated by its General Balance Sheet published herewith. [See tables on page 220.] The following statement shows the funded debt of the Company and the yearly interest charges thereon.

Name.	Principal.	Date of maturity	Rate, per ct.	Yearly interest When due.	Amount.
The Lehigh Valley Coal Co.					
First mortgage bonds, issue of 1892	$10,114,000	Jan. 1, 1933.	5, gold.	Jan. Jul.	$505,700
First mortgage bonds, issue of 1892	1,400,000	Jan. 1, 1933.	4, gold.	"	56,000
Snow Shoe mortgage	359,500	Jan. 1, 1910.	5.	"	17,975
Delano Land Co.:					
First mortgage bonds	1,084,000	Jan. 1, 1932.	5, gold.	"	54,200
Total, Jan. 30, 1907	$12,957,500				$633,875

The total production of anthracite coal from the lands owned and controlled by The Lehigh Valley Coal Company and other companies in which it and the Lehigh Valley Railroad Company are interested, through ownership of stock, was 8,867,254.18 tons for the fiscal year ended June 30, 1907, as against 7,667,665.14 tons for the preceding year, an increase of 1,199,589.04 tons, or 15.64 per cent.

During the year The Lehigh Valley Coal Company and affiliated companies produced and purchased 87.11 per cent. of the anthracite coal transported by the Lehigh Valley Railroad Company.

From the operations of the Snow Shoe property there were mined 187,390.03 tons of bituminous coal, as compared with 210,728.17 tons for the previous twelve months.

The net results for the fiscal year have been seriously affected by many adverse circumstances. At the beginning of the year a cave-in occurred at Warrior Run, resulting in an explosion of gas that fired the mine, making it necessary to flood the entire operation. In October Exeter Breaker was demolished by a tornado. Centralia Breaker was idle for a period of seven months due to the breakage of machinery and the need of extensive repairs that could no longer be deferred without endangering the entire plant. Not only was the tonnage from these operations lost to the Company at a time when most needed and productive of the greatest profit, but the expense of reopening the Warrior Run mine and repairing the damaged breakers was so heavy, combined with other conditions, as to reduce the earnings to a minimum for several months. The anthracite coal handling plant and storage yard at South Chicago, with a stock of coal exceeding forty thousand tons, was entirely destroyed by fire in November and, although partially covered by insurance, the loss of these facilities was an additional burden upon the Company. Further, the shortage of cars was so severe during the winter and early spring as to require many of your collieries, spread over the extended region in which the Company's operations are conducted, to close down frequently during that period with less than a day's output, and this, with the inability of connecting roads to promptly move to destination such tonnage as had been sold, resulted not only in an excessive cost of operation, but prevented the sale of coal during a time when it could have been marketed at the greatest profit.

The Warrior Run Colliery and also Exeter and Centralia Breakers, which were rebuilt and enlarged to permit of handling a greater tonnage, are now in full operation. The new Sayre Colliery at Mt. Carmel, referred to in the last annual report, is also in successful operation. The work of rebuilding the coal handling plant and yard at South Chicago, with an increased capacity, on a basis permitting of more economical operation than the old plant, was begun immediately after the fire and the same will be in operation before the winter.

The construction of an additional coal storage building and dock, with a capacity of 75,000 tons, together with necessary machinery for handling anthracite coal, at Milwaukee, has been authorized and the work is under way. New retail coal yards and trestles have been established at 59th street, Chicago, and Syracuse, and a new trestle is in process of construction at Geneva. The coal handling plant and storage yard at West Superior, and the yards at 31st street, Chicago, and Walden avenue, Buffalo, are being enlarged. The total cost of this work to June 30th was $167,855.20.

In addition to the foregoing, improvements and betterments amounting to $708,169.09 were made to the various collieries during the year, of which amount $250,000 has been charged to the special appropriation made by the Board from the income of the previous fiscal year.

With the rebuilding of the operations mentioned, together with the improvements under way, and the property in a better physical condition than formerly, the future is encouraging.

The Advance Royalty Account has been decreased by $25,918.69.

The sinking funds of the several mortgages have been fully maintained.

FINANCIAL.

There were issued during the year, under authority of your Board, $5,539,000 General Consolidated Mortgage Bonds, bearing interest at the rate of four per cent. per annum, of which $539,000 were sold for various sinking fund purposes and to provide for the acquirement of additional capital stock of certain subsidiary companies the majority of whose capital stock is owned by your Company. The remaining $5,000,000 bonds, together with $2,000,000 previously issued, are in the treasury, making $7,000,000 of these bonds available for future needs.

The Montrose Railroad Company, successor to the property and franchises of the Montrose Railway Company, as referred to in the last annual report, created during the year a first mortgage securing an issue of $100,000 four per cent. fifty-year bonds. The same have been issued to your Company and are now in its treasury in exchange for a like amount of bonds, issued by the old company, which were cancelled.

An equipment trust known as Series I, amounting to $4,000,000, was created under date of August 1, 1906, covering two thousand coal cars of 100,000 pounds capacity each and two thousand box cars of 80,000 pounds capacity each. The certificates issued under the trust agreement bear interest at the rate of four per cent. per annum and are payable in ten annual instalments of $400,000 each, the last instalment being due September 1, 1916. All of the certificates are in your treasury.

The $300,000 Canastota Northern Railroad Company First Mortgage six per cent. Bonds were paid off at maturity, July 1, 1906, and the mortgage satisfied of record.

The mortgage of The Lehigh & Lake Erie Railroad Company, which provided for the issue of $3,000,000 four per cent. First Mortgage Bonds to cover the cost of constructing that road, together with the bonds issued thereunder, was cancelled and a new mortgage, dated March 1, 1907, securing a similar amount of bonds, maturing in fifty years and bearing interest at the rate of four and one-half per cent. per annum, was executed. $2,000,000 of these bonds were received and sold by your Company, the proceeds being applied in partial settlement of the advances made to date for construction, leaving a balance of $353,574.96 not reimbursed at the close of the year. This amount and the further advances necessary to

complete the road will be reimbursed by the remaining $1,000,000 bonds.

Under date of June 27, 1907, The Lehigh & Lake Erie Railroad Company was consolidated with The Lehigh Valley Rail Way Company, your New York State railroad. The authorized capital stock of the latter company was increased by $2,343,000, of which $343,000 was issued to your Company, $25,000 to absorb the stock of the former and $318,000 in reimbursement of the amount advanced, with interest thereon, to The Lehigh Valley Rail Way Company to retire the Canastota Northern Railroad Company First Mortgage six per cent. Bonds, an obligation of the Rail Way Company that matured July 1, 1906, as previously mentioned. The stock so received was pledged with the Trustee of the General Consolidated Mortgage, as provided therein. The remaining $2,000,000 stock will be issued to the Lehigh Valley Railroad Company as future advances are made for improvements and betterments to the property of The Lehigh Valley Rail Way Company.

To reimburse your Company for advances made for the construction and enlargement of their plants, the Hazleton Water Company and the [illegible] Mountain Water Company, the entire capital stock of which companies is owned by the Lehigh Valley Railroad Company, have issued, in the case of the former, $50,000 additional capital stock and $300,000 First Mortgage fifty-year five per cent. Bonds and, in the case of the latter, $75,000 additional capital stock and $125,000 First Mortgage fifty-year five per cent. Bonds. All of these securities have been received by your Company and are in the treasury, with the exception of $50,000 Hazleton Water Company Bonds held in reserve by that company for future use.

The construction account of the Bay Shore Connecting Railroad Company has been closed and capital stock of the company received by the Central Railroad Company of New Jersey and your Company in settlement of advances made, as referred to in the previous annual report.

There were sold for sinking fund purposes $41,000 bonds of the Mutual Terminal Company of Buffalo.

Payments amounting to $1,002,000 were made on account of matured principal of Equipment Trusts Series B, C, D, E, F, G and H and the Maritime Mortgage of the Lehigh Valley Transportation Company. Car Trust Series B and the Maritime Mortgage, both of which matured during the year, were paid off and satisfied of record. The title to the equipment pledged under the former, consisting of one thousand 60,000-pounds capacity coal, fifty stock and six combination cars, was vested in the Lehigh Valley Railroad Company, and the title to the floating equipment pledged under the latter mortgage, being the two lake steamers, "Wilkes-Barre" and "Mauch Chunk," and thirty-two barges, was vested in the Lehigh Valley Transportation Company, the entire capital stock of which is owned by your Company. At the close of the year the total outstanding equipment trust obligations of the Company in the hands of the public were $2,024,000. Equipment Trust Certificates Series H and I, amounting to a total of $4,540,000, are in your treasury and may be sold as occasion arises.

A suit was brought in the year 1904 by the holders of the preferred capital stock of the Company to secure the payment of dividends from the year 1893 to 1904 inclusive, which such holders claimed were cumulative. The Supreme Court of Pennsylvania sustained their contention and the dividends with interest, amounting to the sum of $116,673.96, were paid.

Your Board, on December 19, 1906, declared a semi-annual dividend of five per cent. on the preferred capital stock and a semi-annual dividend of two per cent., with an extra dividend of one per cent., on the common capital stock of the Company payable January 12, 1907. Similar dividends were declared on June 19, 1907, payable July 13, 1907.

The increase of $5,955,552.55 in Capital Amount represents the purchase of new equipment during the year, as previously mentioned.

Current Assets are $8,413,967.54 in excess of Current Liabilities.

The value of material and supplies on hand at the close of the fiscal year amounted to $2,099,145.22, an increase of $283,218.32, which is due to the greater cost as well as the additional quantity required for the increased equipment and business of the Company.

The increase in Securities Owned is explained by the additional securities issued to your Company for advances made to various subsidiary companies, and by the purchase of outstanding stock of companies the majority of whose capital stock is owned by the Lehigh Valley Railroad Company.

Bills Receivable Account has been increased by $182,500 notes of the Buffalo, Thousand Islands & Portland Railroad Company, a road projected by the New York Central & Hudson River Railroad Company and this Company to give additional connection with the Niagara Frontier, for sums advanced from time to time for surveys and right-of-way of that line, a portion of which has heretofore been carried in the account Advances to Other Companies.

The amount of capital stock issued remains unchanged.

The Company's cash on hand shows a decrease as compared with the previous year, which is due principally to the large purchases of equipment that were paid for out of current cash.

The accounts of the Company for the fiscal year, in accordance with the usual practice, have been examined by certified public accountants and the result of such examination is set forth in the accounts' certificate published herewith.

The General Balance Sheet and various statements appended show the financial condition of the Company at the end of the fiscal year.

GENERAL REMARKS.

The general improvement of your property has continued throughout the year and it has been fully maintained.

Included in the Company's equipment are many small wooden coal and box cars, ranging from twenty to thirty tons capacity, that are expensive to maintain by reason of their age as well as productive of but little revenue owing to their limited capacity. While these cars have been fully maintained and would, under previous conditions, be serviceable for additional use, yet placed as they necessarily are at various times between the modern heavy steel cars of this Company or foreign roads, they are being constantly damaged and are a frequent cause of wreck and disaster. Considering this and the fact that the Company's equipment has been more than maintained upon a tonnage basis and exceeds in value the total amount of the Equipment Account, your Board, [illegible] operation of the property, [illegible] a special appropriation of $[illegible] out of the net results of the fiscal year and [illegible] equipment as the appropriation will provide for. The same has been placed in a special reserve and will be credited to Capital Account as the cars are taken out of service.

Contracts have been [illegible] for the [illegible] and delivery during the early part of the next fiscal year of five thousand [illegible] capacity box and coal cars, the tonnage of which will more than exceed the tonnage of the equipment to be condemned.

Substantial progress has been made in the construction of the terminal railroad at Buffalo, referred to in the previous annual report as the Lehigh & Lake Erie Railroad, and it is expected that the line will be [illegible] with double track and be in operation by September 30. In connection with this improvement, and in order to properly handle the lake and [illegible] traffic, an expenditure of $250,000 has been authorized for additional yard and terminal facilities at Tifft Farm, which work is now under way.

The new double track 1,800 ft. steel girder bridge over the Susquehanna River, including the reduction of grades and change of alinement from Wysox to west of Towanda, has been completed and placed in service at a total cost of $810,818. The credit balance remaining in the special reserve fund charged with the cost of this and other similar work has been credited to General Reserve Fund.

The construction of third and fourth tracks from East Penn Junction to a point west of Freemansburg, a distance of 6.5 miles, is completed and a further extension of these tracks to east of Redington, a distance of 4.2 miles, has been authorized and is now in progress. This work, when completed, will give a continuous four-track line from Gap Junction to east of Redington, a distance of 12.7 miles, and will greatly facilitate the movement of traffic. The expenditure to date for this improvement amounts to $300,018.

The extension of the fourth track from Mauch Chunk to Glen Onoko, mentioned in the last annual report, was completed during the year to Coalport Bridge, a distance of 1.25 miles.

The third and fourth tracks at Bridge 28 were extended to New Market, a distance of 1.2 miles.

To relieve Coxton Yard and to eliminate main track shifting, the third and fourth tracks were extended from Falling Spring to Weldon, a distance of 1.73 miles, at a cost of $21,842.

Double track was extended from Morris Ridge to Mt. Carmel, a distance of 1.5 miles, making a continuous double track line from Hazleton to Mt. Carmel Yard.

The change in alinement on the Ithaca Branch between Ithaca and Willow Creek, a distance of five miles, has been completed, reducing the maximum curvature on that section of the line from 6 degrees to 1 degree and 30 minutes.

The car repair yard at Packerton has been remodeled and enlarged to accommodate 250 additional cars.

In order to overcome the present delay to traffic at the Jersey City Terminal and provide for increased business, the sum of $350,000 was authorized for the construction of three new transfer bridges and a freight yard of one thousand cars capacity at the National Docks, Communipaw. This work is now in progress and when completed will relieve the congestion at Jersey City and reduce the cost of operation. The plan under which the improvement is being made will permit of economical enlargements from time to time as necessity may require. Further relief at that point will also be afforded when two of the present float bridges are replaced with new bridges, made necessary by the use of heavier equipment of larger capacity, and Oak Island Yard has been enlarged by the construction of thirteen additional tracks. The aggregate cost of this work, which is now well under way, is $140,000.

New double track gravity ash pits of concrete construction, with depressed track for cinder cars, were constructed at Coxton, the expense being $24,049. A combination coal and ash-handling plant was installed at Hazleton at a cost of $16,496.

To increase the safety of train movements over the single track between Laurel Junction and Silver Brook Junction, a distance of 6.2 miles, a staff signal system was installed at a cost of $9,854.

Automatic signals were installed throughout Ithaca Yard and between Jersey City and Park View.

New stone and brick passenger stations were constructed at Catasauqua and Towanda, and a new frame station at Mt. Carmel, the latter replacing one destroyed by fire. A new freight house was constructed at Canastota, and a new brick freight house and transfer shed are in course of construction at Sayre.

A transfer station was established at Depew Junction, for handling passenger business via Suspension Bridge, at a cost of $12,546.

The locomotive coaling trestle at East Buffalo, which was partially destroyed by fire in January, 1906, was rebuilt during the year at an expense of $27,325.

Extensive renewals were made to Pier 3, New York, and Wharf No. 2 at Perth Amboy, aggregating a cost of $37,114.

A water tank of 100,000 gallons capacity, together with the necessary piping and pumps, was installed at Coxton, and a 34,000-gallon capacity tank at Niagara Docks. Two ten-inch standpipes were installed at Manchester and one ten-inch standpipe at National Stores.

During the year 71 new industries were located on your Company's line, track connections being made with 28 of these plants.

65.17 per cent. of the total operating expenses of the Railroad Company, or $14,412,015.11, was paid direct to labor, being distributed among 23,003 employees.

The principal purchases of real estate have been at Bayonne, Lehighton, Wilkesbarre and Buffalo, where additional land was required for the extension or enlargement of present facilities.

The Board takes pleasure in hereby tendering its thanks to the officers and employees of the Company for the efficient and loyal services rendered by them during the year.

By order of the Board of Directors,

E. B. Thomas, *President.*

COMPARATIVE INCOME ACCOUNT FOR THE YEARS ENDED JUNE 30, 1907 AND 1906.

Lehigh Valley Railroad Company.

	1907	1906	Increase	Decrease
Gross Earnings:				
Coal frt. earnings..	$15,110,899.38	$13,248,565.42	$1,862,333.96	.....
Other frt. earnings.	14,996,672.62	13,934,127.10	1,062,545.52	.....
Passenger earnings	4,363,452.12	3,971,392.05	392,060.07	.....
Express earnings..	373,953.30	367,706.36	6,246.94	.....
Mail earnings.....	217,792.69	217,745.88	46.81	.....
Miscel. earnings....	1,005,661.40	1,050,319.82	.....	$44,658.42
T'l gross earnings	$36,068,431.51	$32,789,856.63	$3,278,574.88	.....
Operating expenses:				
Maint. of way and structures	$3,196,854.34	$3,153,245.22	$43,609.12	.....
Maint. of equipm't.	6,186,641.83	5,485,794.06	700,847.77	.....
Conducting transp.	12,100,681.44	10,891,953.73	1,208,727.71	.....
General expenses...	630,075.28	621,217.71	8,857.57	.....
Total op. exp....	$22,114,252.89	$20,152,210.72	$1,962,042.17	.....
Percentage, op. exp. to gross earnings	61.31	61.46	.....	.15
Net Earnings	$13,954,178.62	$12,637,645.91	$1,316,532.71	.....
Other Income:				
Dividends on stocks	64,893.50	76,994.50	.....	$12,098.00
Interest on bonds..	12,810.00	24,570.34	.....	11,760.34
Interest on real estate mortgages..	18,113.46	20,616.53	.....	2,503.07
Miscel. interest....	254,493.33	284,545.71	.....	30,052.38
Net earnings from miscel. operations	594,824.70	402,124.69	192,700.01	.....
T'l other Income	$945,137.99	$808,851.77	$136,286.22	.....
Total Income.....	$14,899,316.61	$13,446,497.68	$1,452,818.93	.....
Deductions from Income:				
Additions and Impr. to property.....	$2,068,589.91	$1,570,227.19	$498,362.72	.....
Interest on funded debt	3,546,333.22	3,215,022.22	331,311.00	.....
Interest on equipm't trust obligations.	119,170.00	163,147.49	.....	$43,977.49
Rentals, leased lines and guarantees..	2,200,473.00	2,295,723.00	.....	95,250.00
Taxes	885,908.95	707,039.90	178,869.05	.....
Miscel. deductions.	53,888.20	43,754.36	10,133.84	.....
Total deductions from income....	$8,874,363.28	$7,994,914.16	$879,449.12	.....
Net Income	$6,024,953.33	$5,451,583.52	$573,369.81	.....
Lehigh Val. Coal Co. Net Income	111,250.45	318,489.19	.....	$207,238.74
Total net income	$6,136,203.78	$5,770,072.71	$366,131.07	.....

PROFIT AND LOSS ACCOUNT FOR THE YEAR ENDED JUNE 30, 1907.

Lehigh Valley Railroad Company.

	Dr.	Cr.
Balance surplus, July 1, 1906.....	.....	$11,380,915.31
Discount on general consolidated mortgage bonds sold	$5,200.00	.....
Dividends of 5 per cent. on preferred stock paid July 14, 1906, and January 12, 1907, respectively.....	10,630.00	.....
Cumulative div. paid on preferred stock..	116,673.96	.....
Dividend of 2 per cent. on common stock paid July 14, 1906, and dividend of 2 per cent. and extra dividend of 1 per cent. paid January 12, 1907.....	2,016,740.00	.....
Amount transferred to special reserve for equipment to be condemned.....	1,250,000.00	.....
Miscellaneous adjustments	.....	2,658.58
Net income for the year ended June 30, 1907, Table No. 2.....	.....	6,024,953.33
Balance surplus, June 30, 1907.....	14,009,283.26	.....
	$17,408,527.22	$17,408,527.22
Balance carried forward, July 1, 1907.....		$14,009,283.26

PROFIT AND LOSS ACCOUNT FOR THE YEAR ENDED JUNE 30, 1907.

The Lehigh Valley Coal Company.

	Dr.	Cr.
Balance surplus, July 1, 1906.....	.....	$1,974,452.52
Appropriated for improvements.....	$250,000.00	.....
Miscellaneous adjustments	47,838.65	.....
Net income for year ended June 30, 1907, Table No. 2.....	.....	111,250.45
Balance surplus, June 30, 1907.....	$1,787,864.32	.....
	$2,085,702.97	$2,085,702.97
Balance carried forward, July 1, 1907.....		$1,787,864.32

CONDENSED BALANCE SHEET, JUNE 30, 1907.

Lehigh Valley Railroad Company.

ASSETS.

Railroad:		
Cost of road		$18,639,291.95
Equipment		35,726,422.18
General consolidated mortgage bonds of the company held in its treasury		7,000,000.00
Equipment trust certificates of the company held in its treasury		4,540,000.00
Treasury stock		250.00
General consolidated mortgage bonds of the company in hands of trustee of Warrior Run stock purchase bonds.....		100,000.00
Real estate		2,149,523.02
Construction contract, Lehigh & Lake Erie railroad		353,574.90
Mortgages receivable		350,200.00
Securities Owned:		
Stocks of railroad and water lines included in Lehigh Valley system	$29,166,659.11	.....
Stocks of allied coal companies	19,674,682.71	.....
Stocks of other companies	5,003,050.00	.....
Bonds of railroad and water lines included in Lehigh Valley system....	4,372,926.00	.....
Bonds of other companies	3,305,907.87	.....
Certificates of indebtedness, Lehigh Valley Coal Company	10,537,000.00	.....
		72,750,225.09
Advanced insurance premiums.....	.....	119,687.18
Current Assets:		
Cash on deposit and in bands of treasurer	$6,612,849.07	.....
Cash in bands of officers and agents.....	25,839.53	.....
Cash in transit	688,171.84	.....
Due by station agents.....	1,033,864.20	.....
Due by individuals and companies.....	2,493,518.74	.....
Traffic balances due by other companies..	426,420.88	.....
Bills receivable	306,250.85	.....
Advances to other companies.....	170,991.49	.....
Material and supplies on hand.....	2,099,145.22	.....
		13,837,051.82
Deferred and Suspended Assets:		
Sundry accounts	.....	291,972.42
Total assets	.....	$155,878,199.22

LIABILITIES.

Capital Stock:		
809,696 shares common stock, par $50..	$40,334,800.00	.....
2,126 shares preferred stock, par $50....	106,300.00	.....
		$40,441,100.00
Funded debt	.....	82,639,000.00
Equipment trust obligations.....	.....	6,564,000.00
Reserves:		
Reserve for depreciation of Coxe mines and properties	$2,209,360.06	.....
Special reserve for equipment to be condemned	1,250,000.00	.....
Equipment and general reserve funds...	1,091,489.48	.....
		4,550,849.54
Mortgages on real estate	.....	196,880.55
Interest and rentals Accrued, Not Due:		
Interest on funded debt.....	$730,135.00	.....
Interest on equipment trusts.....	26,775.00	.....
Accrued rentals, leased lines.....	406,985.82	.....
		1,163,895.82
Current Liabilities:		
Dividends unpaid	$1,331.00	.....
Interest on bonds due and unclaimed...	60,340.50	.....
Rentals of leased lines due.....	337,500.00	.....
June pay roll, since paid.....	1,195,893.59	.....
Audited vouchers, including June bills, since paid.....	2,350,137.63	.....
Due to individuals and companies.....	127,562.88	.....
Traffic balances due to other companies.	1,077,954.56	.....
Unclaimed wages	11,540.31	.....
Taxes accrued	257,273.77	.....
Lehigh Valley relief fund.....	23,550.04	.....
		5,443,084.28
Deferred and Suspended Liabilities:		
Taxes accrued, not due.....	$298,211.17	.....
Sundry accounts	571,894.60	.....
		870,105.77
Profit and loss	.....	14,009,283.26
Total liabilities	.....	$155,878,199.22

NOTE.—The dividends declared prior to the close of the fiscal year, and payable July 13, 1907, amounting to $1,215,359, are not included as a liability in the above statement.

CONDENSED BALANCE SHEET, JUNE 30, 1907.

The Lehigh Valley Coal Company.

ASSETS.

	Dr.	
Property and plant		$17,565,524.79
Treasury stock		350,000.00
Advances for Coal Mining Rights		5,408,542.02
Current assets:		
Cash on deposit and in hands of Treasurer....	$493,162.03	
Cash in transit	410,347.37	
Stock of coal on hand	2,665,688.36	
Materials and supplies	450,775.13	
Bills receivable	254,271.28	
Due by individuals and companies	4,394,802.30	
		8,669,046.47
Deferred and Suspended Assets:		
Premiums on unexpired insurance and other deferred assets		16,398.48
Trustees of Sinking Funds:		
Cash and bonds in the hands of the Trustee.....		1,418,335.66
Total assets.		$33,427,847.42

LIABILITIES.

	Cr.	
Capital stock	$1,965,000.00	
Funded debt	12,957,500.00	
Certificates of indebtedness	10,537,000.00	
		$25,459,500.00
Current Liabilities:		
Audited vouchers	$3,010,056.42	
Wages due and unpaid.....	431,120.95	
Sundry accounts payable	314,843.62	
Royalties on coal mined and due lessors.....	45,651.26	
Bond Interest due and payable	6,600.00	
Taxes due and payable	4,331.00	
		3,812,603.25
Deferred and Suspended Liabilities:		
Royalties received from lessees, not accrued..	$153,967.17	
Interest on funded debt, accrued	316,937.50	
Taxes accrued	51,040.18	
Deferred real estate payments	56,000.00	
Miscellaneous	2,360.30	
		580,305.15
Reserve Accounts:		
Sinking funds and other reserves		1,787,574.70
Profit and loss		1,787,864.32
Total liabilities		$33,427,847.42

STATEMENT OF EQUIPMENT TRUST OBLIGATIONS.

Lehigh Valley Railroad Company.

Equipment Trust.	Principal.	Date of maturity, annually.	Interest—Rate, per cent.		Interest—Due.
Outstanding:					
Series C, crtfs..	$100,000	$20,000 to June 1, 1909	4½	gold	June Dec.
Series D, crtfs..	900,000	300,000 to Mar. 1, 1910	4½	gold	Mar.-Sept.
Series E, crtfs..	161,000	82,000 to Feb. 1, 1909	4½	gold	Feb.-Aug.
Series F, crtfs..	160,000	80,000 to May 1, 1909	4½	gold	May-Nov.
Series G, crtfs..	400,000	100,000 to Aug. 1, 1910	4½	gold	Feb.-Aug.
Total.....	$2,021,000				
In the Treasury:					
Series H, crtfs..	540,000	90,000 to Feb. 1, 1913	4	gold	Feb.-Aug.
Series I, crtfs..	4,000,000	400,000 to Sept. 1, 1916	4	gold	Mar. Sept.
T'l, June 30, 1907.	$6,561,000				

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS.

THE BRITISH AND EASTERN CONTINENTS edition of the Railroad Gazette is published each Friday at Queen Anne's Chambers, Westminster, London. It contains selected reading pages from the Railroad Gazette, together with additional British and foreign matter, and is issued under the name Railway Gazette.

CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.

ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

OFFICERS.—In accordance with the law of the state of New York, the following announcement is made of the office of publication, at 83 Fulton St., New York, N.Y., and the names of the officers and editors of The Railroad Gazette:

CONTENTS

VOL. XLIII., No. 9. FRIDAY, AUGUST 30, 1907.

In our issue of Aug. 2 we called attention to the first of the bulletins issued by the committee on car efficiency of the American Railway Association, showing surpluses and shortages of revenue freight cars on July 10 on all the principal roads. Statistical bulletin No. 2 has now appeared, continuing the previous study in the effort to show the causes which affect the efficiency of a freight car Mr. Hale, chairman of the committee, has done a remarkable piece of work in collecting the figures thus presented. His report covers 163 roads, and gives for each one, except in rare cases where the information was partially not available, a complete history of its car balance and performance for the six months ended Dec. 31, 1906. Four measures are used to determine car efficiency: per cent. of cars in shop, average miles per car per day, per cent. of loaded mileage and average loading of cars. Thus, the average per cent. of cars in shop for all roads reporting is 5.48. Mr. Hale points out that it is customary on many roads to make reductions from time to time in shop expenses, and though this may not occur often when there is a local shortage, it is frequent practice when there is a general shortage. His statistical findings show very clearly the actual cost of this, since a decrease of but one-half of 1 per cent. in the number of cars in shop would be equivalent to an increase of 9,490 cars in service, with an approximate value of $9,500,000. One of the roads listed showed a percentage of cars in shop as high as 30.69. The average number of cars on line per freight engine owned is given as 82, but individual averages run as high as 231, excluding one company not fairly comparable. The average daily earnings of all cars on the line is $2.51, and the average per car owned is $2.59. In one instance the individual average of all cars on the line was $11.42, and it is reported as low as 88 cents in ordinary service, but it does not fall below $1.07 on any railroad of importance. Earnings of from four to six dollars a day occur frequently in the compilation. The common assumption, therefore, that freight cars on a busy line earn five dollars a day is a conservative one. The average mileage per car per day is 24.2, including, as in the previous figures, 11 Canadian and Mexican lines, and 71 per cent. of the mileage is loaded. The average ton mileage per car mile is 13.6, and the average ton mileage per loaded car mile, 19.4 per car per day, the average ton mileage is 329. The average daily car journey is lowest in the southern states (18.3 miles), not in the New England states (18.5 miles) as might have been expected. The Union Pacific reports a daily car journey of 48.8 miles in Montana, Wyoming, Nebraska and the Dakotas, while one of the largest lines in the South can only get 14.6 miles.

THE PRESENT COST OF MONEY.

In accounting for the present depreciation in the quoted values of railroad and industrial shares and securities it is often mentioned and it is apparent that a general cause is the world-wide demand for money, aggravated in the United States by a hostile governmental and legislative attitude. It is interesting and perhaps worth while to look a little farther and see if this unprecedented demand for capital among all the great nations is comparatively permanent or passing.

In the period of from two to five years ago the transportation and other industries in this country were at high tide, as they still are. They needed and easily got, at reasonable interest rates, all the money needed for rapidly increased facilities, and this money came from England, Germany, Holland, and for the first time in large amounts from France, as well as from our own people. In that period the industrial situation on the Continent was none too good. In spots it was bad. German manufacturing was only beginning to show signs of improvement under the artificial stimulus of cash subsidies and a rebate of freight rates on exported products. The government contribution to the German maker of exported locomotives is about ten per cent., not far from $1,500 per locomotive. Generally speaking, the capital requirements in Germany and the other European manufacturing nations was less than normal, because business was not very good. In England business was distinctly bad. "Armies of the unemployed" were organizing and marching to an extent that was mildly threatening. Old schemes, many of them fantastic, for making work for working people without enough to live on, were revived, discussed and sometimes tried. Money earning small return in Europe flowed in billions to investment in American railroads and, less generally, in industrials.

Looking back for thirty-five years there is further and quite uniform evidence for an inference. During our periods of most acute depression following the years 1873 and 1893, as well as during our other severe but less keenly felt reaction, the conditions in Europe were quite different, and sometimes were reversed. For a generation our seasons of highest prosperity have not been coincident with foreign prosperity. For the first time in recent history we meet long continuing prosperity in the four great manufacturing nations. They are in opposition. More and more capital expenditures in all these countries have at the same time become highly profitable, both as a means of earning more and in order to produce cheaper. When it pays to borrow capital money for great under-

takings at from six to seven per cent., and when Fortune, perforce, smiles alike in three languages, the resulting effect on the interest rate is inevitable.

And the awakening; the certain effect on the prices of shares, notes and first-class bonds? The price of bonds is affected the least. The holdings of restricted institutions, trustees and estates are the last to be changed, but the market is narrowed and almost choked. The device of two- and three-year notes of great corporations, to tide over the times of too widespread prosperity, has been useful, until the coming of the 7 per cent. rate; then the conservative officer halts.

As we look back at it now, the prices of dividend paying stocks have been too slow to yield to the pressure. Up to about a year ago, strong stocks may be said to have sold at a price to yield from 4 to 4½ per cent. Speaking generally, good stocks are now quoted on a 6½ to 7 per cent. basis. With a prevailing interest rate increased from 4 to 5½ per cent.; from 4½ to 6, and from 5 to 7 per cent., varying with the time and the security, there comes quite late a depreciation in the prices of good stocks of from 17 to 33 per cent.

The object of this reference is not at all to consider the investment or speculative value of corporate securities at present prices; it is simply to point out to officers of railroad and manufacturing companies that this present depreciation in security prices, this increased interest rate, means to them not only added difficulty in getting new capital, but also an increased operating cost, or, rather, more deduction from net earnings. They buy materials and hire labor and money. The cost of material has increased less than is ordinarily counted. For example, the cost of locomotives per unit of horse-power developed is less now than it was ten years ago. The cost of labor has increased quite 20 per cent., rated in cost per hour, but its efficiency has decreased largely—by a percentage which no one is competent to estimate. The added cost of money comes last, and it is evidently as much as 25 per cent.

THE SALE OF THE CHICAGO & ALTON.

Even while Wall Street is in the depths, there comes news of a new railroad merger. The Toledo, St. Louis & Western, a small road with one single line connecting Detroit and Toledo on the east with St. Louis on the west, adds to its 450 miles of line and $4,200,000 of gross earnings the 970 miles and $11,600,000 gross earnings of the Chicago & Alton, a far stronger and better equipped property. This has been brought about through its acquisition of $20,800,000 of the total of about $40,000,000 capital stock of the Chicago & Alton. This controlling block of Alton stock was sold by the Rock Island Company and interests identified with it. The Rock Island made its investment in Chicago & Alton in 1903 after the Union Pacific has acquired over $10,000,000 Chicago & Alton preferred stock. The Rock Island's object was to prevent the road from falling under entire control of the Union Pacific. In this the Rock Island interests were successful, for they secured more than enough stock to give them actual control of the property. Despite this fact, an agreement was made with the Union Pacific by which the Alton was to be held under a system of alternating control, the Union Pacific managing the property one year and the Rock Island the next. This agreement, however, was abrogated last June. The Rock Island Company controls the Chicago & Eastern Illinois, which parallels the Alton between Chicago and St. Louis, and the St. Louis, Kansas City & Colorado, which parallels the Alton between St. Louis and Kansas City. The Rock Island's control of the Alton therefore drew unfavorable criticism from the Interstate Commerce Commission. The Rock Island interests realized that they would not be allowed by the United States Government to keep possession of the Chicago & Alton, and therefore were glad to sell the property to the Toledo, St. Louis & Western at a loss said to be about $1,500,000 on the original investment.

The Chicago & Alton stock purchased by the Toledo, St. Louis & Western is to be paid for by that company by issuing its collateral trust bonds secured by the Alton stock. Four per cent. bonds are to be issued against the preferred stock at par and 2 per cent. bonds against the common stock at 35. The rate on these latter bonds is to be raised to 4 per cent. at the end of five years. Figuring the preferred stock at par and the common stock at 35, the par value of these collateral securities which the Toledo, St. Louis & Western is to issue will be $11,227,000, of which $6,380,000, issued against the preferred stock, will be paying 4 per cent. and $4,847,000, issued against the common stock, will be paying 2 per cent. This makes an average rate of 3.1 per cent. which the Clover Leaf will be paying on the par value of its Alton-collateral bonds during the first five years of their existence. It is obvious that in the present state of the market collateral trust bonds of a road like the Toledo, St. Louis & Western, which until five months ago had never declared a dividend and which occupies by no means a commanding position among the railroads of the country, secured by stock of the Chicago & Alton, a railroad at a moment peculiarly under the ban of alleged over-capitalization, could not be sold on a basis to yield anything like 3.1 per cent. In fact they almost certainly could not be sold on twice as favorable an income basis; for short term notes and equipment trusts of the strongest railroads in the country are selling at better than 6.2 per cent. Yet since the Clover Leaf has five years before its rate of payment on the total amount of these bonds rises from 3.1 per cent. to 4 per cent., it is hardly fair to figure the investment at the extremely low prices now prevailing, which would probably give an income return on these bonds of 7 per cent. or more. Taking 6.2 per cent., twice the rate paid on the par value of the bonds, as a fair rate for the five years, we may consider the actual cash price paid for the Rock Island's Alton holdings as $5,613,500, half the par value of the collateral trust 4 per cent. and 2 per cent. bonds. The Rock Island's original investment in Chicago & Alton stock is said to have been about $10,000,000; on this basis the loss was about $4,400,000. If there is to be a decided change for the better in stock market conditions, and continued prosperity, the rising value of the collateral trust bonds would lower the amount of this loss.

As for the physical aspects of the merger, there is one obvious advantage to both roads. By building seven miles of line from Panama, Ill., on the Toledo, St. Louis & Western 50 miles northeast of St. Louis, west to Litchfield, the eastern terminus of a Chicago & Alton branch line, the consolidated system will have a short through line from Kansas City east to Toledo and Detroit, giving a long haul on traffic between Kansas City and the East. Aside from this, there are no strikingly obvious physical advantages from the merger. A map on another page shows the relation of the two roads and also the Iowa Central and the Minneapolis & St. Louis, two roads controlled by the same interests as those at the head of the Toledo, St. Louis & Western. With the building of the short connection already mentioned, it will be possible to haul grain from points as far west as the Missouri river in northern South Dakota, east as far as Lake Erie over the system's own rails; but, as can be seen from the map, this would be a rather roundabout route. It would also be possible with the same limitation to form a through route from Chicago to Minneapolis and St. Paul and to South Dakota over the Chicago & Alton to Peoria, the Iowa Central to Albert Lea, Minn., and the Minneapolis & St. Louis to St. Paul and South Dakota. It is possible that the four roads will be more closely united in a single system with centralized management. They all serve rich traffic territory, but highly competitive. On all through business they must meet severe competition by better situated carriers; yet such a system is not without its possibilities.

"STRIKE" CHARTERS AND THEIR WARNINGS.

A phase of prospective street railway overcapitalization which made its appearance not long ago in Connecticut serves at once as a text and a warning to conservative capital in these hustling days when that kind of capital—along with more blameworthy sorts—is so commonly the object of public and legislative attack. We have heretofore had occasion to point out the symptoms and seriousness of the dropsy disease in street railway finance in both Rhode Island and Connecticut and how in the latter state there had come too late a public awakening and reaction, caused immediately by what was, in effect, the guaranteeing of a 4 per cent. annual dividend on some $18,000,000 of watered stock of the Connecticut Railway and Lighting Company by the New York, New Haven & Hartford. This aroused public sentiment naturally gave the street railway promoters a pause; but it was only a temporary pause, evolving into a new and rather original form of subtlety.

At the opening of the last Connecticut legislature, and during the first few weeks allowed for the introduction of new measures, it was noticed that there were bills relating to street railway charters remarkable in number for a period of tight money and public suspicion about trolley enterprise, and in a state where, as it seemed to the expert eye, profitable trolley territory had been exhausted. At first these projects did not attract attention. They seemed independent of each other, isolated, and with no coherent and ulterior purpose. But presently it was observed that they seemed to focus

in a definite region along the shore and in rough parallelism to the New Haven company's steam line of about 50 miles between New Haven and New London, and reaching up toward Middletown, besides some other proposed parallels in other parts of the state. About the same time two other schemes came to the surface. They involved charters like that of the Connecticut Railway & Lighting Company, which gave large power of purchase, absorption and merger and unlimited privilege in the issue of stock. The "promoting" scheme in its full magnitude was finally brought to light, namely, the bunching of the street railway projects in one or two power companies, next either a "sell out" of the whole watered outfit to the menaced steam corporation or the building of the parallels and the enlargement of the club to pound the steam company into final surrender. Later in the session the scheme was substantially defeated.

This Connecticut case is cited here only as one of numberless instances elsewhere of the workings of "high finance" in its relations to legislation. The devices have been many: First there is the new charter, seemingly harmless in shape and formal in outward character but, hidden away in some obscure clause, containing the desired and dangerous powers. Next there is the "charter amendment," sometimes prolix and masking the same evil. Again, most subtle and dangerous of all, is the "merger" trick worked through the minor charter of a small railway enterprise. The small charter—so small as to the project that it quite escapes notice—is asked for and obtained readily. Next comes along, a year or two later, the true parent, the larger corporation, which, having acknowledged ownership of the small enterprise, asks for merger with acquisition also of its charter powers. Nobody in the legislature remembers what the small charter granted, and the merger bill that may invest the great corporation with immense and undreamed of powers, goes through with a snap on some day of high legislative pressure of business. Added to such examples are the multiplied cases of "hawk" charters obtained simply to be sold and, too often, charters with such a reach that they apply legally to enterprises far different than those indicated by any cursory reading of the text.

The average legislator, though he may be absolutely honest, is apt to be too ignorant or inexpert to detect such charter stratagems. Railroad committees of state lawmaking bodies are too often "set up" to let just such projects through; and state railroad commissions are apt to deem prevention as beyond their own jurisdiction and refer them to the law-making responsibility. The public is protected from them in most cases only when it happens that some strong corporate interest is opposed. In the Connecticut case, for instance, it is doubtful whether the seeming "strike" on a large scale would have been exposed except for the antagonized interest of the New Haven company. But the public find the stratagems out at last, usually too late to be rectified by law, but not too late to excite public wrath. It would be interesting if we could measure how far that discovery, repeated year after year and driven into the public mind by repetition, now enters into the anti-corporation feeling of the country, that involves the railroads. It certainly is a component in that feeling not to be ignored. And its lesson to the corporations is that legislation, and particularly, charter legislation, when sought hereafter should be sought along straightforward and not devious lines.

To corporation interests that are unscrupulous, such an appeal, of course, is made in vain. But there are other corporation interests broad-minded and far-sighted enough, we trust, to see that trick legislation harvests in the end as its share of a general penalty greater loss than can be made good by transitory gain. In other words, as to such matters as stock watering, honest finance and the public are as one in partnership and should be equally aggressive in resistance. Had honest finance, expressed in the corporation form, realized that fact sooner, and with its keener and quicker intelligence set itself against the evil, we might now be hearing less of public prejudice and legislative inequity.

The Railway Employment Safety Appliances Committee.

"The Railway Employment Safety Appliances Committee" of the British Board of Trade is the name of a board of three gentlemen—H. A. Yorke, Richard Bell and Robert Turnbull—which has during the past 12 months been considering the question whether or not the hand brakes on freight cars can be arranged so that the brakeman can apply them or let them off from either side of the car; and the committee gives it up as an impracticable task. This committee was appointed by the Board of Trade a year ago last April, and although it was instructed to examine, so far as new fit, any kind of appliance designed to diminish danger to railroad employees, it has thus far considered only this one subject. The reader will recall that seven years ago the English Parliament after two years' investigation, passed a law dealing with a number of questions concerning safety appliances, chiefly questions connected with freight yard work, and that the Board of Trade two years later issued rules on the subject. The rules, however, did not cover the brake question and the appointment of this committee appears to have been in pursuance of the policy, begun in connection with the legislation of 1900, to do everything possible to meet the demands, some of them rather unpractical, of the labor unions. Mr. Bell, the second member of this committee, is head of the Amalgamated Association of Railway Servants; Mr. Turnbull is Chief Passenger Manager of the London & North-Western Railroad, and Colonel Yorke, Chairman of the Committee, is the well known Chief Inspector of the Board of Trade.

The "Either-Side Brake" question has been agitated because when a shunter, in the hurry of his work, finds that a car which he wishes to move has the brake held on by the lever on the opposite side of the car, he is liable to risk his life by crossing to the other side of the car or train under dangerous conditions. The brakes of the English freight car ("waggon") are controlled by a long horizontal lever on the side of the car, and the men are most of the time on the ground. The weight of this lever, when the handle end is not fastened up, is alone sufficient to apply the brakes with considerable force. To apply it more forcibly the brakeman can press it down, while running along on the ground at the side of the car, or he may jump up and stand on the lever, utilizing the whole weight of his body. Still further, he may use a stick, somewhat larger than the "pick-handle" used by American brakemen, and by utilizing the sill of the car as a fulcrum he can secure the advantage of double leverage.

It is easy enough to arrange the two levers on the opposite sides of the car so that either one can be used to apply the brakes, but the difficulty is to interconnect these two levers so that when releasing one of them the other one shall also be unfastened.

The committee met 14 times during the year. Thirty or 40 brakes or models of brakes were examined and criticised or rejected, and then after a few weeks the same and other devices would be taken up again; but finally, after giving every opportunity to inventors and railroad companies, the committee decided that none of the appliances had sufficient merit to warrant its general adoption. Moreover, if a simultaneous movement of the two levers could be satisfactorily accomplished, there would always be danger that with men on opposite sides of a wagon, one of them, unknown to the other, would move the lever so as to cause bodily danger to the other man.

There are in the United Kingdom 1,400,000 vehicles to which the ordinary hand brake is applicable; of these 33,000 are already fitted with brakes which can be applied and released from either side; 172,000 have brakes which can be applied on both sides but not released. Included in the total mentioned are 650,000 private cars. The committee finds that where there are two levers they are often fixed so that both extend in the same direction from the middle of the car, whereas they ought to extend in opposite directions, so that the arrangement would be "cross-cornered."

In looking over the records of men killed and injured because of the lack of a lever on one side of a wagon, it was found that more men were killed when applying brakes than when releasing; so, finally, the committee recommended that the Board of Trade require after a certain date, that all new wagons have cross-cornered brake levers; that within seven years wagons having a lever on one side shall have a lever on the other side, and those having none shall have two; that within 10 years those having the levers single-ended be changed to cross-cornered; and that no either-side brake be put on hereafter unless it has been approved by the Board of Trade, on the advice of this committee.

The New York Central on Sunday last restored its New York City electrified terminal lines to "right-hand running," at the same time putting 13 miles of its elaborate new all-electric signaling in service. This was a great undertaking and it appears to have been carried out with a good degree of success. A brief account of it is given on another page. Trains were delayed on Monday forenoon and Monday evening, many of them for over an hour each, but Tuesday morning showed an improvement and Tuesday evening was almost normal.

These delays were due to instructions to lose a little time, to extreme caution on the part of enginemen, to one switch failure, and to a few mistakes of signalmen. The task of the men on Monday morning was made harder by a heavy extra passenger movement. There were further delays on Wednesday, due apparently to failures in automatic signal working; but as a whole the work appears to have been highly creditable. Comparing the delays with the magnitude of the work the results appear to have been far more

satisfactory than on the occasion of former radical changes at the New York terminal. In changing the interlocking at 56th street, where the four tracks in Park avenue diverge to the station layouts, an exceptional record was made. Here a new interlocking plant had to be installed. An 88-lever all-electric machine replaced an 84 all-electric machine. The entire change was made from the old to the new machine and the new put in operation for traffic (at 4 a.m.) in just seven minutes. To make this change, 38 men were assigned. The last previous change made at this point was in April, 1906, at which time a low pressure pneumatic machine was replaced by the 84-lever all-electric machine. The change at that time consumed 25 minutes.

A description of the way in which the change was made is published on page 227.

CONTRIBUTIONS

The "Brother Jonathan" and the "Robert Fulton."

Binghamton, N. Y., Aug. 10, 1907.

To the Editor of the Railroad Gazette:

At the end of the year 1833 Stephenson & Co. built two engines named "Brother Jonathan" and "Robert Fulton" for the Mohawk & Hudson Railroad, which was chartered in 1826 and opened September 12, 1831. This railroad is now a part of the New York Central system. The builder's numbers of these locomotives were 60 and 61.

I do not know who designed these engines, but probably one of the two Stephensons, who founded their locomotive works at Newcastle-upon-Tyne in 1821, the business being still carried on under the name of Robert Stephenson & Co., but they have lately moved their shops to Darlington.

Herewith I send you a copy of the working drawing of the above named engines, which, although it is very imperfect, is the only one in Messrs. Stephensons possession, as they recently informed me.

The cylinders were inside the smokebox. Under the barrel of the boiler there were a pair of vibrating shafts, each having an inner and an outer arm. The inside arms received motion from the pistons and usual rods, and transmitted it by the outside arms and connecting rods to the driving wheels. This was probably done to retain the advantage of inside cylinders with the driving wheel position afterwards adopted by Baldwin. It also got rid of the long connecting rod, which was an objectionable feature of the early Baldwin engines.

The cylinders were 10 in. diameter by 15 in. stroke; driving wheels, 48 in. diameter. The eccentric blades ran back from the driving axle and were connected by rocking arms and drop hooks to the reversing levers, and from thence forward to the rocking shafts behind the smokebox. The valve chests must have been at the top of the cylinders.

In reference to the Baldwin engines it may be noted that the idea of placing the driving wheels behind the firebox did not originate with him as is generally supposed, for his first engine of this design was not completed until February 18, 1834, but the first locomotive with a leading truck, designed by John B. Jervis, Chief Engineer of the Mohawk & Hudson Railroad, and placed in service at the beginning of 1832, was an inside connected engine with the driving wheels behind the firebox, and its history will be found in the *Railroad Gazette*, Vols. III. and IV.

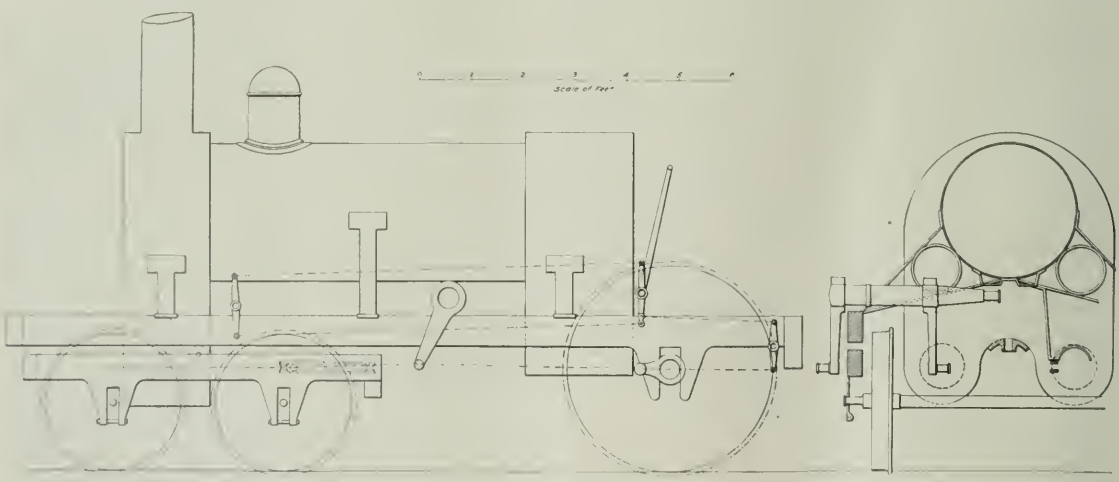
In the early days of the locomotive, many curious designs were brought out which quickly fell into disuse, although some of them were revived from time to time, and a few of them quite recently. A study of locomotive history reveals the fact that nearly every modern improvement in the locomotive, including the four-crank balanced engine, can be traced back to the early thirties, when George Stephenson was in the height of his power, and his "Rocket" was doing regular every day work. An illustration of the fact that history repeats itself may be made by taking the designs of locomotives having intermediate gear between the cylinders and driving wheels to balance the reciprocating parts without the use of four cranks. This was done as far back as 1833, but strong patent claims for these designs have been granted to more than one modern inventor, and I have reason to believe that the time is not far distant when we shall have a revival of this class of locomotive.

In the engines illustrated herewith there was no attempt to balance the reciprocating parts, since both inner and outer side levers rocked in the same direction. Had the inside arms been oppositely disposed to the outside arms, we should have had an example of the side lever locomotive which was introduced about the same time as these Stephenson engines, and drawings of which I may send you at some future time.

Herbert T. Walker.

Railroad Legislation in Pennsylvania.

The laws passed this year in Pennsylvania to establish a Railroad Commission and to reduce passenger fares have already been noticed in the *Railroad Gazette*. Besides these the Legislature also passed a number of less important acts, a summary of which is given herewith, together with some of the details of the Railroad Commission Law.



Working Drawings of Stephenson's Engines Numbers 60 and 61 for the Mohawk & Hudson Railroad, 1833-34.

An Act prohibiting the placing of lights at places where they may interfere with the view of railroad signals.

One requiring railroads to report Aug. 31, and every third year thereafter, the exact number of statute miles of line operated; penalty for violation $5,000.

One forbidding a demurrage charge of more than $1 per car per day; free time 48 hours.

One prohibiting common carriers from engaging in mining or manufacturing. Mining or manufacturing companies are permitted to haul their own product for a distance of 50 miles.

Forbidding railroad officers and employees to have any interest in any coal or mining or manufacturing property along the line of the railroad after Jan. 1, 1908; penalty $250 to $1,000 fine or three months to one year's imprisonment.

Prohibiting railroad companies from acquiring control of competing parallel street passenger railway lines.

Requiring railroad companies whose lines pass through forest land containing oil or gas wells to remove all inflammable material from the right of way at least once annually, also to provide suf-

ficient trackmen to extinguish fires; also to provide engines with spark arresters.

A number of laws were passed prescribing penalties for violation of provisions of the constitution, and all of the laws above mentioned have severe penalty clauses.

A law was passed permitting street railways to carry express and light freight, and granting to them power to acquire a contemplated route by condemnation proceedings where 51 per cent. of the property owners consent.

The Railroad Commission law provides that one of the three members shall be learned in the law. One of the three is to be appointed for five years and ultimately five years will be the term of all the members. The Governor is to designate the Chairman. The Commission is to have a Secretary, an Attorney and a Marshal. The Attorney is to conduct the examination of witnesses at hearings, when requested to do so by the Commission, and is to assist the Attorney General of the state in all actions brought by him incidental to the recommendations and rulings of the Commission. The Commission may appoint other officers including an inspector, who must be a civil engineer skilled in railroad affairs and another inspector expert in electrical affairs. The office of the Commission will be in Harrisburg. Its proceedings shall be public upon the request of either party interested. The act appears to be intended to give the Commission authority over all common carriers, though we do not find a clear statement to this effect; but section six, defining the term "common carrier" includes persons and corporations transporting freight or passengers by water as well as by railroad or electric railway; it also includes pipe lines "engaged in the transportation of oil" and sleeping car companies "engaged in transporting passengers" and express companies "engaged in transporting property upon any railroad, electric railway, street railway or by water"; also telegraph and telephone companies.

The Commission after full hearing may declare rates unjust and recommend what will be the just rate to be thereafter observed as the maximum. (Section 8.)

Section 9. If a shipper or consignee renders any service in connection with transportation, the allowance therefor shall not be more than is just and reasonable.

Section 10. The Commission or its agent may enter and remain during business hours in cars, offices and depots, and may examine books, etc. It may order the production of testimony or of papers, and in case of disobedience may call on the Court of Common Pleas to enforce such an order. Where the Court finds that neglect or refusal of a witness is occasioned by the advice or consent of a carrier, the fine against the witness may be collected from the carrier.

On request of the Secretary of Internal Affairs or the Legislature, or the Governor, the Commission may have a hearing on any proposed change of law relating to common carriers.

Section 12. The Commission may require every common carrier to file with it a copy of its annual report which is sent to the Interstate Commerce Commission.

Section 13. The Commission is to investigate accidents when deemed advisable. Accidents must be reported immediately after their occurrence.

Section 14. The Commission is to regulate the establishment of crossings of one railroad with another, including electric railways, and shall recommend what safety appliances are necessary both at new crossings and at existing grade crossings.

Section 15. If a common carrier violates the law or neglects its duty or usurps authority not granted by law, the Commission is to notify the carrier; and, if the offence is continued, certify the matter to the Attorney General.

Common carriers must within 30 days notify the Commission whether or not they intend to comply with an order.

Section 17. In case of excessive rates or insufficient or unsafe fixtures or works, or inaufficient trains or cars or faulty modes of operating, the Commission shall notify the carrier what to do, and if after full hearing the carrier refuses or neglects, or fails to satisfy the Commission that nothing should be done, the Commission must certify to the Secretary of Internal Affairs and the Attorney General the facts for their action according to law.

In case of a proposed increase in stock or bonds, the Commission may employ experts to investigate the necessity for the proposed increase, and report to the Secretary of Internal Affairs.

Section 18. No examination, request or advice of the Commission nor any investigation or report made by it shall impair in any manner or degree the legal rights, duties or obligations of any common carrier or its legal liabilities for the consequences of its acts or of the negligence or mismanagement of any of its agents or employees.

Section 19. Common carriers must furnish the Commission any necessary information concerning rates, contracts, etc. The Commissioners shall not make this information public unless the public interest requires publicity, nor if publicity would injure the common carriers of the state.

Section 21. An annual report is to be made to the Governor by the second Monday of January, and a duplicate filed with the Secretary of Internal Affairs. Nothing in this act shall impair the authority of the Secretary of Internal Affairs in the exercise of supervision of railroads and canals.

Section 23. Salary of Commissioners, $8,000 each; Secretary $4,000; attorney, $4,000, and marshal, $2,500.

Section 24. The total annual expenses of the Commission shall not exceed $100,000.

This Act goes into effect January 1, 1908.

Newark Warehouse of the Central Railroad of New Jersey.

The Newark Warehouse Company, a subsidiary company of the Central Railroad of New Jersey, on August 1 formally opened for service its building at Mechanic, Lawrence and Ward streets, Newark, N. J. The accompanying photographs and drawings show the size and general arrangement of this modern freight handling depot. Freight cars are switched into the building on the second floor level, from which their contents are unloaded either to be lowered to the floor below and loaded directly on trucks, for which there are driveways on this floor, or to the platforms and then by a complete elevator system lifted to the floors above, there to be stored awaiting consignee's orders.

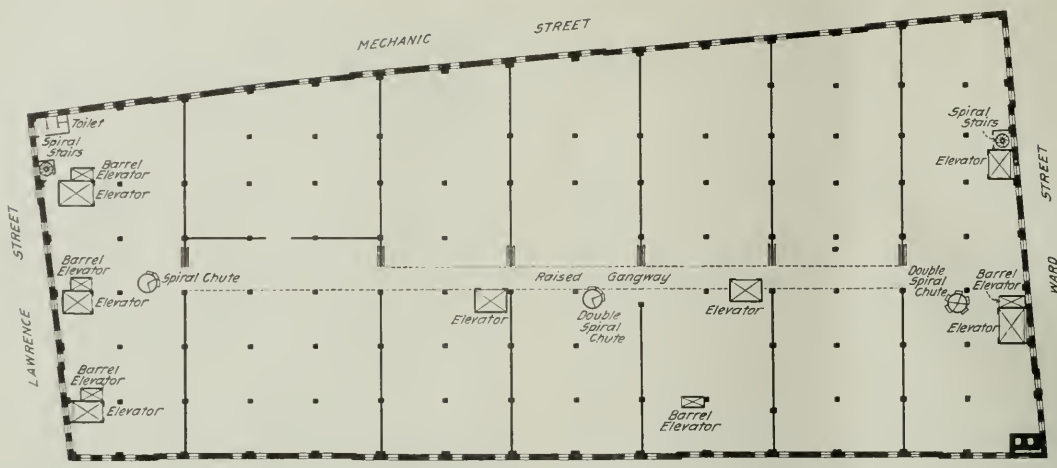
The building is 357 ft. by an average depth of 145 ft.; it is 102 ft. high and has a ground area of 52,000 sq. ft. and a floor area

Newark Warehouse, Showing Wagon Entrance.

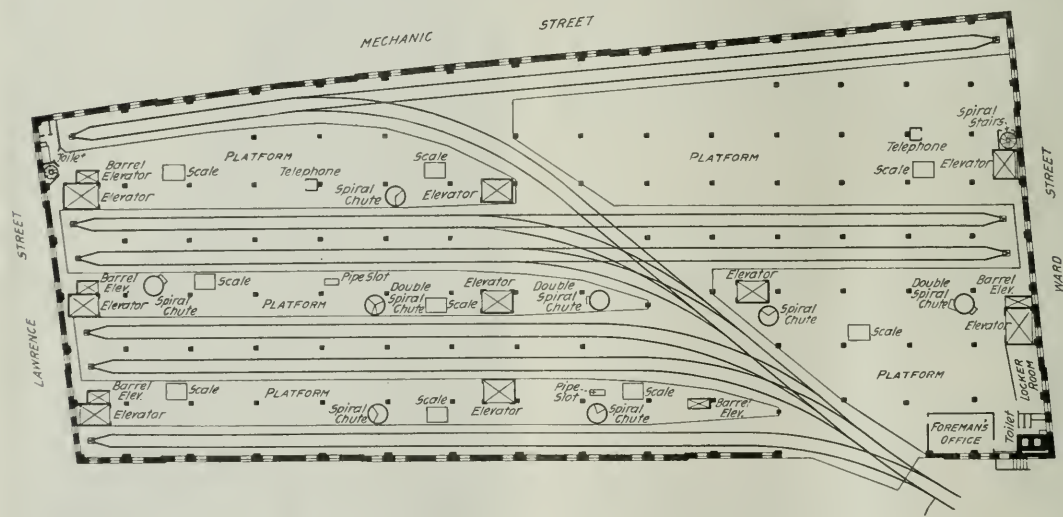
of 370,000 sq. ft. It occupies the whole of a rectangular city block just between the point at which the Central Railroad of New Jersey tracks into Newark cross over the main line of the Pennsylvania and the Broad street terminal station in Newark. The warehouse has six floors and a basement. The first floor is the team floor, the second, the track floor; the third, fourth, fifth and sixth, the storage floors. The total storage capacity is about 1,200 carloads of freight.

The whole building is made of reinforced concrete and fireproof. The construction is steel frame and concrete wall, with a foundation of steel beam grillage and concrete. The floors are of metal plate and reinforced concrete, designed to support 300 lbs. per sq. ft. throughout and 500 lbs. per sq. ft. in certain areas. The partitions are steel frames and hollow fireproof tile. Windows and sky-lights have metal frames and wire glass and close automatically. All partition openings are protected by automatically closing fireproof doors.

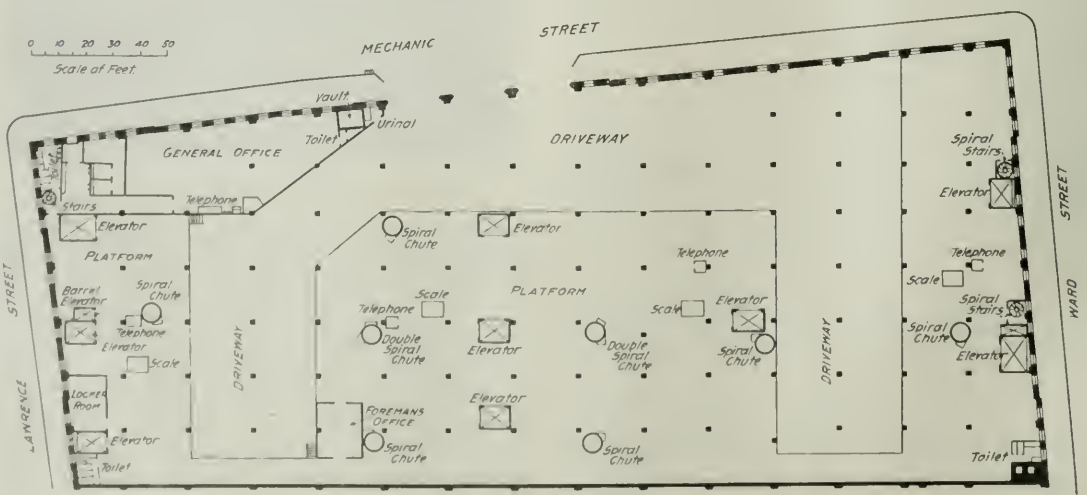
There are nine platform elevators, two 8 ft. x 12 ft. and seven



Typical Plan of Upper Floors; Newark Warehouse.



Plan of Second Floor Showing Railroad Tracks and Platforms.



Plan of Street Level Floor Showing Driveways and Elevators.

7 ft. x 10 ft., all of 6,000 lbs. capacity; also five barrel elevators with capacity of eight flour barrels per minute each, and eight spiral chutes, pneumatic chutes for carrying invoices, etc. The building is lighted by electricity throughout, and has complete telephone connections. The fire protection for merchandise on storage consists of automatic Springer equipment with two 750 gal. electric-driven fire pumps.

The location is convenient to the wholesale business district of Newark. The building is approached by well paved streets, and the teamways on the first floor are large enough to furnish access to platform space of 25,800 sq. ft., on which goods can be handled for team delivery; this floor is to be used only for this purpose. On the track floor there is standing room for 43 cars alongside freight platforms.

View of Newark Warehouse from Central Railroad of New Jersey Tracks.

This warehouse is worthy of note because it represents the latest and most improved designs and methods for such a building, and also because it is an example of a railroad entering indirectly in the warehouse business. The warehouse company suggests that merchants can abandon local storage or relieve crowded storage space by sending their goods to the warehouse, where storage charges will be less than the cost would be to the merchant himself, with the great additional advantage that goods can be received or shipped without any cartage expense. The warehouse company is prepared to act as the representative of merchants and handle goods as directed. The manufacturer may at certain seasons, when it is necessary to hold goods to accommodate trade conditions, store them with the warehouse company, who will insure them and act as shipper, distributing the goods as ordered and furnishing the manufacturer with negotiable warehouse receipts that may be realized on at once if desired. The broker or commission merchant, who sells and buys, can get along with only an office or deskroom by having the warehouse company take care of his goods, fill the orders that he issues and forward his consignments, all for less expense than can be secured elsewhere. He can also in this way buy large quantities of goods and hold them for change in market and have the warehouse company care for them and issue negotiable warehouse receipts. The connection of the railroad with such a project lies in the fact that if the warehouse company furnishes satisfactory service to these different classes of business men, the business of these men will, as long as they are using these warehouse facilities, naturally travel over the Central Railroad of New Jersey. For the information, photographs and drawings published herewith, we are indebted to Joseph O. Osgood, Chief Engineer of the Central Railroad of New Jersey, and Engineer of the Newark Warehouse Company.

Track Floor of Warehouse, Showing Tracks and Platforms.

Reversal of Track Running on the New York Central.

On Sunday last, August 25, the trains of the Harlem division of the New York Central between New York and Croton Falls, 41 miles, began running on the right-hand track, reversing the left-hand practice that has been in vogue for the past 12 or 13 years, and at the same time the section of 13 miles nearest New York, all four tracks, called the Electric division, was the scene of a sweeping change in signaling, the new all-electric block and interlocking signals being put in service, and green adopted for the night all-clear indication. These signals have been in course of construction for the past year and a description of them was published in the *Railroad Gazette* of June 28, 1906.

The line may be briefly described as follows: The southern terminus consists of the old (Grand Central) and the new (Lexington avenue) yards side by side. These converge at 56th street where the four-track line and tunnel begin. The outside tracks are numbered 1 and 4. The tunnel extends north from 56th street to 98th street, two miles. The first station is 125th street. One-half mile farther is the Harlem river draw (135th street). At 149th street is Mott Haven Junction, 5¼ miles from the terminal, where the Hudson division diverges to the left. The Electric division extends to Wakefield, 7¼ miles from this junction and 12½ miles from the terminals. Just south of Wakefield the New York, New Haven & Hartford diverges to the right. Following is an account of the work done on the Electric division. Between Wakefield and Croton Falls a similar change was made, involving chiefly automatic block signals which had to be changed but not renewed. Here as on the Electric division the night fixed signal indications were changed from white to green for proceed and green to yellow for caution. On part of the territory a number of new style "D" Union electric motors were put in service.

CHANGES ON ELECTRIC DIVISION.

Tracks 2 and 3 between 56th street and Wakefield were put out of service at 7 p.m. Saturday and were restored to service under right-hand traffic at 4 a.m. Sunday; also tracks 2 and 3 between Wakefield and Mount Vernon.

At 4 a.m. Sunday tracks 1 and 4 between 56th street and Wakefield were put out of service and at 8.30 a.m. were restored to service under right-hand running between Wakefield and Mott Haven Junction. Between Mott Haven Junction and 56th street these

tracks were put in service under right-hand running at 7.30 p.m. Sunday.

All of the new automatic signals were set up (minus the blades) and worked for a number of days before they were put in service; so that at the final moment the principal part of the work on these was to attach the blades to the new signals and take the blades and lamps off from the old ones. Between 98th street and Mount Vernon the old signals were controlled manual. The work at interlockings was of course more complicated.

The total mileage affected by this reversal was approximately 13.37 miles of four track and one-half mile of double track. On this territory there was a drawbridge equipped with mitre end lift rails. The position of these lift rails was reversed to accommodate the new conditions. The drawbridge was interlocked with an interlocking plant which was kept in service on two tracks during the transition period and a new all-electric machine was put in use in place of it. In other words, while work was progressing on tracks 2 and 3 the mechanical machine controlled the draw and protected movements over the two tracks then in service (1 and 4) and the new electric machine was installed on 2 and 3 so that when the traffic was reversed and these tracks put in service protection was afforded by the new machine. At the same time all of the lock and block apparatus, including torpedo machines, gongs, mechanical and electrical indicators in the Park avenue tunnel, were rearranged in all their details to accommodate right-hand movement on tracks 2 and 3 prior to the reversal of traffic, and the same thing was done to tracks 1 and 4 while they were out of service.

At 56th street trains are diverted to the two separate terminal stations. Here an all-electric machine has been in service for several months. This was abandoned and a new machine substituted, adding a number of new switches and signals. Also the electro-pneumatic interlocking at Mott Haven Junction was entirely rebuilt under traffic, as well as a second electro-pneumatic at the junction on the west side of Mott Haven yard, where it connects with the Hudson division.

The change in the tunnel not only affected the lock and block apparatus but also five mechanical machines and two low-pressure pneumatics as well. The revolving signals which have been in use in this tunnel for a number of years had to be connected to the towers for right-hand running and their indications were changed from white to green for proceed and from green to yellow for caution.

At the same time that these changes were being made, the two low-pressure pneumatic interlocking machines in the old terminal and one all-electric in the Lexington avenue terminal were rearranged for right-hand routes. The mechanical interlocking plants at 106th street and at Mount Vernon were also changed under traffic.

Altogether the change brought about the abandonment of five mechanical, one low-pressure pneumatic and four electro-pneumatic interlocking plants, while seven electric interlockings were put in service. To accomplish this work 575 men were employed in the various signal, track and bridge departments, and the entire reversal was accomplished by 4 p.m. on Sunday, and all tracks were restored to service at 7.30 p.m.

At the time that this reversal was taking place it was also necessary to change from white to green for proceed and from green to yellow for caution on the night signal indications throughout all of the territory named, and also the old and new terminals; also between High Bridge and Spuyten Duyvil cut on the Hudson division.

The following is a list of the plants affected:

	Levers.	
MECHANICAL PLANTS ABANDONED.		
126th street (Harlem)	14	
Harlem River draw	15	
135th street	13	
Walton avenue	8	
Temporary interlocking with New Haven connection at Wakefield	20	
		—70
ELECTRO-PNEUMATIC PLANTS ABANDONED.		
156th street	9	
Melrose	8	
Botanical Garden	8	
Woodlawn	15	
		—40
Low pressure pneumatic, 140th street also abandoned	3	
Also all-electric at 56th street and Park avenue	84	
		—87
Grand total abandoned		197
NEW ALL-ELECTRIC PLANTS PUT IN SERVICE.		
156th street	35	
Melrose	53	
Botanical Garden	34	
Woodlawn	67	
Wakefield engine house	29	
Wakefield, north end of yard	35	
Harlem River draw	31	
		—284
CHANGED WHILE TRAFFIC WAS BEING MOVED; IMPOSSIBLE TO TAKE OUT OF SERVICE.		
Mechanical.		
72d street (tunnel)	8	
86th street	8	
96th street	6	
106th street (crossover)	32	
Mount Vernon	10	
		—62
Low-Pressure Pneumatic.		
59th street (tunnel)	9	
49th street tower (terminal)	10	
Tower No. 1 (terminal)	25	
		— 44
Electro-pneumatic.		
Mott Haven Junction (MO)	35	
Mott Haven Junction (MJ)	23	
		— 58
All-Electric.		
Tower C (new terminal)	2	
56th street	88	
		— 90
Grand total		254

The signals placed in service supplied 344 high indications (homes and distants) and 201 dwarfs.

In order that this work should be efficiently handled a separate system of despatching for work trains was established. Work trains were assigned to the tracks which were put out of service, and these were used for the handling of material and men from one point to another. North of Mott Haven Junction electric work trains were used and south of Mott Haven Junction steam engines, it being found advisable to do so on account of the added convenience of cutting off the current from the rails on which work was in progress.

All of the forces employed on this work were handled through this despatching system under the direct charge of H. S. Balliet as installation director, who worked by telegraph from his office at No. 5 Vanderbilt avenue, west of the Grand Central Station. All the men assigned to the work reported to that office and were not permitted to move from one locality to another without first receiving its authority. In this way the work was concentrated very effectively.

The details of the work were handled through the Electric Zone Signal Department under the charge of Azel Ames, Jr., Signal Engineer; the General Railway Signal Company, W. G. Hovey, Construction Manager; C. E. Lindsay, Engineer Maintenance of Way on the Electric division, and H. S. Balliet, Engineer of Maintenance of Way of the Grand Central Station and Signal Engineer of the Electric division.

At the Harlem river draw the interlockings have been so designed that under the new arrangement considerable time is saved in opening and closing the draw. The new interlocking (all-electric) is so arranged that the draw and lever controlling the engine part of the draw as well as each individual lift-rail are bolt locked, with a facing point lock. Derails of the Hayes type are fixed on each track at each end of the draw.

The signals for the normal direction are standard semaphores. For reverse movements, standard electric dwarfs are used, of two types; one the standard shape of arm, of small size, and the other a disk. The disk is used on but one track, and this is on account of scant clearances.

On the north fixed span there are automatic home and distant block signals. These were put in for the purpose of better spacing the trains. The full block over-lap is used with all of the signals north of the tunnel. Through the tunnel, the controlled manual system continues in service, the levers being controlled by track circuits throughout the block, and with 800 ft. over-laps.

Under the present arrangement—that is, as long as steam engines are used in the tunnel—there will be no change in block sections, but after automatic signaling is introduced in the tunnel there will be one more inbound and two more outbound blocks on each track. Between 98th street and Mott Haven Junction the aggregate number of blocks on the four tracks has been increased from 13 to 26; and between Mott Haven and Woodlawn from 25 to 46.

A New Transcontinental Cut-Off for the Southern Pacific and the Santa Fe.

With the taking over last April of the Phoenix & Eastern, a Santa Fe branch line running from Phoenix, Ariz., east 100 miles to Winkleman on the Gila river, by the Southern Pacific, and the election of Epes Randolph, President of various Southern Pacific lines in Arizona, as its President, a definite step was taken in the development of what will in all probability ultimately become a new transcontinental cut-off for both the Southern Pacific and the Atchison, Topeka & Santa Fe.

Plans by both companies for the development of a new and better transcontinental line through Arizona have been in the making for at least two or three years. The accompanying map shows the present location of the through lines of the two roads and indicates, as nearly as it is possible to do at present, the extent of the new cut-off line. The recently completed Belen-Texico cut-off of the Santa Fe is included in the map as well as its eastern connection from Texico northward toward Kansas City, and the proposed connection southeast to Brownwood, Tex., and thence to Galveston.

The heavy lines on the map west of Belen mark the known or the probable location of the new transcontinental cut-off of the two roads. The Phoenix & Eastern, as shown, runs from Phoenix,

Ariz., southeast to Florence, where it meets the Gila river and then follows up the river eastward to Winkleman, the present terminus. At San Carlos, about 34 miles up the Gila river beyond Winkleman, the Gila Valley, Globe & Northern line of the Southern Pacific crosses the river. To the north it runs to Globe; to the south, it follows up the river as far as Solomon (formerly Solomonville), and then turns south to connect with the Southern Pacific main line at Bowie.

The route between Winkleman and San Carlos was for years disputed by the Southern Pacific and the Santa Fe. As nearly as can be ascertained, the Santa Fe surveyed the first route northeast up the Gila canyon from Winkleman. This was an invasion of Southern Pacific territory, as such a line not only cut across the Gila Valley, Globe & Northern, but if extended less than 100 miles further would reach the Clifton mining district, now served only by the Arizona & New Mexico, which is the line owned by the Arizona Copper Company connecting the Clifton mines with the Southern Pacific main line at Lordsburg, N. Mex. The Southern Pacific at once hurried a surveying party to the Gila canyon and located almost exactly the same line that the Santa Fe had adopted from Kelvin, 15½ miles west of Winkleman, east to San Carlos. The Southern Pacific map of this route was filed a few hours before the Santa Fe map. The rights under these surveys were then carried into the local courts, where there were decisions and counter-decisions almost without number. Meanwhile the Santa Fe built and put in operation its line from Florence east to Winkleman. After Santa Fe trains were already running over the track on regular schedules a decision was handed down by one of the local courts awarding 17½ miles of the right-of-way from a point two miles west of Kelvin east to Dudleyville, which is two miles east of Winkleman, to the Southern Pacific, but forbidding either company to use this track for commercial purposes until the case was finally decided. On appeal, the Supreme Court of Arizona returned the track to the Santa Fe, pending a further appeal to the United States Supreme Court, on condition that the Santa Fe give a bond to indemnify the Southern Pacific in case the Santa Fe lost the final appeal. In order to strengthen its demands for the contested right-of-way the Southern Pacific in the fall of 1904 put a considerable force of men at work grading the proposed route east of Dudleyville. In November of that year there were about 500 men employed. Before work was stopped, early in 1905, grading was nearly finished from Winkleman through the lower Gila Box canyon, that is, for about 10 miles up the river. Meanwhile the Santa Fe awaited the final decision of the case.

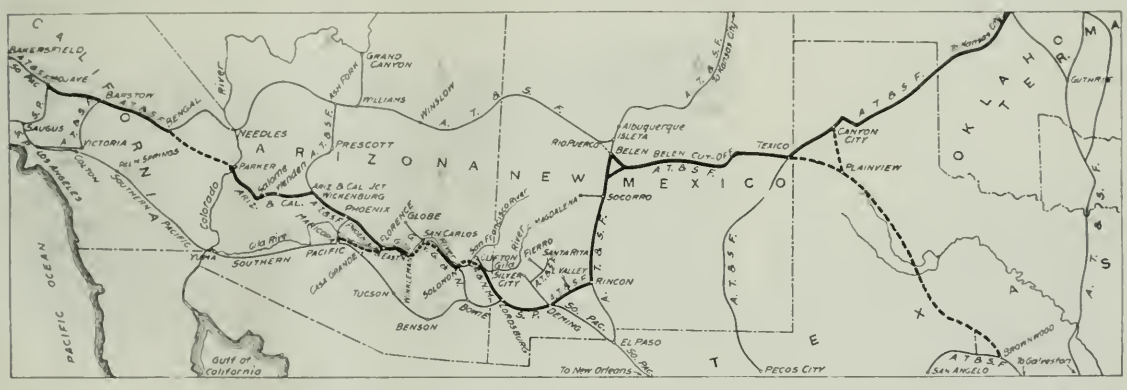
The Southern Pacific's grade through the Box canyon is on the north side of the Gila river. The contest between the two companies was not for a route where there was only one possible location, for from an engineering point of view there is little difference in the difficulties of construction on the two sides of the river through the canyon; but it was for ownership of an important feeder line over a route where it would not pay to build two competing lines. The decision of the United States Supreme Court was in favor of the Santa Fe, but by the sale of the Phoenix & Eastern to the Southern Pacific interests, ownership of the proposed route through the Gila canyon finally falls, as it should naturally from its territorial location and connections, to the Southern Pacific.

It is probable that this line was turned over by the Santa Fe to the Southern Pacific in course of arrangements for a new through line through Southern Arizona for both railroads. For the past three years construction work has been under way on a Santa Fe branch line, the Arizona & California, from Wickenburg, on the Ash Fork-Phoenix line, westward to the Colorado river. This is at present an undeveloped territory, though mining development is under way. The Arizona & California a new [illegible] the Colorado river, and its ultimate destination has been announced as Bengal, Cal., on the present Santa Fe main line, 80 miles west of the Colorado river. Bengal is to be the western end of the new transcontinental cut-off.

On the east, the Santa Fe plans have not been made public. The map shows how the Gila Canyon line could be reached over existing Santa Fe lines and a short stretch of the present Southern Pacific main line. This is a roundabout route but is marked out here in the absence of any official or semi-official information as to where a more direct connection with the new cut-off line is likely to eventually be built. A connection from Socorro, N. Mex., to the headwaters of the San Francisco river, thence down that river to its junction with the Gila near Clifton looks feasible on paper, but this route we are informed is more or less impracticable from an engineering standpoint and therefore is not ever likely to be built. Some such through connection, however, would seem to be a necessary part of the eventual plans of the Santa Fe if it is to share most efficiently in the new cut-off line through Arizona.

The connection on the east as shown on the map is as follows: A short connection will probably be built from the Belen cut-off to the present El Paso line, which will be followed as far south as Rincon, N. Mex., from which a Santa Fe branch now runs to Deming on the Southern Pacific. From here the route is over the Southern Pacific to Lordsburg, near the New Mexico-Arizona boundary, 60 miles. From Lordsburg the route would be the same for both Santa Fe and Southern Pacific.

Leaving the main line at Lordsburg, it would be either over the Arizona & New Mexico road nearly as far as Clifton, thence down the Gila river to Solomon, or by a new line built direct from Lordsburg to Solomon. From Solomon the route is over the Gila Valley, Globe & Northern (part of whose line is to be changed as shown) to San Carlos, where it would meet the extension of the Phoenix & Eastern line through the Gila canyon at its eastern terminus. Over the Phoenix & Eastern the route would run to Phoenix, over the Santa Fe to Wickenburg, and the Arizona & California to Bengal.



A Proposed Transcontinental Cut-Off Through Southern Arizona.

Adoption of these plans will result in changing the present transcontinental routes of both roads for many hundred miles. On the Santa Fe, from Rio Puerco, N. Mex., to Bengal, Cal., is 621 miles. Adding the approximate length of the connection from the new Belen cut-off to the present main line at Rio Puerco, the distance from Belen to Bengal by existing lines is about 640 miles. Of the projected route west of Belen already described there are three sections not yet built, so that it is impossible to get an exact estimate of the distance, but from Belen to Bengal the through route outlined on the map, which is undoubtedly, as already explained, considerably longer than any which is likely to be eventually

adopted, would probably be about 800 miles, made up as follows:

		Miles.
Belen, N. Mex. to Rincon	A., T. & S. F.	146
Rincon to Deming	A., T. & S. F.	53
Deming to Lordsburg	So. Pacific.	60
Lordsburg, N. Mex., to nr. Clifton, Ariz.	A. & N. M.	65
Point near Clifton to Solomon	Estimated.	42
Solomon to San Carlos	G. V., G. & N.	59
San Carlos to Winkleman	Estimated.	25
Winkleman to Phoenix	P. & E.	96
Phoenix to Wickenburg	A., T. & S. F.	54
Wickenburg to Colorado river	Ariz. & Cal.	113
Colorado river to Bengal, Cal.	Located.	92
Total		805

If the new through line of the Santa Fe east of Belen is counted in, the amount of new through line eventually to be used by that road is more than double this figure. From Newton, Kan., to Rio Puerco by the present through line via the Hutchinson cut-off is 737 miles. By the line from Newton southeast to Texico and Belen, the southern part of which is shown on the map by a heavy line, it is 716 miles; adding 19 miles as before for the distance from Belen to Rio Puerco, the total is 735 miles, the saving by the new line being in grades rather than in distance.

For the Southern Pacific the distance is less. From Lordsburg to Casa Grande over the present line is 230 miles. The new short cut-off would probably approximate the same length. From Lordsburg, N. Mex., to Mojave, Cal., by the present line is 765 miles. The new cut-off between these points would probably be just about 700 miles long, made up as follows:

		Miles.
Lordsburg, N. Mex., to Bengal, Cal.	As above.	546
Bengal to Mojave	A., T. & S. F.	163
Total		709

But saving in distance is not the object of the new cut-off line for either road. It is being built to get better grades and curvature. There are steep grades on the existing lines of both roads to be avoided. On the Southern Pacific in the neighborhood of Benson, Ariz., there is a ruling grade both east and westbound of 74 ft. to the mile, or 1.4 per cent. On this 164 miles between Lordsburg and Tucson there are total ascents of 2,148 ft. westbound and 4,003 ft. eastbound. These would be avoided by even the short Lordsburg-Casa Grande cut-off. Further west there are heavy grades which would be avoided by using the longer cut-off all the way to Mojave, Cal. Between Palm Springs, Cal., and Colton, 49 miles, the limiting gradients are 103 ft. to the mile, or 1.9 per cent. westbound, and 104 ft. eastbound, with total ascents of 1,898 ft. west- and 1,612 ft. eastbound. Between Colton and Los Angeles, 57 miles, the maximum grade exceeds 1 per cent. both ways, being 66 ft. to the mile, or 1.2 per cent. westbound, and 64 ft. to the mile eastbound, with total ascents of 395 ft. west- and 1,066 ft. eastbound. Thus such a new cut-off line would avoid three grades of over 1 per cent. both east- and westbound with total ascents of 4,441 ft. west- and 6,681 ft. eastbound.

On the Santa Fe between Winslow, Ariz., and Needles, Cal., 292 miles, there are 5,307 ft. of westbound and 9,678 ft. of eastbound ascents with ruling grades of 75 ft. to the mile (1.4 per cent.) westbound, and 137 ft. to the mile (2.5 per cent.) eastbound. From Needles west to Goffs, 31 miles, there is a rise of 2,104 ft. to the top of the Piute summit, and from Goffs west, a fall of 1,876 ft. in the 46 miles to Bengal. The Piute summit has an elevation of 2,580 ft. against a maximum elevation of 1,053 ft. over the Old Woman Mountain summit which the Arizona & California is to cross between the Colorado river and Bengal.

As the new line is not yet built it is impossible to say how much saving it will show in gradients and curvature over the existing lines, but as it follows water courses for much of its distance and has been laid out with the idea of improving on the existing roads, it is fair to assume that it will be a much more efficient line to operate than the present through line of either road.

Progress on the Florida East Coast's Key West Extension.

Rapid progress is being made on the Key West extension of the Florida East Coast Railroad, and unless some unforeseen difficulties arise or a violent tropical storm destroys some of the water work trains will be running over the "ocean route" within two years. The first locomotive crossed from the mainland, south of Homestead, over the drawbridge at Jew Fish creek to Key Largo, six months ago, and construction trains are now running over half the distance from Miami to Key West. Most of the water construction, however, lies west of the Matacombe keys, so work over the balance of the line may prove relatively slower. All told there will be a little more than 5¾ miles of concrete arches, which will require 206,100 cu. yds. of sand, 286,800 barrels of cement, 176,900 cu. yds. of stone and 4,810 tons of steel. One of the accompanying photographs shows a section of the Long key viaduct under construction.

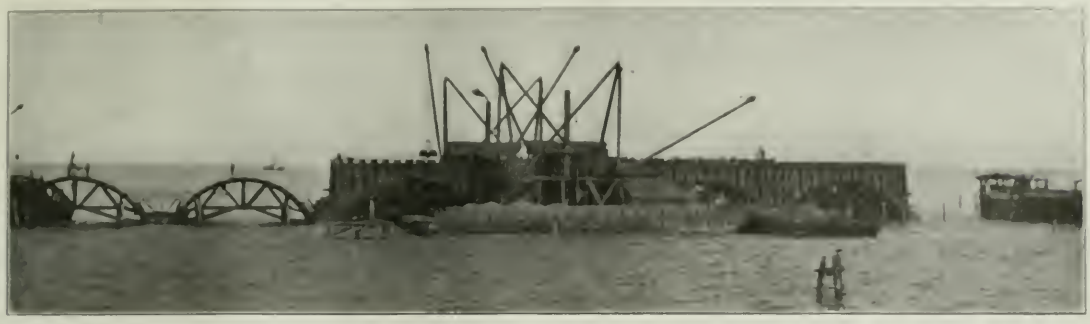
Embankment Thrown Up by Dredging.

Nearly 50 of the 184 concrete arches required at this point to connect with Conch key have been finished. They rise 31 ft. above the tide and have a span of from 50 ft. to 60 ft. There will be several drawbridges in this section.

The distance from Homestead, the old terminus of the Florida

Hydraulic Dredge Throwing Up Embankment in Shallow Water.

East Coast to Key West is 126 miles. Of this distance about 65 miles of the extension is built on solid ground on the keys. Of the remaining 60 miles nearly six miles will be concrete arches over deep water. The longest stretch is from Long key to Conch key 10,500 ft. Knight's key channel is 7,300 ft. Moser key channel 7,800 ft., and Ithala Honda channel 4,950 ft. The openings between



Long Key Viaduct under Construction; 184 Concrete Arches.

the keys will be closed by embankments where the water is shallow. These are thrown up by dredging and then rip rapped. Great difficulty has been experienced in reaching several of the small islands west of Big Pine key. The water between them is a series of rocky lagoons through which a channel had to be blasted to allow dredges and boats to get near the land.

A base of material supplies has been established at Knight's key, where a dock 600 ft. long by 175 ft. wide has been built with 19 ft. of water alongside. Sand, rock, cement and steel are stored there in enormous quantities. On Big Pine key a large tank has been built for storing water that was formerly carried on tank barges from Miami to the different camps. This reservoir holds over 1,000,000 gallons, being 90 ft. long, 40 ft. wide and 15 ft. deep.

The destructive tidal wave of last October which engulfed

End of Grade on Grassy Key; Florida East Coast's Key West Extension.

Elliott's key and other islands and drowned scores of workmen did little damage to the railroad construction work.

Symmetrical Masonry Arches—Coefficients for Reactions and Moments at the Supports.

BY MALVERD A. HOWE.

The elastic theory in designing masonry arches is coming into use with the introduction of concrete reinforced with steel. A thorough analysis of the stresses, however, is rarely made. This is probably due to a lack of familiarity with the methods or a lack of time, and, furthermore, because practical considerations do not make it feasible to design the arch ring to correspond to the maximum stresses at each section.

The application of the formulae based upon the elastic theory is very much more flexible than is generally supposed. The results obtained from a thorough analysis of a given arch ring can be used in designing a great number of other rings having quite different dimensions. The formulae in their integration form can rarely be employed owing to the shape of the arch axis and the variation in the moments of inertia. Summation formulæ have been devised, while approximate, which are quite accurate for all practical purposes. The summation formulae assume that the arch ring is divided into a number of finite lengths ds, sometimes equal but more often of unequal lengths, for which the moment of inertia is constant from one section to the next. This moment of inertia is usually that at the center of ds.

Assume that a certain arch ring has been designed upon and that its dimensions are known including the span and rise of the arch axis. Divide the span into 20 equal parts and measure or compute the lengths of the axis having these equal divisions as horizontal projections. These lengths are designated ds_1, ds_2, ds_3, etc. Bisect each of the 20 equal divisions of the span and through these points draw verticals until they intersect the axis of the arch. Beginning at the left number these points 1, 2, 3,....10, and from the right 1′ 2′ 3′....10′. Determine the co-ordinates x and y of each point referred to the left end of the span. Also compute the moment of inertia of the arch section at each point 1—1′ inclusive. Then for vertical loading, neglecting the axial stress, the horizontal thrust is given by the formula

$$2\,H_1 = \frac{\Sigma\, m_v\, \Delta \left(y - \frac{\Sigma\, y\, \Delta}{\Sigma\, \Delta} \right)}{\Sigma\, y\, \Delta \left(y - \frac{\Sigma\, y\, \Delta}{\Sigma\, \Delta} \right)}.$$

Where H_1 = the horizontal thrust

$\Delta = ds \div$ moment of inertia of section

y = ordinate of points 1, 2, 3, etc.

Σ = sum of factors for points 1—1′ inclusive

m_v = the common moment for the given loading on a beam supported at the ends *plus* the moment of an equal and symmetrical loading.

All quantities in the above expression with the exception of m_v are independent of the loading and consequently are constant for the given arch ring. Let $y = fy'$ and $\Delta = \Delta' \Delta_{10}$ where f = the rise of the arch axis and Δ_{10} = the value of Δ at point 10, then,

$$2\,H_1 = \frac{\Sigma\, m_v\, \Delta' \left(y' - \frac{\Sigma\, y'\, \Delta'}{\Sigma\, \Delta'} \right)}{f\, \Sigma\, y'\, \Delta' \left(y' - \frac{\Sigma\, y'\, \Delta'}{\Sigma\, \Delta'} \right)}$$

In which y' and Δ' have fixed values relative to the rise of the arch axis which has been taken as unity and the value of Δ at point 10 which has also been taken as unity, respectively. As long as the actual values of Δ vary in the same manner as the values of Δ' the value of H_1 will remain unchanged. Consequently an infinite number of arch rings can be designed fulfilling this condition without changing the value of H_1. If the actual values of y vary as the values of y' then the value of H varies inversely as the actual rise of the arch axis. The two statements made above assume that the

values of m_x remain the same under all conditions.

For a single vertical load

$$m_x = Px - \Sigma^x P\ (x - a)$$

where P = the magnitude of the load

and a = the abscissæ of the point of application of the load.

$$\text{Let } x = \frac{\delta_x}{2} z \text{ and } a = \frac{\delta_x}{2} k$$

then

$$m_x = P\frac{\delta_x}{2}\left(z - \Sigma^x (z - k)\right)$$

and when P = unity

$$m_x = \frac{\delta_x}{2}\left(z - \Sigma^x (z - k)\right) = \frac{\delta_x}{2} m_x'$$

For a single vertical load then, since $\frac{\delta_x}{2} = \frac{l}{40}$

$$2 H_1 = \frac{P\,l}{40 f} \frac{\Sigma m_x' \Delta' \left(y' - \frac{\Sigma y' \Delta'}{\Sigma \Delta'}\right)}{\Sigma y' \Delta' \left(y' - \frac{\Sigma y' \Delta'}{\Sigma \Delta'}\right)} = \frac{2\,l}{40 f} H' (P)$$

or

$$H_1 = \frac{l}{40 f} H' \text{ for unit load.}$$

Since m_x' is independent of the span and rise and also of any dimension of the arch ring, as long as the actual values of y and the actual values of Δ vary as y' and Δ' respectively, the value of H_1 varies directly as the span and inversely as the rise of the arch axis. The factor H' ÷ 40 is a constant and can be computed independently. It is more convenient to simply compute H'.

In table A are given the values of y', Δ' and H' obtained from the actual values for an arch ring having a span of 100 ft. and a rise of 8½ ft. The values of H_1 found from the coefficients in table A do not include the effect of the axial thrust. For very flat arches this should not be neglected. The horizontal thrust produced by the axial thrust is

$$H_a = H_1 \frac{\Sigma \frac{\delta_x}{F} \cos \Phi}{D' f^2 \Delta_{10} + \Sigma \frac{\delta_x}{F} \cos \Phi}$$

where H_a = the horizontal thrust due to the axial thrust

H_1 = the horizontal thrust neglecting the axial stress

δ_x = 1 ÷ 20 = length of one division of the span

F = area of arch ring at points 1, 2, 3, etc., respectively

f = rise of the arch axis

Δ_{10} = value of Δ at point 10

D' = coefficient given in table A.

The thrust H_a acts in a direction opposed to H_1 and consequently the true horizontal thrust is H_1—H_a. The effect of the axial stress may be considered independently as it is equivalent to a fall in temperature producing a horizontal thrust equal to H_a. The moment at each support is

$$M_1 = H_a \frac{\Sigma y \Delta}{\Sigma \Delta} = H_a f \frac{\Sigma y' \Delta'}{\Sigma \Delta'} = M_2$$

For changes in temperature

$$H_t = \frac{c\ t^0\ E}{D' f^2 \Delta_{10}} l = \frac{c\ t^0\ E\ l}{D}$$

where H_t = the horizontal thrust due to temperature changes

c = coefficient of expansion for 1°

t° = number of degrees change in temperature

E = Young's modulus of elasticity of the material composing the arch ring

l = length of span of arch axis:

The other factors have the significance given above.

The moment at each support is

$$M_t = H_t f \frac{\Sigma y' \Delta'}{\Sigma \Delta'} = M_2.$$

The moments at the supports produced by vertical loading can be found from the formula

$$M_1 = H_1 \frac{\Sigma y \Delta}{\Sigma \Delta} - m_1$$

Substituting the values of H_1, y and Δ used above

$$M_1 = \frac{l}{40 f} H' \frac{f \Delta_{10}}{\Delta_{10}} \frac{\Sigma y' \Delta'}{\Sigma \Delta'} - m_1 = \frac{\delta_x}{2}\left(H' \frac{\Sigma y' \Delta'}{\Sigma \Delta'}\right) - m_1$$

The value of m_1 is

$$m_1 = \frac{\Sigma m_x \Delta \left(x - \frac{\Sigma_x^2 \Delta}{\Sigma_x \Delta}\right)}{\Sigma \Delta \left(\frac{1}{2} l - \frac{\Sigma_x^2 \Delta}{\Sigma_x \Delta}\right)}$$

substituting $m_x = \frac{\delta_x}{2} m_x'$, $\Delta = \Delta' \Delta_{10}$ $x = \frac{\delta_x}{2} z$ and $l = 40 \frac{\delta_x}{2}$

$$m_1 = \frac{\Sigma m_x' \Delta' \left(z - \frac{\Sigma z^2 \Delta'}{\Sigma z \Delta'}\right)}{\Sigma \Delta' \left(40 - \frac{\Sigma z^2 \Delta'}{\Sigma \Delta'}\right)} \frac{\delta_x}{2} = \frac{\delta_x}{2} m_1'$$

Therefore for a unit load

$$M_1 = \frac{\delta_x}{2}\left(H' \frac{\Sigma y' \Delta'}{\Sigma \Delta'} - m_1'\right) = \frac{\delta_x}{2} M_1'$$

The expression within the brackets is independent of the span length and is constant as long as y and Δ change in the same manner as y' and Δ'.

In table A, columns 6-9 inclusive, give the values of $H'. \frac{\Sigma y' \Delta'}{\Sigma \Delta'}$ = K', m_1', m_2', M_1' and M_2'. The last two are all which are necessary as far as the arch analysis is concerned. The others are given as in some cases they were used for checks. Col. 8 should equal Col. 5 minus Col. 6 and Col. 9 should equal Col. 5 minus Col. 7. The last figure may not check as each column was computed independently and reduced by slide rule for the table.

The reactions V_1 and V_2 at the left and right supports are easily found

$$V_1 = \frac{M_2 - M_1}{l} + R_1$$

where R_1 is the left reaction for the loading if on a simple beam supported at the ends. The expression may be written, for unit load.

$$V_1 = \frac{\frac{\delta_x}{2}(M_2' - M_1')}{l \div \frac{\delta_x}{2}} + R_1$$

R_1 is constant for any span. The first term of the second member is also constant as both terms of the fraction have been divided by the same quantity giving quotients which are constant. Therefore the reactions remain constant for all spans as long as the actual values of y and Δ vary the same as y' and Δ'.

Knowing the values of H_1 M_1 and V_1 for unit loads the equilibrium polygon for each load may be constructed and then the points selected which must be loaded to produce the maximum moment at any given point of the arch rib. This was done for the values given in table A and the points determined which should be loaded to produce maximum moments at the support, the crown and point 6'. Then the corresponding values of H', M_1', M_2' and V_1 were computed. These quantities are given in table A, columns 16—19 inclusive.

These loadings are not absolutely correct in some cases but are not much in error. The effect of the axial stress has been neglected but can be included as shown above. Columns 16—19 are to be used for uniform moving loads only. The coefficients assume a unit load at the points designated in column 15.

For the dead or fixed loading the coefficients in columns 5, 8, 9, 11 and 12 are to be used and each coefficient multiplied by the fixed load corresponding to its number. If a slide rule is employed it means setting the rule but 10 times and obtaining 50 products composed of five sets of values which when added give everything necessary for the construction of the true equilibrium polygon.

Of course the above method of coefficients cannot be employed in the examination of a given arch ring. Its principal use is in designing new rings or modifying rings which do not fulfill certain conditions.

Table A.

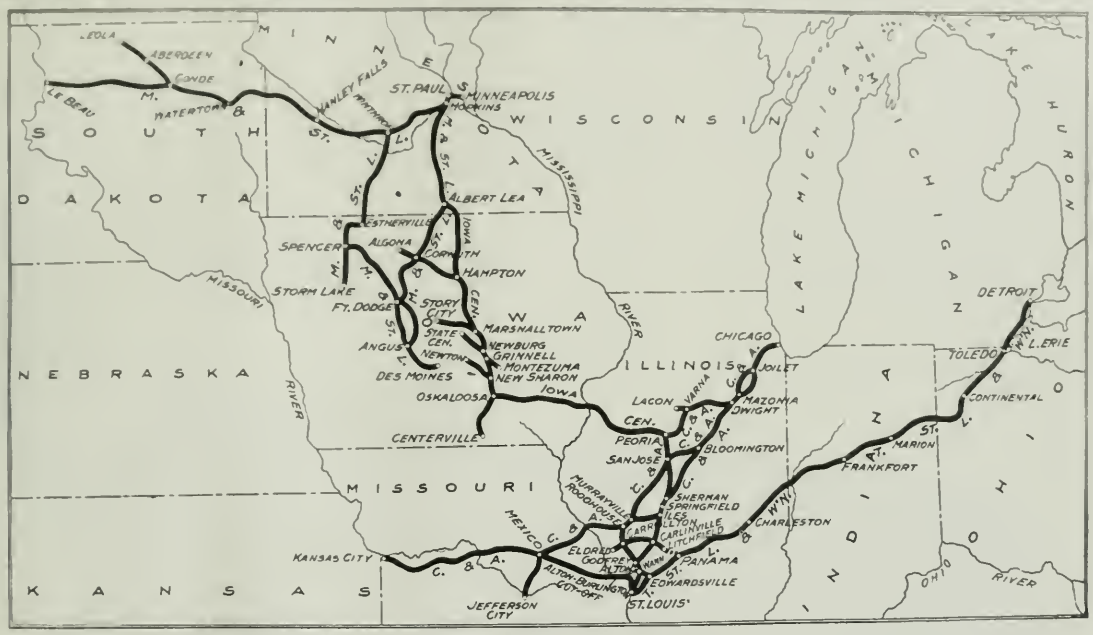
1.	2. $\frac{\Sigma y' \Delta'}{\Sigma \Delta'} = \frac{\Sigma y \Delta}{\Sigma \Delta} = \frac{H_1}{K} = y'$	3. $\Delta_{10} = \Delta'$	4. $\frac{l}{40 f} = H'$	5. $\frac{\delta_x^2}{2} = K'$	6. $\frac{m_1}{K} = m_1'$	7. $\frac{m_2}{K} = m_2'$	8. $\frac{M_1}{K} = M_1'$	9. $\frac{M_2}{K} = M_2'$	10. Notes.
1.	0.0396	0.0579	0.000	0.000	1.000	0.000	1.000	0.000	
2.	.2829	.0680	.401	.352	2.826	.134	2.474	.218	$K = H_1 \frac{\Sigma y \Delta}{\Sigma \Delta}$
3.	.4392	.0856	1.163	1.022	4.467	.408	3.444	.614	
4.	.5820	.1108	2.260	1.985	5.894	.835	3.909	1.150	
5.	.7008	.1461	3.649	3.205	7.081	1.426	3.876	1.779	$M_1 = \frac{\delta_x}{2} M_1'$
6.	.8004	.1990	5.269	4.628	7.993	2.192	3.365	2.436	
7.	.8796	.2821	7.026	6.172	8.583	3.141	2.411	3.030	
8.	.9348	.3905	8.779	7.712	8.783	4.292	1.071	3.420	$M_2 = \frac{\delta_x}{2} M_2'$
9.	.9768	.5718	10.338	9.081	8.615	5.539	0.466	3.542	
10.	.9972	1.0000	11 405	10.018	7.978	6.863	2.040	3.155	
			2.9118	50.290	44.174	63.220	24.850	21.550	$+ 21.850$ M_1' $+ 0.300$

11. V_1	12. V_2	13. Maximum moment at Neg.	Pos.	14. Points loaded (Incl.).	15.	16. H_1'	17. M_1'	18. M_2'	19. V_1
1. 1.000	0.000								
2. .992	.008	Pt. 0	Pt. 6'	1 8		28.547	—21.550	+ 12.647	7.255
3. .976	.024								
4. .951	.049	Pt. 6'	Pt. 0	9 1'		72.033	+ 21.850	— 12.347	2.745
5. .916	.084								
6. .870	.130	Crown.	.....	1 8 8' 1'		57.094	— 8.903	— 8.903	8.000
7. .811	.189								
8. .737	.263	.....	Crown.	9 9'		43.486	+ 9.203	+ 9.203	2.000
9. .651	.348								
10. .552	.447	.....	.....	1 1'		100.580	+ 0.300	+ 0.300	10.000
		. .	. . .	1 10'		50.290	—19.044	+ 19.344	8.458

D' = 0.2498.

The Sale of the Chicago & Alton to the Toledo, St. Louis & Western.

On August 23 it was announced that the Toledo, St. Louis & Western had acquired control of more than a majority of the capital stock of the Chicago & Alton. The controlling interests in the Toledo, St. Louis & Western also control the Iowa Central and the Minneapolis & St. Louis. The accompanying map, therefore, shows these four railroads and their relation to each other. The Colorado & Southern, which runs from Orin Junction, Wyo., south through Denver, Colo., to Fort Worth, Houston and Galveston, Tex., in which the same men are largely interested, is not included in the map. The Toledo, St. Louis & Western has 451 miles of line and gross earnings of $4,200,000, the Chicago & Alton has 970 miles of line and gross earnings of $11,600,000. The Minneapolis & St. Louis has 800 miles of line and gross earnings of $3,700,000, and the Iowa Central, 558 miles of line and gross earnings of $3,000,000.



The Toledo, St. Louis & Western; Chicago & Alton; Iowa Central, and Minneapolis & St. Louis.

On May 11 1889 a new railroad law was passed. This contained all the good qualities of the earlier law, with certain improvements suggested by later experience both at home and abroad. Railroad building was encouraged as in the previous law by liberal land exemptions from taxes and duties for certain periods of years while the operation of the roads was facilitated by permission to form pools, divide shipments and apportion business by preventing the building of unnecessary parallel lines and by forbidding ticket scalping and all forms of rebates. At the same time the interests of the state were well cared for in the law by provisions whereby the actions of pools should be subject to approval of the government which also has the power to regulate and adjust freight and passenger rates at intervals of three years and to approve rates before they become operative. Further, the law lays down the rates to be charged for government business and provides for free mail service; this last provision being very different from the custom of some countries of paying higher rates than other shippers. One of the most interesting features is that which provides that the railroad property, except rolling stock and similar appliances, shall pass to the possession of the government at the expiration of the life of each concession, which is limited to 99 years.

The modern tendency toward consolidation appeared in Mexico in due course of time, among the railroad companies. The Mexican Central, originally 1,224 miles long, had been increased from time to time by construction of branch lines and finally by purchase of smaller roads, to about 3,000 miles of line in 1903. At this time rumors were in the air to the effect that certain interests, allied with the Standard Oil Company, were acquiring control of the system and that there were to be further combinations. Certain facts, as for instance the fact that H. Clay Pierce was Chairman of the Board, tended to confirm this rumor. Now it happened that the company was making surveys and plans for construction of a short line to the United States with terminus at San Antonio, Tex. This line would not only tap the valuable coal lands of northeastern Mexico, but also would remove the handicap under which the road had carried on its through business of the long haul by way of El Paso, which it could avoid only by making traffic arrangements with the Mexican International. About this time the government stepped into the breach. By acquiring stock in the open market, it obtained control of the National of Mexico, the Mexican International and the Interoceanic, which were combined in one system, though still retaining in a way their separate organizations. The combined mileage of these roads very nearly equalled that of the Mexican Central. It then appeared that the Mexican Central would not be given a concession for a line to the United States as had been planned, crossing the Rio Grande between the lines of the National and International roads, as this privilege had been granted to these latter roads exclusively. This put a stop to the Central's aspirations for a short line connection, and, in the light of subsequent events, made more desirable the merger now under way of all these roads under government control.

The Railroads of Mexico.*

BY ERDIS O. ROBINSON, C.E.
Formerly of the Engineering Department of the Mexican Central.

III.

RELATIONS BETWEEN GOVERNMENT AND RAILROADS.

Railroad development in Mexico as influenced by the laws of that country may be considered as having passed through several distinct periods. During the first there were no special inducements offered by the government to aid railroad construction and to attract capital. Nevertheless there were several roads planned and companies organized. There was ample confidence in the country and its industrial advancement. But, commercially, Mexico was new, business growth slow, distances great, and railroad construction difficult and costly; and with one exception these plans were not carried out. The only road built during this period was the Mexican Railway, from Vera Cruz to Mexico City, which was built to handle a well established business and therefore did not have to depend on future development.

In 1880 the government, realizing the necessity of railroad development to advance the prosperity of the whole country and being itself firmly established and at peace, enacted a law which provided for liberal subsidies, tariff and customs exemptions and governmental regulation of rates, life of concessions, charges for government business, etc. Thus early was inaugurated a policy which has since been followed consistently, whereby on the one hand railroad construction has been made easy for the companies, while on the other the rights and interests of the state have been carefully guarded. This law remained in force till 1900 and consequently most of the railroads have been built under it.

*The first article was published in the *Railroad Gazette* of July 12, 1907; the second, in the issue of Aug. 9, 1907.

It is not to be supposed that the government entered the railroad business merely to make money on its investment. Its object rather was to secure the prosperity of the country and guarantee its future against the arbitrary control of railroad corporations. It was not content to stop with what had been done. The difficulty encountered by the United States in its attempts to regulate the great railroad mergers did not pass unnoticed, nor did the fact that these efforts of the United States, though at times seeming to prevail, still in the end apparently put little hindrance in the way of railroad consolidations. The Mexican government felt that it was necessary to act before the railroads had become so powerful as to be invincible.

Hardly had the country become accustomed to the new order of things when, following later rumors as to the purchase of the Mexican Central by certain interests in the United States, it was announced in December, 1906, that the Mexican government had acquired a controlling interest in the securities of that road. By that act it became virtually supreme in the railroad field of the country, since it was the controlling influence in the three principal lines reaching the United States border, all the lines reaching the port of Tampico, the interoceanic line from Mexico City to Vera Cruz, the road under construction to the Pacific port of Manzanillo, the railroad crossing the Isthmus of Tehuantepec and the road connecting this with the Vera Cruz lines. Thus has Mexico become innoculated with the germ of modern life that produces an irresistible desire for consolidating like industries, and is fighting the trust tendency with the trust style of warfare. There is this difference, however, that the motives of the government are unselfish, since its desire is to protect the interests of the nation, which means of the people of the country, and also to advance the value of the railroad properties.

This action of Mexico merits the careful attention of the rest of the world, and will call for the exercise of rare tact and wisdom on the part of the government's representatives. Probably the fact that Mexico is in reality a paternal or autocratic government will render more simple the working out of the problem. Following the first merger, the National Lines of Mexico, under governmental control, the railroads combined were still, in the details of their management, operated as separate companies, while their larger policies were influenced by the government control. Probably some policy of this kind will be followed now, with the government in control but advised by practical railroad managers.

A question that has entered vitally into the operation of the railroads of Mexico, and on which the government has shown a friendly attitude toward the roads, has been the fluctuating value of the silver peso as compared with the standard gold coins of other nations. It will be seen that this fluctuation works to the advantage or disadvantage of the railroads according as to whether they are spending money at home or abroad. The income of a road doing business in Mexico is received in the peso of that country. Certain items of operating expenses such as wages and taxes, are paid in the same coin. If these were all that entered into the problem the matter of money fluctuation would affect the prosperity of the railroad company in only an indirect way. But the railroads have other payments to make. They are financed on a gold bond basis the interest payments of which must be met in gold, and many supplies must be purchased in foreign countries where gold payments are required. It will be seen that for every 1,000,000 pesos of net earnings there will be a shrinkage of $10,000 for every decline of one cent in the price of silver. In the early '90s there were declines in the peso of nearly 10 cents in a single year. This decline with a road earning 5,000,000 pesos would mean a shrinkage of $500,000 in the fund to be applied to bond payments or foreign purchases.

There is, of course, another side to this question. In borrowing money abroad to be expended on works in Mexico, it is evident that money borrowed while silver is at a low price will buy a greater number of silver pesos and consequently cover more work, since wages and domestic supplies do not fluctuate with the value of silver.

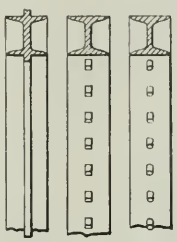
Expressed in figures the Mexican peso declined steadily in value from 83 cents in 1891 to 37 cents in 1902, and then rose again to a value of 50 cents in 1905. In this year the government, after a most careful and extended study of the whole matter, inaugurated a monetary reform. It was the object of this measure to place the Mexican currency on a stable gold basis with the value of the peso fixed at 50 cents. Up to the present time the attempt has succeeded, as the value of the peso has fluctuated little from that fixed figure. This stability of exchange warrants confidence in values, encourages the investment of capital, and by making money transactions more dependable greatly increases the convenience of doing business.

(To be continued.)

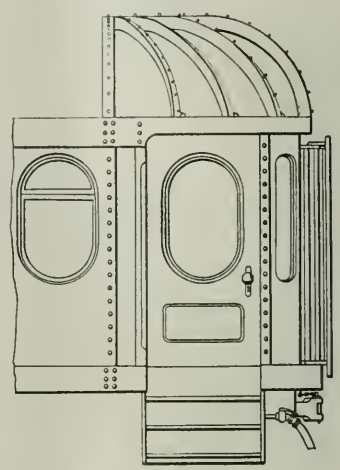
A New Pressed Steel Passenger Car.

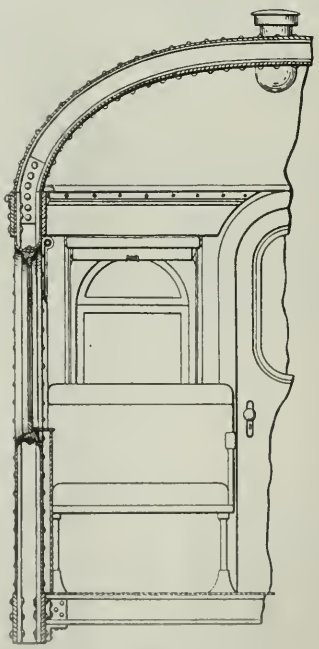
A patent has recently been issued to William G. Wagenhals, St. Louis, Mo., covering a design of steel passenger car built largely of pressed steel shapes. One of the accompanying photographs has been "doctored" to show the general appearance of a car built in this way. The drawings show the principal details of construction on which the patent was allowed. Steel plates about ⅛ in. thick, of a length equal to the height of the side of the car and of sufficient width to give the window opening desired, are placed in a special press and the oval openings for the windows are punched in them. The plates are then placed in another flanging press and the edges of the openings are bent down to form a continuous flange. All the rivet holes in the flanges and along the vertical edges of the plate are punched at one time. These plates are then made up in pairs, one forming the outside wall and the other the inside wall of the car. The oval flange on the inside plate is made smaller than the flange on the outside plate so that the two flanges overlap and can be riveted together.

The framing of the car is made up of two side sill plates between which the vertical I-beam posts are riveted. These I-beam

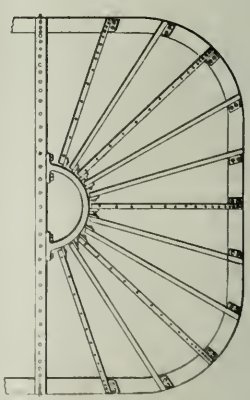


Method of Forming Rivets on I-Beam Posts.





Half Cross Section Through Wagenhals's Pressed Steel Car.

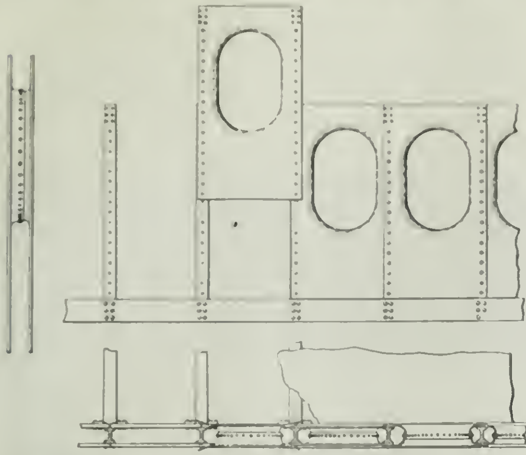


Plan and Side Elevation of Vestibule Hood Framing.

posts are rolled preferably from soft Norway iron suitable for riveting and are made with a projecting rib in the middle of each flange. By means of a special machine sections are cut out of these projecting ribs leaving square lugs which are afterwards rounded up into [illegible] plates. The frame having [illegible] plates are lowered into position over [illegible] out to clear the projecting rivets on the posts. [illegible] to overlap each other and when assembled [illegible] back over the rivets and the rivets headed up, securing both plates at one time.

After the sides are constructed, the roof beams are riveted in place. These roof beams are of the same construction as the side beams, except that they are curved to form an oval or turtle back roof, and are somewhat lighter in weight and size than the side beams as they are not required to carry any strain except holding the roof and sparing the sides. The rivets on these roof beams are formed in the same way as in the side beams. The roof and ceiling plates are riveted to these roof beams, in the same way as the sides, the plates running entirely across the roof and being in width about equal to the distance of four or five side sections. The outside plates are first riveted on and then the ceiling plates. Before riveting the roof plates in place, the letter board plates and transom plates are riveted in place at the top of the side plates. The roof plates overlap the upper edge of the letter board plate and the edges are secured by a finish molding running longitudinally and screwed in place. The ceiling plates are riveted in place last of all, and the joint between the ceiling plates and this inside plate is concealed by a metal molding.

For the window frames, a framework of aluminum or brass to fit the opening formed as a window opening in the side plates is used. This frame will cover the rivet heads in the window section, and in it is mounted the stationary window and a movable window, which can be lowered to open by drawing in the lower end of the window sash and dropping it into the pocket between the seats.



Method of Assembling Side Plates and Riveting to Posts.

Steel Passenger Car for the New York Central, Built by the St. Louis Car Company.

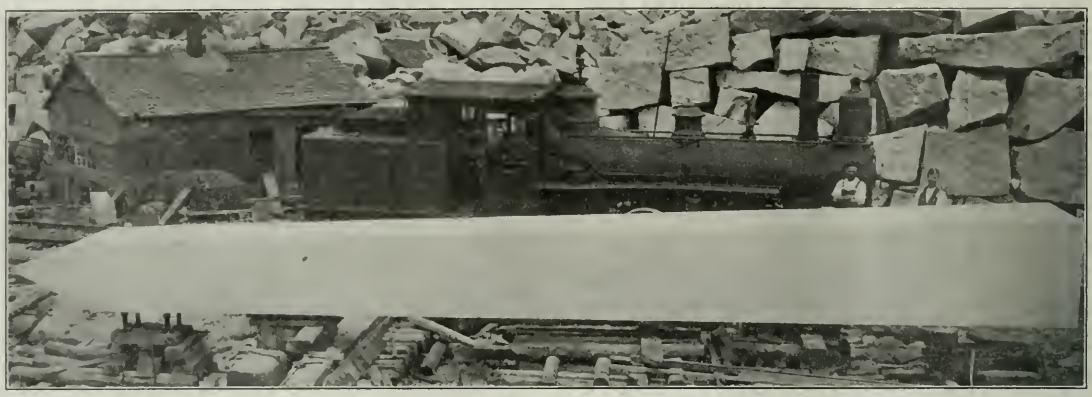
Wagenhals's Proposed Modification of Steel Passenger Car with Pressed Steel Side Plates and Curved Roof.

The sash for the windows are aluminum castings. The shade roller is mounted above the window on the inside of the car, in a metallic case, which case has extensions that reach to the bottom of the windows, and cover the rivet heads of the plate joints inside the car. They also have grooves on the inner sides to guide the curtain to the bottom of the window and to retain it in position.

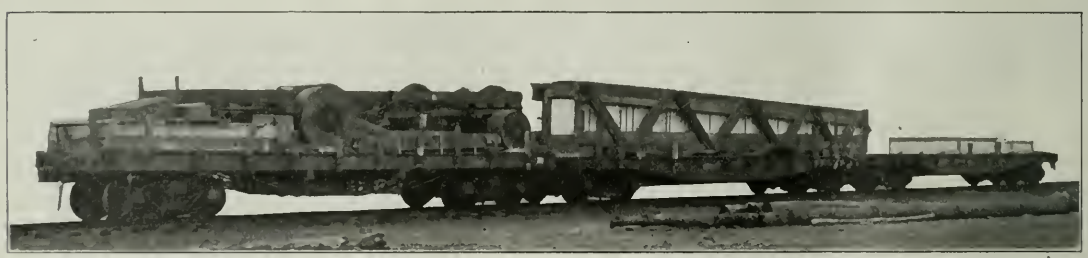
The construction of the ends of the car, the side walls of the vestibules, the door frames and the doors is the same as the construction for the sides of the car, but for the hoods over the vestibules a novel construction is provided. The last carline at each end of the car runs straight across from one side to the other, and to the middle of this carline is bolted a semi-circular casting of brass, steel or malleable iron, with lugs cast thereon extending out radially.

An Obelisk for Sault Ste Marie.

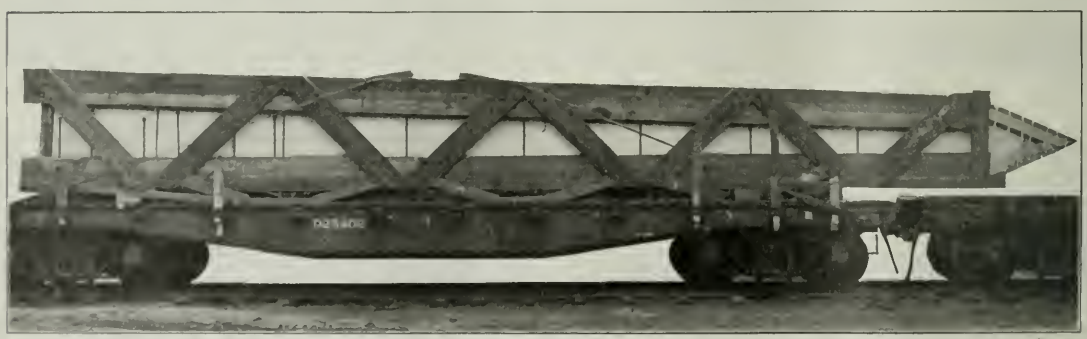
There was recently shipped from a quarry at Stony Creek, Conn., by The Norcross Brothers Company, general contractors, an obelisk which is to be erected in Locks Park, Sault Ste. Marie. The shaft is of hammered Stony Creek red granite, 5 ft. 5 in. square at the foot, tapering to 1 ft. square near the top and then finished to a point. It is 45 ft. long and is believed to be the longest shaft ever transported by rail in this country. The stone weighs about 60 tons. It was loaded on Pittsburg, Fort Wayne & Chicago car 931,701 and the bases on Pennsylvania Company car 92,540, the former of these cars being one generally used to transport heavy ordnance. As this car, which is 36 ft. long, was the longest car available, the



Obelisk for Sault Ste. Marie in the Quarry.



Whole Shipment, Including Obelisk, Bases and Machine.



Obelisk Loaded on Car.

Holes are cored in these wings or lugs and hood carlines bent to the shape of the roof required are bolted or riveted to the lugs of the casting and radiate therefrom to the edge beam of the roof to which they are secured by angle plates. The hood carlines are constructed in the same way as the side posts and main roof carlines with the rivets formed integrally on the top of the beams.

Instead of punching oval openings in the side plates for window openings, rectangular window spaces can be formed, and the flanges riveted together as in the case of the oval openings, but in such construction the corners of the flanges would have to be cut or severed, and the openings can then be covered by an ornamental molding forming part of the window frame. The oval construction, however, obviates the necessity of severing the flanges.

shaft was rested on a bed mounted on swivels to allow for the sway around curves. In loading the stone, it was jacked up to the level of the car; greased timbers similar to launching timbers for a ship put under it, and it was then smoothly and easily slid on the car without the use of any derrick. The accompanying photographs show the obelisk in the quarry before being loaded on the car; the obelisk boxed for shipment and loaded on the car and the three cars which made up the shipment; one containing the machine which was used to carry it at Sault Ste. Marie; the second the obelisk; and the third, the bases on which it is to rest. The shipment was made from Stony Creek, which is on the Shore Line division of the New York, New Haven & Hartford, west to Harlem river, and thence via the Star Union Line to its destination at Sault

Ste. Marie. The shipment left Stony Creek on July 16 and arrived at Sault Ste. Marie in good order on August 7.

The obelisk is being erected by the semi-centennial commission appointed two years ago to celebrate the opening of the first canal at Sault Ste. Marie.

Poor's Manual for 1907.

The advance sheets of the statistical tables from the 1907 edition of Poor's Manual, covering the year ended June 30, 1906, are at hand this year some two months earlier than usual.

The total length of railroads completed on Dec. 31, 1906, is given as 222,635 miles, as compared with 217,341 miles on Dec. 31, 1905, an increase for the year of 5,294 miles, while the increase of 1905 over 1904 was 4,947 miles. These figures, it will be observed, are for the calendar year, the balance of the statistics deal with the June 30 year. In the 12 months ended June 30, 1906, the southwestern group of states, embracing Missouri, Arkansas, Texas, Kansas, Colorado, New Mexico, Indian Territory and Oklahoma, built the most mileage, as in 1902, 1904 and 1905, the total for this group being 1,433 miles of new construction, as compared with 1,140 miles in 1905, 1,716 miles in 1904 and 1,892 miles in 1903. The northwestern group stands next with 1,099 miles, then the Pacific group, with 919. Texas has a long lead among the individual states, with the surprising record of 667 miles, as compared with 337 in 1905. Louisiana, with 323 miles, is second, and South Dakota, 309 miles, third. The new mileage in Texas is little short of the sum of new construction in the 11 states making up the middle and central northern group. New Hampshire, Vermont, Rhode Island, Connecticut, Delaware and Iowa built no new mileage.

	[illegible]	[illegible]
Traffic earnings: Passenger	[illegible]	[illegible]
Freight	[illegible]	[illegible]
Miscellaneous	[illegible]	[illegible]
Total	$2,[illegible]	$2,[illegible]
Net earnings	790,187,712	[illegible]
Other receipts	[illegible]	[illegible]
Total available revenue	$890,480,081	$76[illegible]
Payments.		
Taxes	$68,[illegible]	$[illegible]
Interest on bonds	[illegible]	[illegible]
Other interest	13,197,109	[illegible]
Dividends on stock	235,091,245	[illegible]
Miscellaneous	79,896,024	[illegible]
Rentals—Interest	79,612,170	[illegible]
Dividends	27,7[illegible]	[illegible]
Miscellaneous	15,042,78[illegible]	[illegible]
Total payments	$7[illegible]	$644,516,13[illegible]
Surplus	151,474,775	121,876,014

The following statistics of track mileage and rolling stock equipment are also important:

Statistics of Track Mileage and Rolling Stock Equipment.

Year.	Miles—Rails—Steel.	Miles—Rails—Iron.	Total track.	Per ct. steel of total.	Locomotives.	Revenue cars—Passenger.	Revenue cars—Baggage, mail and exp.	Revenue cars—Freight.	Revenue cars—Total.
1896.	210,290	28,440	238,730	88.1	36,388	21,940	7,880	1,245,640	1,278,460
1897.	215,658	26,043	241,701	89.2	36,410	25,654	8,180	1,234,972	1,268,806
1898.	220,804	24,435	245,239	90.0	36,746	25,844	8,049	1,284,807	1,318,700
1899.	228,976	21,387	250,363	91.5	37,245	26,184	8,121	1,328,084	1,362,389
1900.	238,464	19,389	257,853	92.4	38,065	26,786	8,209	1,350,258	1,385,253
1901.	246,811	19,181	265,992	92.7	39,729	27,114	8,667	1,409,472	1,445,25[illegible]
1902.	257,437	17,398	274,835	93.6	41,626	27,364	9,726	1,503,949	1,541,0[illegible]
1903.	271,013	15,249	286,262	94.6	44,529	28,648	10,182	1,621,150	1,662,980
1904.	282,229	11,708	293,937	96.0	47,344	29,295	10,417	1,691,42[illegible]	1,731,0[illegible]
1905.	289,109	10,803	299,912	96.3	49,616	30,777	10,552	1,757,105	1,798,434
1906.	297,378	9,265	307,003	96.8	55,439	33,896	12,295	1,979,667	2,025,858

The next tables show statistics of passenger and freight traffic for a series of years.

Year	Length of RRs. in operation, miles.	Miles run by passenger trains, miles.	Passenger traffic: No. passengers carried.	Passenger traffic: Pass'ger movement, miles.	Passenger earnings: Gross amount.	Average receipts: Per pass'g'r per mile, cents.	Average receipts: Per passenger, cents.	Average receipts: Per passenger train-mile, cents.	Per mile of road, $	Ave. No. passengers per mile of railroad, No.	Ave. No. Passenger-miles per pass. train-mile, miles.	Average distance traveled per pass'ger, miles.
1902	196,648	403,213,172	655,130,236	19,706,908,785	396,513,412	2.012	60.52	98.34	2,016	3,331	48.87	30.08
1903	203,910	430,378,153	696,908,994	20,895,375,853	428,713,109	2.052	61.52	99.61	2,102	3,418	48.55	29.98
1904	210,352	446,890,386	719,173,676	22,108,484,473	455,062,675	2.058	63.46	101.85	2,163	3,313	49.46	30.74
1905	213,635	467,270,447	745,446,641	23,906,420,668	484,929,076	2.028	65.05	103.77	2,269	3,489	51.16	32.06
1906	218,476	488,554,209	815,774,118	25,842,462,029	519,826,434	2.011	63.73	106.40	2,379	3,734	52.89	31.67

Year.	Length of RRs. in operation, miles.	Miles run by freight trains, miles.	Freight traffic: Freight carried, tons.	Freight traffic: Freight movement, miles.	Freight earnings: Gross amount.	Average receipts: Per ton per mile, cents.	Average receipts: Per ton, cents.	Average receipts: Per freight train mile, cents.	Per mile of R.R.	Average No. of tons: Per mile of railroad.	Average No. of tons: Miles per freight-train mile.	Av'ge haul, per ton, miles.
1902	197,381	508,210,140	1,192,136,510	156,624,166,024	$1,197,212,452	0.764	100.43	235.57	$6,065	6,041	308.19	131.38
1903	201,668	545,026,459	1,299,684,081	171,290,310,685	1,337,706,616	0.781	102.93	245.35	6,536	6,350	314.28	131.79
1904	211,233	542,084,037	1,273,077,475	172,613,027,474	1,370,298,438	0.793	107.63	252.78	6,487	6,026	318.42	135.58
1905	214,836	559,434,683	1,435,321,748	187,375,621,537	1,469,518,157	0.784	102.38	262.67	6,840	6,681	334.90	130.45
1906	220,688	608,324,539	1,610,099,829	216,653,795,696	1,659,925,643	0.766	103.08	272.87	7,521	7,295	357.51	134.55

Gross and net earnings, interest and dividends, have been as follows:

Years	Earnings: Gross.	Earnings: Net	Total available revenue.	Payments from available revenue: Int. on bonds.	Payments from available revenue: Dividends.	Earnings per mile of R.R.: Gross.	Earnings per mile of R.R.: Net.	Per cent.: Expenses to earnings.	Per cent.: Int. paid on total bonded debt.	Per cent.: Dividends paid on total share capital.
1902	$1,720,814,900	$560,026,277	$635,269,592	$263,237,451	$178,200,752	$8,696	$2,830	67.45	4.09	2.93
1903	1,908,857,826	592,508,512	681,993,996	278,101,828	190,671,415	9,301	2,887	68.96	4.17	3.03
1904	1,977,638,713	639,240,027	720,597,918	275,800,200	211,640,227	9,248	2,989	67.68	4.01	3.31
1905	2,112,197,770	685,464,488	766,392,147	270,315,290	203,675,622	9,643	3,129	67.54	3.79	3.27
1906	2,346,640,286	790,187,712	890,480,081	309,538,574	253,340,925	10,631	3,580	66.33	3.99	3.63

The following table gives principal statistics for the 1906 and 1905 fiscal years:

	1906.	1905.
	Miles.	Miles.
Mileage of railroads	218,433.46	214,044.24
Second track, sidings, etc.	88,569.48	85,867.45
Total track	307,002.94	299,911.69
Steel rails in track	297,378.15	289,109.18
Iron rails in track	9,624.15	10,802.51
	No.	No.
Locomotives	55,439	49,616
Cars—Passenger	83,896	30,777
Baggage, mail, etc.	12,295	10,552
Freight	1,979,667	1,757,105
Total revenue cars	2,025,858	1,798,434
Liabilities.		
Capital stock	$7,106,408,976	$6,741,956,825
Bonded debt	8,487,139,981	7,821,243,106
Unfunded debt	210,538,466	201,978,773
Current accounts	722,023,502	620,720,096
Sinking and other funds	242,256,471	182,853,229
Total liabilities	$16,768,367,396	$15,568,752,029
Excess of assets	686,919,232	650,821,816
Total	$17,455,286,628	$16,219,573,845
Assets.		
Cost of railroads and equip.	$12,719,736,342	$12,143,997,551
Other investments	3,305,782,328	2,935,276,877
Sundry assets	488,368,638	367,454,847
Current accounts	941,399,320	772,844,570
Total assets	$17,455,286,628	$16,219,573,845
	Miles.	Miles.
Miles of railroad operated	220,633.33	215,506.92
Revenue train mileage		
Passenger	488,554,209	467,270,447
Freight	608,324,539	559,434,683
Mixed	27,711,651	26,715,494
Total	1,124,590,399	1,053,420,624
Passengers carried	815,774,118	745,446,641
Passenger mileage	25,842,462,029	23,906,420,668
Tons freight moved	1,610,099,829	1,435,321,748
Freight mileage	216,653,795,696	187,375,621,537

The concluding table shows mileage, capital stock, bonded debt, and cost, total and per mile.

Year.	Miles of railroad.	Capital stock: Total. $	Capital stock: Pr mile $	Bonded debt: Total. $	Bonded debt: Pr mile $	Total stock, mort bonds, equipment obligations, &c.*: Total. $	Total stock, mort bonds, equipment obligations, &c.*: Pr mile $
1901.	195,887	5,978,796,249	30,521	6,035,469,741	30,811	12,326,491,526	62,926
1902.	199,685	6,078,290,596	30,439	6,465,290,839	32,377	12,853,927,302	64,371
1903.	206,886	6,355,207,335	30,719	6,722,216,517	32,494	13,525,623,300	65,380
1904.	211,074	6,477,045,374	30,686	6,908,799,403	32,731	14,081,756,366	66,715
1905.	214,044	6,741,956,825	31,497	7,425,261,901	34,690	14,563,199,931	68,038
1906.	218,433	7,106,408,976	32,533	7,851,107,778	35,942	15,593,548,957	71,388

*Representing approximately cost of road and equipment.

Foreign Railroad Notes.

The Russian Minister of Railways has, according to press despatches, submitted to the Council of Ministers a scheme for improvements in the state railroads, which it is proposed to carry out during 1908-1912. The total estimated expenditure is $458,000,000, divided among five annual budgets. The principal items are: Double tracking, $46,000,000; bridges and embankments, $30,000,000; stations, $59,500,000; work-shops, $52,000,000; new rails, $30,000,000; cars and engines, $151,000,000.

The Austrian authorities are having a survey made of the streams available for water power in the mountainous parts of the country, with a view to their utilization for railroad motive power. The Railroad Minister declares that electricity should be used for large parts of the Arlberg Railroad, on the new Alpine railroads, and in all the long tunnels.

The Finance Minister of Argentina, in his budget for the year 1908, says that the government will henceforth leave the construc

tion of new railroads to private parties, and he proposes the annulment of several laws looking to the construction of railroads by the state. This recommendation, if carried out, will make a difference of $50,000,000 in the future national expenditures. The state owns about 1,700 miles of railroad, but there has been much waste of money in the construction of these lines and only one of them returns any interest on its cost. The Central Northern Railway, a state owned railroad extending toward Bolivia, will be completed to the frontier of that country by the end of this year, and the Argentine government, under a contract with Bolivia, will extend the railroad to Potosi.

The Chinese Eastern Railroad runs from the junction with the Vladivostok main line at Harbin southwesterly to Port Arthur, with connections to Pekin. It seems that since the war a gap of eight miles has been left between the northern section, controlled by the Russians, and the southern, which the Japanese manage. The through passenger from Europe to China must make this part of the journey on a Chinese cart or a Russian vehicle, either much less comfortable than a sleeping car. The passage is not made after dark, for fear of brigands. It takes from 80 to 96 hours to go from Harbin to Pekin, with several changes of cars.

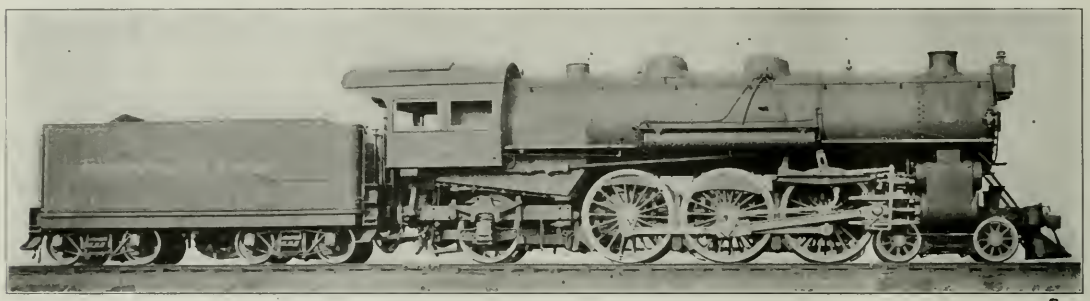
The Shantung Railroad (German) has made its report for the year 1906. It was opened for through business on June 1, 1904. The gross earnings of the 271 miles of railroad were $4,002 per mile in 1906, which is 13½ per cent. more than in 1905. The working expenses increased but a trifle, and were but 36 per cent. of gross earnings; so that the net earnings per mile were $2,561 in 1906, against $1,836 in 1905. A dividend of 4½ per cent. was paid. The traffic increased, but was by no means large, 816,810 passengers and 420,814 tons of freight having been carried, 228,663 tons of which were coal.

A plan has been worked out for the operation by electricity of the state railroads of Sweden. Power is to be generated at five water falls, the Karse, the Trollhätta, the Motala, the Hammarby and the Elfkarleby. Based on the requirements for 1905, the installation of the central power stations and the transmission lines would cost $16,400,000. The yearly operating expenses, including administration, are estimated at $1,578,000, as against $1,700,000 at present, a saving of $122,000. Single-phase current is to be used. The scheme will affect the operation of 1,240 miles of road and is the most extensive that has yet been proposed in Sweden.

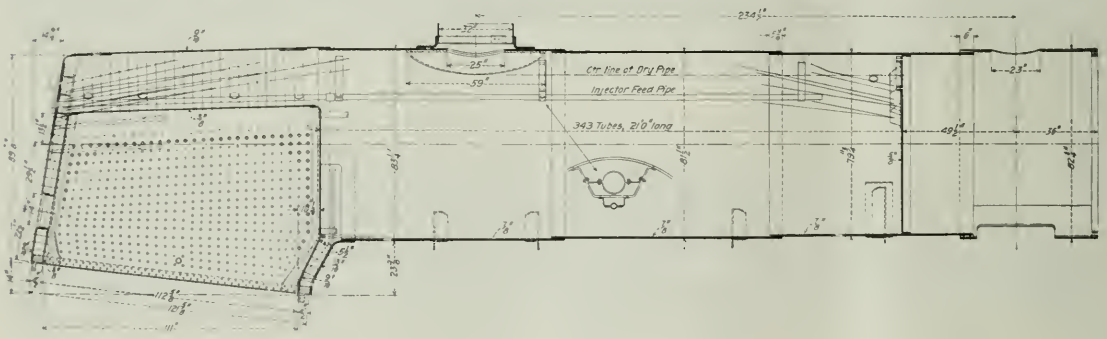
The British Government is to build 400 miles of railroad in Nigeria, Northern Africa.

Pacific Locomotive for the Pennsylvania Lines West.

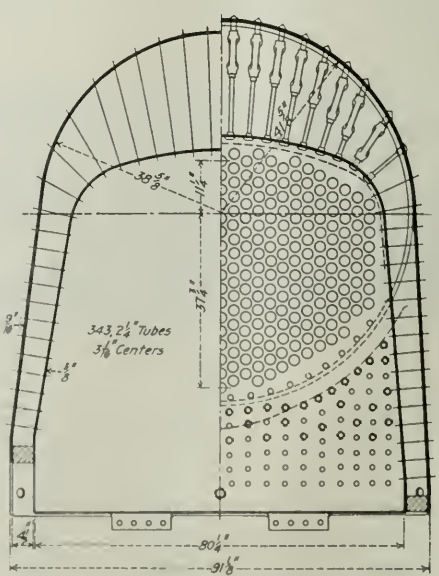
The American Locomotive Company has recently built a Pacific (4-6-2) locomotive for the Pennsylvania Lines West which is the heaviest passenger engine that has been built up to the present time for any road. The cylinders have a diameter of 24 in. and a piston stroke of 26 in. and can develop a tractive power of 31,000 lbs. This is about 22 per cent. more than that developed by the E-3d Atlantic engines of the same road. The introduction of the type was due to the demands of the traffic department for the movement of trains of greater weight, and because these demands could not be met without raising the weight on drivers on Atlantic engines above that which was considered safe. The Pacific type was therefore a necessity, if the weights on the driving wheels were



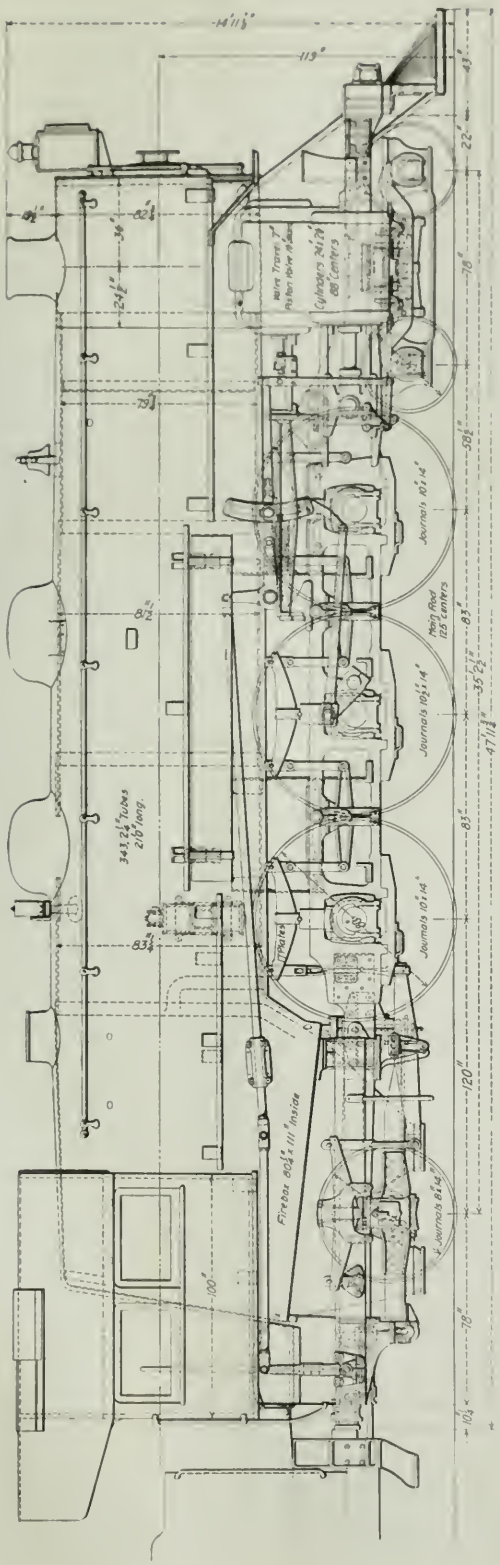
The Heaviest Passenger Locomotive; Pennsylvania Lines West.



Boiler of Pacific Locomotive; Pennsylvania Lines West.



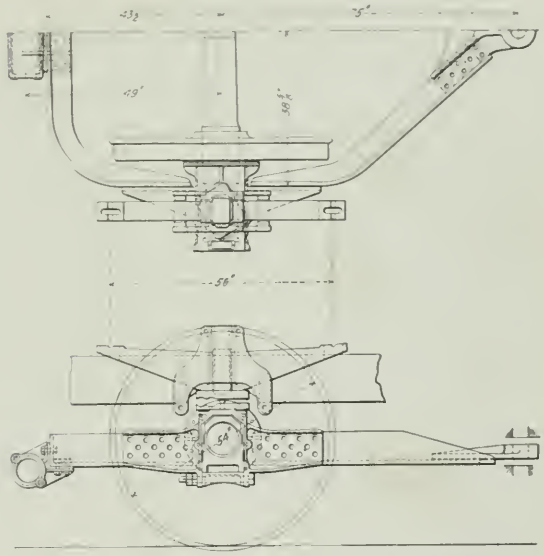
Section of Boiler at Firebox.



General Elevation; Pacific Locomotive for Pennsylvania Lines West.

to be kept below 60,000 lbs. per axle. As it is, this maximum is closely approached for, on the main drivers, it is [illegible] lbs., which is close to the upper limit.

Comparing this locomotive with the Atlantic E3d type which is used for heavy high-speed service it has cylinders 22 in. in diameter and 26 in. stroke, or an excess of 35 per cent. in cylinder capacity. Cylinder capacity however avails but little unless there is a corresponding steaming capacity to supply it. In this case the total heating surface is 4,427 sq. ft. for the Pacific as compared with 2,640 sq. ft. for the Atlantic. This marked increase is obtained by lengthening the tubes from 15 ft. to 21 ft., increasing their number from 315 to 343, and for this extra length a diameter of 2¼ in. was used instead of 2 in. This required a larger shell, which has accordingly been made 79¾ in. in diameter instead of 65 in. on the smaller engines. The boiler presents no striking features of construction aside from its size and the fact that it is a departure from the standard Belpaire firebox that has been in use on the Pennsylvania for all classes of equipment. The steam pressure is 210 lbs. This combination of large diameters and high pressure involves somewhat heavier sheets than are ordinarily used, and the thickness has accordingly been increased to ⅞ in. for the whole shell, or 1/16 in. more than the sheets ordinarily used on boilers of smaller diameter. The roof sheet and the back tubesheet are each 7/16 in. thick, and the front tubesheet is ⅝ in. The staybolt spacing is 3¾ in. and bolts 1 in. in diameter are used. The flexible stays are carried down on the front and back rows to within four



Trailing Truck; Pacific Locomotive for the Pennsylvania Lines West.

and six bolts from the foundation ring respectively, and then across the top row with a cluster in the upper corners. Sling stays are not used for the crown, but in their place are bolts whose length and tension is adjusted by a turn buckle.

For this great amount of heating surface a large grate is essential, and the one used has an area of 61.8 sq. ft. Its length is 9 ft. 4 in., with a width of 6 ft. 8¼ in. between the plates. This is undoubtedly ample for the heating surface, but the question of firing so large a grate with the engine hauling a heavy passenger train at high speed will probably prove a tax on physical endurance, for at a rate of combustion of only 100 lbs. of fuel per square foot of grate per hour, it will involve the handling of more than three tons of coal in that time.

Owing to the large diameter of the shell and the height of its center (9 ft. 7 in.) above the rail, the dome must be low. It is 32 in. inside diameter and the opening is strengthened by a stiffening plate ¾ in. thick to which is added a 1-in. dome base. In the shell the circumferential seams are double riveted, and the horizontal seams are of the usual sextuple riveted type with inside and outside welts. At the front the forward course is extended to form the rear end of the smokebox, and reaches out 29 in. beyond the front tubesheet. This is not common practice, as it is usually unnecessary to use as heavy a sheet for the smokebox as for the shell; but the length and weight of this boiler has rendered such a construction advisable.

The tubes are placed in vertical rows and are spaced on 3[illegible] in.

centers. It is only a few years ago that the advisability of using tubes of greater length than 16 ft. was under discussion at the New York Railroad Club, and the most progressive speaker on the floor stated that while he did not think that any difficulty would be experienced, so far as keeping tubes tight was concerned up to 20 ft. in length, he did not know that he could recommend such tubes because of the decrease of efficiency per foot of length as the length was increased. In accordance with Vaughan's formula this efficiency decreases inversely as the square root of the length, so that, taking the efficiency of the 16-ft. tube per foot of length as one, that of those of greater length would be as given in the following table:

Length of tube in ft.	16	17	18	19	20	21
Efficiency per ft. of length	1.000	0.969	0.943	0.917	0.895	0.873

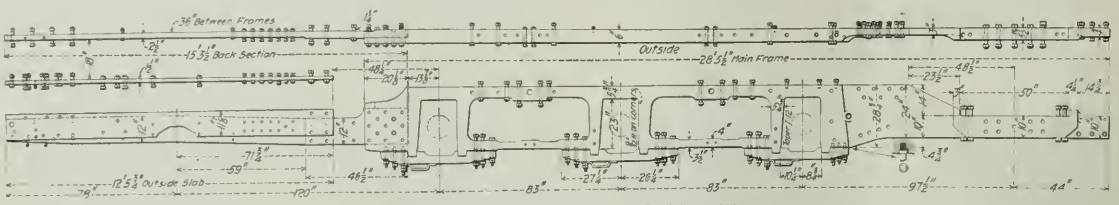
From which it appears that the difference in efficiency per foot of length is not great as between tubes of 16 ft. and 21 ft., and is more than made up by the length. Thus a 21-ft. tube has a total efficiency of 14.5 per cent. more than a 16-ft. tube of the same diameter, while in this case the increased diameter adds to the total efficiency per tube which will thus probably be raised to from 25 to 28 per cent. in excess of the smaller and shorter one, a percentage of no small moment where the demand for steam will be as great as in this engine.

The feeding of the boiler is in accordance with the standard practice of the Pennsylvania Lines West, and is accomplished through the long internal pipe reaching from the back head to a point within 34 in. of the front tubesheet; a 2½-in. iron pipe 17 ft. 9 in. long being used for the purpose.

The total length of the boiler from the bottom of the back head to the edge of the flanging of the front tubesheet is 31 ft. 10 in., to which 2 ft. 3½ in. must be added for the front course and then 4 ft. 6½ in. to reach the end of the smokebox, making a total length of 38 ft. 10 in.

The cylinders are cast in the usual shape with half saddle attached. The valve chests are above and slightly outside the cylinder centers and are bored out to 19 in. to take the bushing for the 16-in. piston valve. The port opening in the cylinder has a chord length of 21 in. The steam passages are worked out on easy curves so that the movement may be as unobstructed as possible. The valves are driven by the Walschaert gear and are inside admission. They are built up about a wrought iron tube of 10 in. outside diameter. The heads are of malleable iron of the form shown, riveted to the tube, and are fitted with cast-iron spring rings.

The frames are of wrought iron forged in one piece from the front end to a point just back of the rear driver pedestal, where there is a seat for bolting the plate forming the rear section. The double bar type is used with an upper rail 5 in. deep and 6 in. wide between the pedestals and 5¾ in. deep above the opening. The pedestal binders are correspondingly heavy and are not only fitted to take the direct outward thrust, but are held by three bolts upon each side as well. The cylinders are held by nine 1½-in. bolts. At the rear, the frame is formed of two plates. The inner one is set in line with the main frames and is 2½ in. thick. The outer plate is separated from it 18 in. and is 1½ in. thick. The trailing truck wheel is between the two with the journal box outside of both, and



Frame of Pacific Locomotive; Pennsylvania Lines West.

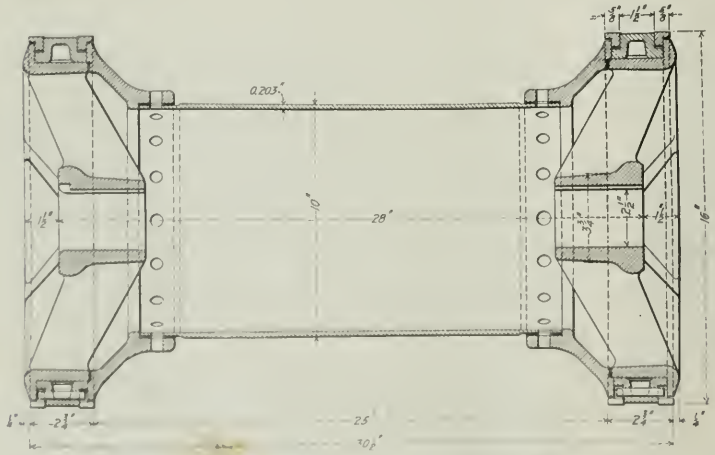
with the weights so equalized upon it that the load carried by the back end of the frame is only 12,340 lbs.

The truck is of the radial type with a radius bar of 75 in. virtual length, and formed of a heavy box and yoke casting to which the cross piece and the diagonal radius bar are rivetted.

The frames are crossbraced by a heavy casting at the front at the point of guide yoke attachment, and at three intermediate points between that and the front end of the firebox.

The principal weights and dimensions of the engine are as follows:

Cylinders	24 in. diameter; 26 in. stroke.
Piston valve	16 in. diameter; 7 in. stroke.
Boiler: Diameter, first ring	78¾ in.
" pressure, per sq. in.	210 lbs.
" firebox	111 in. x 80¼ "
" tubes—number	343
" " —diameter	2¼ in.
" " —length	21 ft.
" Heating surface, tubes	4,222.0 sq. ft.
" " firebox	205.0 "
" " total	4,427 "
" Grate area	61.8 "
Driving wheels, diameter	80 in.
Main journals	10½ in. x 14 in.
Other journals	10 " x 14 "
Front truck wheels, diameter	36 "
Front truck journals	6½ in. x 12 "
Wheel base, total engine	55 ft. 2½ "
" " total engine and tender	67 " 3¾ "
" " driving	13 " 10 "
Weight on front truck	46,175 lbs.
" " front drivers	59,000 "
" " main drivers	57,675 "
" " back drivers	56,875 "
" " trailers	49,475 "
" total locomotive	269,200 "
" tender	140,000 "
Tractive power	31,000 "
Tender, water capacity	7,000 gals.
Tender, coal capacity	22,000 lbs.
Tender journals	5½ in. x 10 in.
Total length of engine and tender	75 ft. 10 15/16 in.
Extreme width of engine	10 " 3½ "



Valve; Pacific Locomotive for Pennsylvania Lines West.

$$\frac{\text{Weight on drivers}}{\text{Tractive power}} = 5.6$$

$$\frac{\text{Total weight}}{\text{Tractive power}} = 8.7$$

$$\frac{\text{Tractive power x diameter drivers}}{\text{Heating surface}} = 560.2$$

$$\frac{\text{Heating surface}}{\text{Grate area}} = 71.63$$

$$\frac{\text{Firebox heating surface}}{\text{Total heating surface}} = 4.63$$

$$\frac{\text{Weight on drivers}}{\text{Heating surface}} = 39.23$$

$$\frac{\text{Total weight}}{\text{Heating surface}} = 60.80$$

$$\frac{\text{Volume of both cylinders}}{\text{Heating surface}} = 6.87 \text{ cu. ft.}$$

$$\frac{\text{Heating surface}}{\text{Volume of 2 cylinders}} = 644.69$$

$$\frac{\text{Grate area}}{\text{Volume of 2 cylinders}} = 9.00$$

Tube heating surface equated to firebox heating surface (Vaughan formula)	900.6 sq. ft.
Total equated firebox heating surface	1,105.6 "
Ratio of total heating surface to equated firebox heating surface	4.0

GENERAL NEWS SECTION

NOTES.

The enginehouse of the Buffalo, Rochester & Pittsburgh, at Rochester, N. Y., was destroyed by fire on August 24, and 14 locomotives were badly damaged. The fire started from the explosion of a crude-oil apparatus used in firing up engines.

A press despatch from Atlanta dated August 21, says that the Governor of Georgia has suspended from office Railroad Commissioner Joseph M. Brown and appointed in his place A. G. McLendon. The order cites the law authorizing the Governor to take such action but gives no reason for the suspension.

In the United States District Court at Minneapolis, August 23, the Chicago, St. Paul, Minneapolis & Omaha was fined $20,000 and its former General Freight Agent, H. M. Pearce, $2,000 for granting rebates to the Spencer Grain Company. The jury in this case returned a verdict of guilty on April 11.

A press despatch from Omaha says that on account of the scarcity of help, the Union Pacific has had to greatly curtail work in its coal mines and is buying coal in Illinois for which it pays $1 a ton. The estimated cost of this coal after carrying it to Utah is $8 a ton. The Southern Pacific has ordered coal from Australia. Japanese miners in Wyoming are drawing as high as $170 a month.

The railroads of Missouri have notified the Attorney General of that state that henceforth they will carry 150 lbs. of baggage free for each first-class passenger. It appears that under the new law recently passed, the railroads were allowed to charge for the transportation of all baggage over 100 lbs. for each passenger, but the Attorney General has induced the roads to restore the old arrangement.

The Board of Conciliation appointed to adjust the controversy between the Grand Trunk Railway and its locomotive engineers, reports that a settlement has been reached and an agreement signed for three years from Aug. 1, 1907, giving a substantial increase of wages. This is the second important dispute between the Grand Trunk and its employees which has been settled under the Canadian industrial disputes act.

The Chicago, Burlington & Quincy has issued a circular announcing that all lands and buildings owned by the company and occupied by others must be paid for at a reasonable rental. It appears that the Burlington, like some other roads, has granted the use of its property at many places to shippers and others at nominal rentals. Henceforth applications for leases must be referred to an executive officer of the company.

Complaint has been made to the New York State Public Service Commission at Albany of the Pullman parlor car fare between Buffalo and New York, which is $2, having been advanced from $1.50. The complainant says that between Chicago and Minneapolis, about the same distance, the charge is only $1. He also calls attention to the fact that in Wisconsin the Legislature has passed a law requiring upper berths in sleeping cars to be kept closed when not actually occupied.

The New York State Shippers' Protective Association, consisting of about 100 shippers in the central part of the state, has asked the Public Service Commission to require the railroads to give them adequate service and proper treatment. They want suitable cars to carry perishable products in the winter; want a full supply of cars at all times; want all agents to give through rates; want damage claims settled promptly, and want the railroad to be as fair to them as to itself in fixing demurrage charges.

The Wisconsin State Railroad Commission, deciding a complaint made by Nicholas Streveler, holds that the Marathon County Railroad, known as a "logging road," is a common carrier. In some cases passengers were carried free, as were many less-than-carload lots of lumber. The company published no tariff. The road is owned by the Connor Lumber Co., of Marshfield, and W. D. Connor, Lieutenant-Governor and chairman of the Republican State Central Committee, is its chief owner. The Commission held that the rates on lumber were extortionate and ordered them reduced from $5 and $7 a car to $3.50 and $4.50 a car; and, finally, "The carload business is charged with the additional expense of conducting the less-than-car load and passenger business, which is unlawful, inequitable and socially and economically parasitic."

The Chicago, Milwaukee & St. Paul has appealed to the Circuit Court of Dane county from the Wisconsin Railroad Commission's order directing the company to place its terminal facilities at the disposal of a competing road. The state Institute for the blind, a mile and a half south of Janesville on the Milwaukee road, wanted the St. Paul to switch to the sidetracks at the Institution cars from the North-Western road; and the Commission, despite vigorous protest by the company, held that one road must switch the cars of another at a reasonable switching charge.

The Grave Danger from Tramps.

The startling explosion of nitroglycerine by a tramp ejected from a freight train at Ridgway, Pa., will alarm every traveler and every train hand. There is grave neglect in this matter by the state. The tramp is always a trespasser. He is most of the time a criminal. Every ride he steals is theft. There is not a county in the state along the main line of any leading railroad where the country roads are safe to women. Yet the state does nothing to suppress this chronic piracy. It shifts on railroad corporations the public duty of keeping the peace. There is no more justice in this than for a city to make a householder police his front door and back yard. Train hands go in peril of life. Every state should meet this by a state police and make every mile of track secure. Men at their honest work ought not to have to put up a fight for life, as train hands daily do. The mere increase of property value due to safety would pay for such a state police.—*Philadelphia Press.*

On the Baltimore & Ohio last year there were 2,617 arrests for "ride stealing," most of which were followed by no punishment. The 900 vagrants arrested for trespassing on the Pennsylvania Railroad last year constituted but a small proportion of the total number constantly traveling over the road. In a single recent month 300 tramps were arrested by Pennsylvania Railroad police. A representative of that road says: What is going to be done about it? The railroads are willing to do their part in the way of furnishing police if they can have some assurance that offenders will be properly punished after they are arrested. Strict vagrancy laws strictly enforced will provide a remedy. Small localities can ill afford to bear the expense of keeping in prison a tramp that happens to drop off a passing railroad train. It is largely this matter of expense that prevents vagrants from being punished. If the state would undertake the punishment of vagrants, town and county officers would much more readily co-operate with railroads in putting an end to the really serious state of affairs.

Railroad Building in the Lewiston, Idaho, District.

An era of competition for the immense grain traffic of the Pacific Northwest has begun in the Lewiston, Idaho, country, the result of which may make Lewiston one of the most important inland railroad centers west of the Rockies. The Union Pacific, it is said, has the route for a line through the Rocky mountains from Butte, Mont., via Lewiston to the Pacific coast located. From Lewiston east to Kooskia the line has been surveyed for a year and is ready for construction. It has been decided to run the line up the Selway fork, through the Nez Perces pass and thence to Butte.

The Oregon, Washington & Idaho, building from Lewiston to Riparia, Wash., is to be finished in a few months; the officials say the line is to be opened January 1. This line, being built jointly by the Northern Pacific and the Oregon Railroad & Navigation Co., will connect with the latter's road at Riparia, giving a direct, all-rail route from Lewiston to Portland. Work is under way on a line for the Oregon Railroad & Navigation Co. along the upper Snake river, and work on the Lewiston end is to begin this fall. The line is projected from Huntington to Lewiston, connecting at that place with the new Riparia line and thus on to Portland. The probable intention of the company is to route both freight and passenger traffic over the new line, thus avoiding the heavy grades and sharp curves over the Blue mountains, beside getting a water grade to the coast.

The Chicago & North-Western is reported to be planning to reach

Puget Sound via the Lewiston country waterways by building an extension via St. Anthony, Idaho. Though permanent surveys have not been made, it is understood that the line will pass down the Salmon, Snake and Columbia rivers to the sound.

Another railroad, the Chicago, Burlington & Quincy, has for several years planned to take advantage of the easy water grade via the Lewiston district to reach coast terminals. The road now reaches Billings, Mont., and the proposed extension will probably be down the Middle Fork and Clearwater rivers to Lewiston.

The proposed electric lines to be built include the Lewiston & Southeastern, which will open up the country from Lewiston southeast to Grangeville. Work is to be begun within 90 days and will be rushed to completion.

The Spokane & Inland Empire is building an electric line from Spokane south to Lewiston, 115 miles, with a parallel line on the west leaving the first line at Spring Valley Junction, Wash., to a connection with the same line at Moscow, 65 miles. The east line has been finished to Moscow, 50 miles south of Spring Valley Junction, and the west line to Colfax, 36 miles south of the junction. Early next year the remaining link is to be built. The line will carry large quantities of grain through Lewiston that now pass through Spokane, and through a traffic arrangement furnish an entrance for the Canadian Pacific into Lewiston.

A third interurban line is to enter Lewiston from the southwest, being projected from Walla Walla, Wash., by way of Pomeroy. Construction may begin next year.

The project of the government to open the Columbia river to navigation by building a canal around Celilo rapids, the only portion of the entire distance between Lewiston and the coast that is not navigable, for which large sums of money have been appropriated, is likely to come within the next decade.

Union Pacific Gasolene Motor Test.

As an endurance test, on August 22, Union Pacific motor car No. 12 was run from Omaha to Denver in 16 hrs. 34 min., running as the second section of No. 1, the Overland Limited, Omaha to Julesburg. The running time of the regular Denver fast train is 17 hrs. 15 min. The distance run was 570 miles, making the speed of the motor about 34½ miles an hour, a very satisfactory long distance test. The motor cars now in service at Denver have been making 172 miles a day, and have been on time constantly. The company is building 18 additional cars.

A Railroad Journey from Peking to Hankow.

The Peking-Hankow Railroad from Peking to Hankow, opened at the beginning of this year, is 800 miles long and passes through continuous plains of rice fields, stretching as far as the eye can reach on either side of the railroad. Generally the water is pumped up by hand from the river to the highest level and then led down in bamboo pipes to the various terraces on which the rice is growing.

About half way on the journey the train crosses the Yellow river on a bridge a mile and a quarter long. The train proceeds at a very slow speed, as the oscillation is considerable and the Chinese engineers do not like accidents, for the road is owned and operated by the government, and heads would be likely to fly off if anything happened through carelessness. The oscillation when the first passenger train went over was so great that some of its occupants became uneasy. Herbert Brewster, a New Yorker who made the initial trip, said that he went out on the platform of the rear car and found the chief engineer of the road standing by with a life belt in his hand, but no accident occurred. This was fortunate, as there were no more life belts on the train.

There is a daily express train from Hankow to Peking, and vice versa, which makes the journey in three days. Passengers have to eat their meals and sleep each night in Chinese inns, with primitive accommodations. In addition to the express service there is a train de luxe composed of sleeping and dining cars, which performs the journey in 36 hours, for which there is a supplementary charge of $13 gold beyond the $20 ordinary fare. It leaves Hankow at 11 p.m. on Saturdays, arrives in Peking at 11 a.m. Mondays, and returns at 11 p.m. Wednesdays, arriving at Hankow at 11 a.m. on Friday. Already this train has paid so well that a bi-weekly service will be run next season.

There are no arrangements for checking baggage in China, and the scene at Hankow on the open platform, dimly lighted with Chinese lanterns, just before the departure of the Peking train on Saturday night, puts an ordinary bridge crush in the shade. The Chinese have taken kindly to railroad travel and crowd every train, their enthusiasm being due in large measure to the number of free passes issued. As it is a government road, all officials of high and low degree are entitled to passes. Only foreigners and poor Chinese coolies appear to pay their fares. At stations three or four Chinese bands, composed chiefly of horns, cymbals and drums, mingle ear-soothing strains with the voices of hundreds of Chinamen all talking at once. When a Mandarin travels on the train this performance is gone through at each stop made during the night as well as the day. Baggage is placed in a closed car and guarded by an armed Chinese watchman. As people are allowed to board the car at each station, and haul out any package they may want, it is just as well to give the watchman a quarter and indicate one's own baggage. The government warns all travelers that it takes no risk.

The sleeping cars on the train de luxe are similar to those in use in Europe, and are divided into two and four berth compartments. Chinese boys make up the berths, and an Italian conductor has charge of the train. Chinamen fill the diner all day long, eat and drink everything in sight, then smoke their long pipes filled with some soul destroying weed while the American passengers eat their meals. Frantic demands that the Chinamen should be made to smoke in the baggage car fall unheeded on the ears of the conductor of the diner. He is a guileless heathen Chinee. The strong odor of garlic and decayed seaweed mingled with the smoke of the quaint Chinese tobacco makes a subtle perfume, and puts one next to the people at once, as a Boston man described it.—*New York Times.*

The "American" Tender Hose Coupling.

The "American" tender hose coupling shown herewith is a gravity coupling, based on the wedge principle, a single straight movement only being required in coupling and uncoupling, without the

The "American" Tender Hose Coupling.

aid of any tool. It is claimed that it is perfectly tight at all times, automatically adjusts itself to changes in temperature, and vibrations tend to tighten it; that it does not leak under the most severe conditions. It is guaranteed to carry water or oil between engine and tender without waste. It is durable and there is little or no wear, except on the gaskets. The couplings are made to fit 2½-in., 3-in. and 3½-in. hose. They are in use on a number of roads. The American Coupling Co., St. Louis, Mo., is the maker.

Roadbed of Salt for the Western Pacific.

At a point about 120 miles west of Salt Lake City on the new line of the Western Pacific is a great area of salt beds eight miles wide and 40 miles long. Immediately west of Salt Lake City, the line of the road skirts the southern end of the Great Salt lake, crossing it at one point for a distance of six miles. At milepost 80 it enters the Great American Desert and for the next stretch of nearly 40 miles crosses a vast sea of alkali, gleaming in dazzling whiteness in all directions. Near the western end of the desert lie the salt beds where the previous whiteness of the landscape changes to a glaring sparkle of the salt crystals. So closely are these crystals packed together that they form a strong roadbed for the railroad. In building the line this hard level surface required no ballasting and no blasting: track-laying was a simple and rapid operation. In placing telegraph poles, however, it was necessary to blast out the salt, whose rock-like hardness made it impossible to dig down the required eight feet. This distance of eight feet for the telegraph poles is the deepest bore which has so far been made in the deposit, so that its true depth is not yet known. With no greater depth than this the commercial value of this salt deposit, which is said to be 95 per cent. pure, is very large. There is a theory that this deposit drains underground to the Great Salt lake. This is borne out by the fact that salt beds are 27 ft. higher than the lake, with the slope toward the lake. More than this, the salt deposit contains moisture, for ties and telegraph poles imbedded in it become moist to a point four or five inches above the surface. This also argues

an underground stream since the air is too dry to furnish enough moisture for this. Placer claims are already staked out on the salt beds.

New Scale of Wages on Bavarian Railroads.

In Baden also new scales of wages have been introduced. Those men who are paid for 365 days in the year are divided in four groups, according to the locality where they work, and in the year when they begin work are to receive 3 marks, 2.90, 2.80 and 2.70 marks a day, with an extra allowance of 10 per cent. for those employed in Mannheim. Three marks is 71.4 cents. Heretofore there were five classes, beginning to work at 2.20, 2.30, 2.40, 2.50, 2.60 and 2.70 marks, respectively. Those who are paid only for the days they work receive 10 pfennig a day more. An addition of 10 pfennigs a day is made after the first, the second, the fourth, the sixth, the ninth and the twelfth year. Thus the man who begins to work at 3 marks a day after 12 years' service will receive 3.60 marks (85.7 cents) a day. This is interesting to us, chiefly as an example of gradation of wages according to the varying living expenses in different parts of a small country.

The Atchison's Recreation Houses.

My work is to assume in every man on our road such qualities of honor and cultivation that no one of them ventures to fall below par. I work on the theory that a man has a strong tendency to become what he is assumed to be. Accordingly, I assume that every man is a gentleman, a man of honor, a man of reading and education. And I have had the gratifying experience of seeing thousands of men palpably bettered.

The Santa Fe has established a system of reading rooms, circulating libraries and club houses from end to end of the road, and I receive daily reports from each of the 25 reading rooms, each of the seven club houses, and from the circulating libraries. We charge a nominal fee for the privileges of the clubs. One of the finest features of the system is the fact that it is established for the whole families of the employees. That is a great factor in promoting domestic happiness. There are few divorces among our employees. We have the women as well as the men enjoying the benefits of the billiard table and the bowling alleys. We have the women reading in the reading rooms. We have the men and their wives at their own firesides reading the good books from the circulating libraries. The system, while not as yet absolutely self-supporting, can be made so very soon without any hardship to the men.—*S. E. Busser, Superintendent of Department.*

Disastrous Collision in France.

In a collision between a passenger train and a freight train at Contras, France, August 24, 12 persons were killed and 31 injured.

Empire Bridge Company's Improvements.

The improvements to the Elmira, N. Y., plant of the Empire Bridge Company, Pittsburgh, Pa., have been under way since early in 1907, and it is expected that the enlarged plant will be in full operation before the end of the year. The completed plant will cover about 15 acres. It is served by the Erie, the Delaware, Lackawanna & Western and the Pennsylvania. Heretofore there has been but one building, 90 ft. x 100 ft.; the improvements consist of an extension to the original building, which will be the main bridge shop, making it 215 ft. x 528 ft.; a boiler and power house, a machine shop, a templet shop and a forge shop. All buildings are of steel construction, column bearing, with brick curtain walls, concrete foundations, and slate or slag roofs.

The present plant employs about 250 men and has an annual output of about 15,000 tons of steel bridge and building work. The enlarged establishment will require more than twice as many and the output will be quadrupled. Electric power, 220 volts, direct current, will be used throughout for individual motor drive and lighting. About two miles of standard gage railroad is being laid in yards and side tracks; cars are handled by a 40-ton switching locomotive owned by the company. About two miles of narrow gage track is being laid throughout the plant for conveying material. Two 100-ton track scales, one at the receiving end of the shop and the other at the finishing end, will record the weight of all carloads of raw material received and of finished product shipped out. The water supply comes from wells, and a water purifying system has been installed. Fire protection is afforded by a complete and independent system of piping with a high capacity pump kept under steam and ready for immediate use at all times. An emergency hospital will be maintained on the premises.

The boiler house is 42 ft. x 90 ft. There are four 250 h.p. water tube boilers, equipped with mechanical stokers, damper regulators and feed water regulators, and fed by two compound duplex pumps, each of which can supply all boilers. The power house is part of the same building, it is 80 ft. x 60 ft., and contains two 300 k.w. generators, driven by horizontal tandem compound condensing engines, and one 100 k.w. generator of the same type driven by a vertical cross compound condensing engine. There are two air compressors whose total capacity is 3,600 cu. ft. per minute, and other minor engines. The power house is spanned by a 20-ton electric crane. The machine shop building is 60 ft. x 240 ft. Planers, shapers, boring mills, heavy lathes and other machines for heavy work will be in the main aisle, which is 30 ft. wide and is served by a 15-ton crane running the length of the shop, while machine tools for lighter work will occupy the 15-ft. wings on either side, served by traveling jib cranes of special design. The forge shop, 60 ft. x 240 ft., will be used in part for making bolts, nuts and rivets, and the rest for bending, forging, tempering and making loop rods and light eye-bars. The templet shop will be 50 ft. x 224 ft. The main bridge shop is 215 ft. x 528 ft. In this building will be the tools for making main members of bridges and buildings of the heaviest type. There will be a system of 10-ton and 20-ton cranes overhead for general service, while all small machines will be served by special jib cranes. An extension 55 ft. x 80 ft. at the west end of the main shop will give space for detail material. The receiving yard and the shipping yard are each served by two electric traveling cranes on separate runways 600 ft. long. The combined storage area of these two yards is about 225,000 sq. ft., all of which is covered by skids to protect the material from rust by contact with the ground.

The Empire Bridge Company is a subsidiary of the American Bridge Company, New York.

Long Runs on English Passenger Trains.

The number of regular passenger trains now running on British railroads every week day which make trips of 100 miles or more without stopping is 156. This is shown by a list which has just been made up from the July time-tables. The total is slightly less than last year. Moreover, some of the trains have been made a trifle slower than formerly. Between London and Sheffield there are now only two such trains as compared with five a year or two since. Of the 156 trains in this year's list, 49 are on the London & North-Western, 32 on the Great Western, 25 on the Great Northern, 14 on the Midland, 10 on the North Eastern, seven on the Great Eastern, five on the Great Central, four on the London & South Western and 10 on the Caledonian. The last named is the only one of these roads outside of England. As regards speeds, the Great Western still stands at the head, six of the seven runs scheduled at 57 miles an hour or faster being on that road. The best speed of all is that made by the Great Western between London and Bristol by way of Bath, 118⅜ miles in two hours, 59.2 miles an hour.

Chicago Pneumatic Tool Company.

The income account of the Chicago Pneumatic Tool Company for the half year ended June 30, 1907, is as follows:

Profits for the half year		$507,528
Depreciation of buildings, plant and machinery including repairs and renewals of buildings and plant	$97,834	
For developing and perfecting new tools	10,800	
		108,634
Net profit		$398,894
Reserve for bond interest	$87,500	
Sinking fund reserve	25,000	
		82,500
Available for dividends		$316,394
Quarterly dividends, Nos. 17 and 18		125,576
Surplus for half year		$190,818
Surplus brought from 1906		878,410
Surplus carried forward		$1,069,228

Chicago Subway.

Samuel McRoberts, the new President of the Illinois Tunnel Company, announces that by November 1 the subway will probably be carrying daily to and from railroad freighthouses of the city 10,000 carloads of freight of two or three tons each. The tunnel railroads—18 east and west and 12 north and south—connect with the freighthouses of the 23 railroads centering in the city. Mr. McRoberts has lately made freight contracts with all of these roads. The tunnel lines already have connections with a number of important stores and the expected new business will, no doubt, be from these stores to the freighthouses and vice versa, as well as from one freighthouse to another. The tunnel motors already make 1,000 trips a day with United States mails between the post office and railroad stations, and in the last three months has carried 2,516,-

430 pouches, of which 99.97 per cent. were delivered on time. The tunnel company has, on its 2-ft. gage tracks, 1,200 cars and 80 electric motors; and 50 more motors will soon be received.

Hours of Labor on English Railroads.

The British Board of Trade has issued another report showing for a single month (April, 1907) the number of railroad employees in the United Kingdom who were on duty more than 12 hours at a time or who, after being on duty more than 12 hours, were allowed to resume work with less than nine hours' rest. The total number of trainmen and signalmen on the roads reporting is 109,257. These men worked, during the month of April, 2,639,851 days; and 46,201 persons were, on one or more occasions, on duty more than 12 hours at a time. The total number of instances of overwork was 87,431, or only about 3.3 per cent. of the total days' work. Most of the roads send supplementary statements showing that after deducting the hours in which the men do no work, although they are nominally on duty, a more favorable showing is made. The railroad companies have been notified that hereafter the Board of Trade will ask for a statement of this kind for one month in every quarter.

TRADE CATALOGUES.

The San Luis Valley of Colorado.—The Denver & Rio Grande has issued a folder describing the live stock and agricultural resources of the great San Luis valley in the southern central part of the state of Colorado, which embraces an area of over 3,000,000 acres of arable lands, as great an area as the state of Connecticut. The most profitable industry is hog raising, which has been given a great boom by the discovery of the value of the field pea as a feeding crop. The great advantage of this plant is that it is rich in nitrogen, which is valuable both as food for stock and as an enrichment of the soil. Grain fields worn out by continual recropping in wheat are being rejuvenated by planting them with field peas, whose roots store nitrogen from the air. Pea-fed mutton and pork sells for more than the same grain-fed products. The San Luis valley is also famous for its grain. Furthermore, the greatest yield of potatoes on a measured acre of ground ever recorded, 794 bushels, was raised in the valley in 1902, in competition for a prize offered by the *American Farmer*. The soil is well suited for sugar beets, but as yet no sugar factories have been established. The valley extends north and south 100 miles and east and west at the widest part 10 miles, and is surrounded on every side except the south by high mountain ranges. Its elevation is from 7,500 to 8,000 ft. above the level of the sea, yet it is the most level stretch of land of its size in the state of Colorado. The mountain ranges cut off severe storms, so that the climate is exceptionally good.

Virginia Hot Springs.—The passenger department of the Chesapeake & Ohio has issued an exceedingly attractive small booklet of convenient size (5 in. by 3½ in.) describing the attractions and advantages of Virginia Hot Springs as an all the year round pleasure and health resort. The booklet is an unusual example of taste in advertising. Both front and back covers are decorated in colors, the front cover bearing simply the words Virginia Hot Springs and the back cover Dr. Johnson's familiar quotation, "There is nothing by which so much happiness is produced as by a good tavern or inn." The full page illustrations are 3½ in. by 2 in. and there are many smaller photographs, yet these are so successful and well chosen that the book is more intelligently illustrated than many a larger volume. There are views of the "Homestead," the Virginia Hot Springs hotel, and of its surrounding buildings and attractions. The various baths and springs and their effects on various physical troubles are described. There are also a number of photographs of interesting scenery on the Chesapeake & Ohio.

Metal Specialties.—The William Powell Company, Cincinnati, Ohio, has issued a complete catalogue of its brass and iron specialties for engines and boilers. The catalogue gives all the necessary dimensions of each article and explains in detail its merits. The company's products include: Valves, lubricators, oil cups, injectors, gages, whistles and similar fittings. The catalogue includes a series of tables and rules which are useful to engineers and shop managers.

MANUFACTURING AND BUSINESS.

J. I. Boggs has resigned from the Virginia Bridge & Iron Co., Roanoke, Va., to become Contracting Engineer of the Southwestern Bridge Co., Joplin, Mo. Mr. Boggs' headquarters will be at Dallas, Tex.

The American Railways Company, Philadelphia, Pa., has secured property in Dayton, Ohio, on which to build new car barns and repair shops for the Peoples Railway, a subsidiary. Dodge & Day, Philadelphia, have been commissioned to draw up plans for the buildings.

The Buffalo, Rochester & Pittsburgh is to extend its Clarion Junction shops this fall and also put some new machinery in the Dubois and Rochester shops.

The Central of Georgia has ordered from the Savannah Blow Pipe Co., Savannah, Ga., a blow pipe and heating and ventilating system for the new shops being built at Macon. The Savannah Blow Pipe Co. also has a contract for equipping the new shop being built for the Atlantic Coast Line at Waycross.

A. P. Eckert, heretofore with the Safety Insulated Wire & Cable Company, is now General Sales Manager of the Duplex Metals Company, 208 Fifth avenue, New York City. The Duplex Metals Company makes the Monnot "copper-clad" wire, samples of which were recently exhibited and described at a meeting of the Railway Signal Association.

E. H. Symington, Manager of Western Sales of the T. H. Symington Co., Baltimore, Md., who was thrown from his horse and seriously injured a few months ago, suffering from a fractured skull, is steadily improving and leaves this week on an extended trip around the world, including Japan, China, India and other Oriental countries. Mr. Symington hopes to be able to get back to work at his office in Chicago by the first of the year.

The London County Council recently received bids for two 7,500 h.p., three-phase steam turbo-generating sets to be installed in the new Greenwich power plant for the electric lines under construction in and near London. The lowest bid, £37,872 ($189,360) was made by the British Westinghouse Electric & Manufacturing Co. The Parsons Steam Turbine Co. bid £40,502 ($202,510), while the highest figure was £49,090 ($245,450). The whole plant will cost over £1,000,000 ($5,000,000).

The A. Gilbert & Sons Brass Foundry Co., St. Louis, Mo., makers of Velox bronze and other bearing metals, is building a new plant on Forrest Park boulevard between Vandeventer and Sarah streets, on a plot 75 ft. x 180 ft. The building will be a one-story structure, with a two-story front, the second floor to be used for offices. The roof will be of the saw-tooth pattern, with 18,000 sq. ft. of skylight. It will be supported on iron beams, leaving the ground floor clear of pillars. The new plant will cost in all about $25,000, and is expected to be in operation by October 1.

The United States Consul General at Marseilles, France, has made a report on the conditions under which American manufacturers can hope to sell their products to French railroads. He says there is much red tape in the purchasing departments of French railroads and advises that manufacturers study the French market in person. He suggests that non-competing firms should form combined sales agencies and he has sent a list, which is now on file at the Bureau of Manufactures at Washington, of people and firms in France who might be willing to handle railroad equipment.

Compressed Air is no longer published by the Kobbe Company, New York, but by the Compressed Air Magazine Company, Bowling Green building, New York. W. L. Saunders, M. Am. Soc. C. E., remains editor, and Frank Richards has succeeded W. R. Hulbert, M.E., Assoc. Am. Soc. M. E., as managing editor. Mr. Richards, who is author of the book, "Compressed Air," was for ten years one of the editors of the *American Machinist;* before that he was for some time Superintendent of Shops of the Ingersoll-Sergeant Drill Company. Lucius I. Wightman is Manager of the new publishing company.

The resignation of Mansfield Merriman as Professor of Civil Engineering in Lehigh University takes effect on September 1. Hereafter his time will be largely devoted to practice as a consulting engineer, his office being at 45 Broadway, New York. The vacancy caused by his resignation has been filled by the appointment of Frank P. McKibben, as Professor of Civil Engineering, and of Winter L. Wilson as Professor of Railroad Engineering, the former having been for several years an assistant professor at the Massachusetts Institute of Technology and the latter an assistant professor at Lehigh University.

F. B. Maltby, who has been Principal Assistant Engineer on the Panama Canal, has resigned to become Chief Engineer of Dodge & Day, Philadelphia, Pa. Mr. Maltby is a graduate of the University of Illinois, class of 1882, and in 1907 received an honorary degree from the same institution. He has had long experience in railroad construction work, municipal engineering and irrigation work, and been at various times on the Wisconsin Central, the Missouri Pacific, the Chicago Great Western and the Illinois Central. He has had charge, for the United States Government, of all the dredging in the lower Mississippi river, and he designed and built the lock and movable dam on the Osage river in Missouri for the Government. He has been on the Panama canal for the last two and a half years, having had charge of railroad construction, docks and wharves,

chief, dredging and some buildings in Panama. He was in charge of the preliminary plans and construction of the Gatun lock and dam.

Iron and Steel.

The Northern Central has ordered 2,000 tons of bridge steel.

The Panama Railroad is in the market for 3,000 tons of 90-lb. rails.

The Baltimore & Ohio is reported to have made reservations for rails for 1908 delivery.

The Norfolk & Western is reported to have made reservations for rails for 1908 delivery.

Orders for rails for 1908 delivery are said to aggregate less than for several years past at this season.

The Atchison, Topeka & Santa Fe is reported to have ordered 15,000 tons of 85-lb. rails for delivery as soon as possible from the Minnequa works of the Colorado Fuel & Iron Co., at Pueblo, Col.

The new open hearth rail mill of the Bethlehem Steel Company, South Bethlehem, Pa., was to be in operation by the end of this month. The structural steel plant, it is expected, will be ready toward the end of the year.

The Pittsburg Steel Company has ordered a 42-in. blooming mill from the Macintosh-Hemphill Company to be installed at the new Monessen plant. Additional ground has been bought, and it is said that other mills will be built.

According to press despatches, the Braddock and Homestead plants of the Carnegie Steel Company, Pittsburg, Pa., have put on extra crews of men to rush orders for rails and structural material for Japan, aggregating about $2,000,000.

The Isthmian Canal Commission has ordered from the Maryland Steel Company 3,000 tons of 75-lb. rails, with accessories, to be used in Panama in connection with the canal construction work. The company, it is said, agrees to furnish the rails for $95,250, shipment to be made in September; as compared with the bid of the United States Steel Corporation of $97,350 for November shipment.

OBITUARY NOTICES.

In speaking of the death of Israel Munson Spellman in the *Railroad Gazette* of August 16th, it was said that he was President of the Boston & Maine for 30 years, from 1839 to 1869. This was a mistake. Mr. Spellman was President of that company for only two years, from 1863 to 1865.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad conventions and engineering societies, see advertising page 24.)

Association of Railway Superintendents of Bridges and Buildings.

At the seventeenth annual convention of this association to be held at the Republican House, Milwaukee, Wis., October 15-17, committee reports will be presented on the following subjects:

Concrete Bridges, Arches and Subways, W. H. Finley (C. & N.-W.), Chairman.

Concrete Building Construction, A. O. Cunningham (Wabash), Chairman.

Expansion and Contraction of Concrete Walls, A. S. Markley (C. & E. I.), Chairman.

Action of Sea Water on Concrete, Grosvenor Aldrich (N. Y., N. H. & H.), Chairman.

Use of Wooden and Asbestos Smoke Jacks for Engine Houses, J. H. Cummin (Long Island), Chairman.

Lock for Rolling and Sliding Doors on Freight Houses, C. A. Lichty (C. & N.-W.), Chairman.

Towers and Guides for Lights on Drawbridges, John N. Penwell (L. E. & W.), Chairman.

Protecting Steel Bridges Against Action of Salt Brine from Refrigerator Cars, R. P. Mills (N. Y. C. & H. R.), Chairman.

Pile and Frame Trestle Bridges, W. E. Smith (C., M. & St. P.), Chairman.

Water Supply, C. E. Thomas (Illinois Central), Chairman.

Fire Protection, Wm. C. Carmichael (C., R. I. & P.), Chairman.

Fences, Road Crossings and Cattle Guards, W. M. Noon (D. S. S. & A.), Chairman.

Preservative for Wood and Metal, J. F. Barker (Southern Pacific Railway), Chairman.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Georgia State Railroad Commission.—Gayton McLendon has been appointed a member of the Commission to serve the remainder of the term of Joseph M. Brown.

Wisconsin State Railroad Commission.—Professor B. H. Meyer has been elected Chairman, succeeding John Barnes, resigned. J. H. Roemer succeeds Mr. Barnes as a Member of the Commission.

Operating Officers.

Baltimore & Ohio.—C. F. Tompkins, general yardmaster at Chicago Junction, has been appointed Inspector of Yards, succeeding J. H. Rosenstock, resigned to go to another railroad company.

Buffalo & Susquehanna.—F. W. Allen, who was recently appointed Superintendent of the Buffalo division, began railroad work in April, 1897, as a rodman on the Erie. On July 1 he was transferred to the maintenance of way department on the Buffalo division. In October, 1901, he was appointed clerk in the general manager's office at New York in the maintenance of way and construction department. In 1902 he was appointed Division Engineer of the Wyoming and Jefferson divisions, and the next year was made Division Engineer of the Allegheny division. This position he resigned on August 1, 1904, to become roadmaster of the Cascade division of the Great Northern. In 1905 he was appointed Assistant Superintendent of the Minot division of that road, where he remained until going to the Buffalo & Susquehanna to take his present position.

Hidalgo & Northeastern.—See Mexican International.

Mexican International.—F. A. Latting, Superintendent of the Hidalgo & Northeastern, has been appointed Superintendent of the Northern division of the Mexican International, with office at Monclova, Coahuila, succeeding R. J. Schmalhausen, resigned to become General Manager of the Bolivian Central.

St. Louis & San Francisco.—J. E. Hutchison, Superintendent at Fort Scott, Kan., has been appointed General Superintendent of the First district, with office at Springfield, Mo., succeeding J. H. Young, resigned to go to the Southern Pacific.

Southern Pacific.—Oscar Giffen has been appointed Car Accountant of the Pacific system, with office at San Francisco, Cal., succeeding R. A. Barker, resigned.

Traffic Officers.

Duluth, South Shore & Atlantic.—S. R. Lewis, chief clerk in the General Freight department, has been appointed Assistant General Freight Agent of this road and of the Mineral Range, effective September 1.

Mexican Central.—Charles F. Berna, commercial agent at El Paso, Tex., has been appointed to the new office of General Agent at that place, and his former office has been abolished.

Mineral Range.—See Duluth, South Shore & Atlantic.

New York, Chicago & St. Louis.—James Webster, General Freight Agent, has been appointed to the new office of Traffic Manager, effective September 1.

Engineering and Rolling Stock Officers.

Chicago & North-Western.—The headquarters of F. W. Peterson, Master Mechanic at Fond du Lac, Wis., have been moved to Green Bay, effective September 1.

Chicago, Rock Island & Pacific.—See Denver & Rio Grande.

Denver & Rio Grande.—F. E. Fox, Master Mechanic of the Chicago, Rock Island & Pacific at Goodland, Kan., has been appointed Master Mechanic of the First division of the Denver & Rio Grande, with office at Burnham, Denver, Colo., effective September 1.

Hocking Valley.—Mendell A. Kinney, who was recently appointed Master Mechanic, with office at Columbus, Ohio, was born in 1871 at Conneaut, Ohio. After a high school education he began railroad work in 1889 as an apprentice in the New York, Chicago & St. Louis shops at that place. He was made air-brake inspector in 1893 and later went to the Chicago shops as pit foreman and machine foreman. He was made general foreman at Fort Wayne, Ind., in 1903 and the next year went to the Baltimore & Ohio as general roundhouse foreman at Newark, Ohio. Last April he went to the Hocking Valley as general foreman of the South shops at Columbus, Ohio, where he remained until his recent promotion.

Mexican Central.—J. M. Fulton, Master Mechanic at Chihuahua, has been appointed Master Mechanic of the Aguascalientes division, succeeding W. O. Morton, resigned. R. A. Johnson succeeds Mr. Fulton.

LOCOMOTIVE BUILDING.

The Ragley Lumber Company has ordered one locomotive from the Hicks Locomotive & Car Works.

The Parkersburg Mill Company, Parkersburg, W. Va., is understood to be in the market for one 36-ft. gage locomotive to weigh 10 or 12 tons.

The Northwestern Pacific, as reported in the *Railroad Gazette* of August 16, is about to order two eight-wheel locomotives and four 10-wheel locomotives.

The Lehigh Valley, it is said, has ordered 10 locomotives from the American Locomotive Company, and 15 locomotives from the Baldwin Locomotive Works.

The Chicago-New York Electric Air Line, Chicago, is in the market for one locomotive for construction work, and is figuring on buying an additional locomotive.

The New South Wales Government Railways, as reported in the *Railroad Gazette* of May 24, have ordered 15 ten-wheel passenger locomotives, 10 tank locomotives and 30 consolidation locomotives from Beyer, Peacock & Co., Gorton Foundry, Manchester, England. Bids on this equipment were asked from builders in Great Britain, America, Europe and Australia.

The Atchison, Topeka & Santa Fe, as reported in the *Railroad Gazette* of August 23, has ordered from the Baldwin Locomotive Works 10 consolidation locomotives, weighing about 180,000 lbs. on drivers; two Pacific locomotives, with about 150,000 lbs. on drivers, and 23 switch engines, with about 144,000 lbs. on drivers. The consolidation engines will be equipped with Baldwin superheaters. All engines are duplicates of previous orders.

The Newburgh & South Shore, as reported in the *Railroad Gazette* of August 23, has ordered two simple six-wheel switching locomotives from the Baldwin Locomotive Works, for March, 1908, delivery.

General Dimensions.

Type	Switching
Weight, total	137,000 lbs.
Diameter of drivers	52 in.
Cylinders	20 in. x 26 in.
Boiler, type	Straight top
" working steam pressure	170 lbs.
Tubes, number	290
" maker	National Tube Co.
" length	10 ft. 11 in.
Firebox, length	108 in.
Firebox, width	33 "
Grate area	25 sq. ft.
Heating surface, total	About 1,803 "
Tank capacity	4,500 gals.
Coal capacity	9 tons

Special Equipment.

Air brakes	Westinghouse
Bell-ringer	Gollmar
Couplers	Climax
Injector	Sellers
Piston and valve-rod packings	Twentieth Century Metallic
Sanding devices	Leach
Sight feed lubricators	Detroit
Tires, driving wheel	Latrobe

CAR BUILDING.

The Southern Pacific is understood to be asking prices on 50 caboosea.

The Lehigh & New England is said to be in the market for 700 freight cars.

The New Orleans Great Northern is in the market for 700 freight cars.

The Maine Central has ordered two postal cars from the Pullman Company.

The Pacific Coast Company is said to be in the market for passenger equipment.

The American Steel & Wire Company, Chicago, is reported in the market for 300 freight cars.

The Chicago & Illinois Midland has ordered six flat cars from the Hicks Locomotive & Car Works.

The Dayton & Troy Union has ordered eight side-dump cars from the Hicks Locomotive & Car Works.

The Boston & Maine has ordered 1,008 steel underframe box cars from the Western Steel Car & Foundry Company.

Wells Fargo & Co. have not yet decided to buy 10 refrigerator cars, as reported in the *Railroad Gazette* of August 23.

The North Georgia Marble Co., Ellijay, Ga., is said to be in the market for three or four side-dump cars for hauling ore.

The Western Maryland is said to be in the market for 1,000 cars, including 500 coal cars. A similar report last month was denied.

The Crossett Lumber Company has ordered two coaches, four box cars and three flat cars from the Hicks Locomotive & Car Works.

The Cold Blast Transportation Company, Chicago, has been receiving quotations on some tank cars, but nothing definite has been decided.

Eyre-Shoemaker, Incorporated, contractors, Philadelphia, Pa., has ordered eight second-hand furniture cars from the Hicks Locomotive & Car Works.

The Antrim Iron Co., Mancelona, Mich., is in the market for from 15 to 20 standard gage second-hand flat cars of from 80,000 lbs. to 100,000 lbs. capacity.

The Erie did not at any time cancel the order for 3,000 box cars placed last February, as reported in the *Railroad Gazette* of August 16. Delivery of these cars is expected to begin in October.

The Northwestern Elevated, Chicago, as reported in the *Railroad Gazette* of August 2, has ordered 40 semi-convertible cars from the American Car & Foundry Co. The body of each car, with fixtures, will weigh 23,700 lbs., and the cars will measure 44 ft. 1¾ in. long, 7 ft. 9 in. wide and 8 ft. 7 in. high, inside measurements. The special equipment includes:

Brake-shoes	Love Brake-Shoe Co.
Brakes	Westinghouse
Brasses	Northwestern Elevated standard
Curtain fixtures	Curtain Supply Co.
Curtain material	Pantasote
Journal boxes	Northwestern Elevated standard
Paint	Northwestern Elevated standard
Wheels	Standard Steel Works

RAILROAD STRUCTURES.

Burlington, Iowa.—The Chicago, Rock Island & Pacific, it is said, is back of a project to build a bridge over the Mississippi river to be used by the railroad and by electric car lines, and also as a highway. Application is to be made to Congress.

Flushing, N. Y.—The New York & Queens County announces that it has plans ready for putting up car barns and repair shops on land recently bought, fronting Jackson avenue. The cost of the proposed improvements will be about $250,000.

Greenville, Pa.—Additions and improvements, it is said, are to be made by the Bessemer & Lake Erie to its shops here at a cost of about $350,000.

Homestead, Pa.—Preliminary plans are reported made by the Pittsburgh & Lake Erie for putting up a new passenger station here to cost about $25,000.

Nisbet, Pa.—The Pennsylvania has bids in for building a seven-span steel truss bridge to be 1,128 ft. long and 30 ft. above the water over the Susquehanna river to replace the present structure. The piers are to be built to carry two tracks, but the steel superstructure for the present will be single track. The contract is to be let as soon as permission to build the structure from the Water Commissioner of Pennsylvania has been granted. An order for 2,000 tons of bridge material was recently let by the Pennsylvania to the American Bridge Company.

Philadelphia, Pa.—Bids are wanted, September 11, by the Philadelphia Department of Public Works for the construction of bridges over the Pennsylvania Railroad at Belmont and Girard avenues and 31st street and Columbia avenue, and for two bridges along the line of the Torresdale boulevard. The bridge at Belmont avenue will cost about $85,000, of which the railroad will pay $20,000. The estimate for the 31st street bridge is $52,500, the expense to be divided equally between the railroad, the Rapid Transit Company and the city. The Boulevard bridge over Little Tacony creek will cost about $100,000, while the cost of the other bridge to span the Reading tracks is estimated at $45,000. Bids are also asked for a number of main and branch sewers, the estimated cost of which will be $220,000.

Pittsburg, Pa.—Announcement is made that the Wabash will soon ask for a franchise to build a bridge over West Carson street, in the west end, for the West Side Belt Line.

Portsmouth, Ohio.—The Norfolk & Western, it is said, has bought 75 acres of ground for extensions to its shops at this place. In the enlarged shops 4,000 men will be employed.

Pottsville, Pa.—The borough officers of Mt. Carbon are considering the question of building a bridge from Cape Horn west over the electric car tracks, the old canal, the river and the Philadelphia & Reading tracks and abandoning the road near the Pennsylvania Railroad yards at Mt. Carbon. It is said that the Pennsylvania Railroad will pay for the improvements in return for the land granted.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

ATCHISON, TOPEKA & SANTA FE.—Work is under way putting in 85-lb. rails on this road, between Pueblo, Colo., and Atchison, Kan.

BEAUMONT & GREAT NORTHERN.—This road, in operation from Trinity, Tex., on the International & Great Northern southeast to Onalaska, 20 miles, is being extended southeast to Beaumont, 95 miles from Trinity. The extension is expected to be finished to Livingston, 15 miles, next November, when contracts for a 50-mile section are to be let. It is said that the line when built is to be turned over to the International & Great Northern.

BRITISH COLUMBIA (ELECTRIC).—This company has plans under way for building a branch from New Westminster, B. C., southeast to Cloverdale, 30 miles. R. H. Sperling, General Manager, Vancouver, B. C.

BROOKVILLE & MAHONING.—See Pittsburg, Shawmut & Northern.

CALIENTE & PIOCHE.—See San Pedro, Los Angeles & Salt Lake.

CANADIAN PACIFIC.—General Superintendent Robert Marpole, of the Pacific division, is reported as saying that surveys for the extension of the Esquimalt & Nanaimo from Nanaimo, B. C., west to Alberni, 50 miles, are sufficiently advanced to permit construction work to be begun.

CENTRAL OF GEORGIA.—The work of installing passing tracks at all of the stations between Atlanta and Macon is about finished. Over 30 miles of new side tracks have been laid and counting the double track of eight miles from Atlanta to Hapeville the road has 38 miles of double track. It is understood that as soon as the new shops at Macon are finished, work will be begun on double-tracking the entire line between Macon and Atlanta. All of the recent work has been done by the company's men instead of by contractors.

CHICAGO & ALTON.—See Toledo, St. Louis & Western.

CHICAGO, ST. PAUL, MINNEAPOLIS & OMAHA.—This company is buying right of way at Eau Claire, Wis., preparatory to building another section of double track.

CLEVELAND, ALLIANCE & MAHONING (ELECTRIC).—Contracts, it is said, are shortly to be let for building a section of this proposed line from Ravenna, Ohio, east to Newton Falls, 18 miles. (Mar. 15, p. 382.)

COLORADO SOUTHERN, NEW ORLEANS & PACIFIC.—See St. Louis & San Francisco.

DANVILLE & SCOTTSVILLE.—This company was incorporated about two years ago in Kentucky. It is now said to have about $2,000,000 subscribed and to have begun actual construction at Scottsville. The proposed route is from Danville, Ky., southwest via Moreland, Hustonville and Liberty to Scottsville, 100 miles. At a recent meeting of the directors, J. S. Allen, of New York, was elected President, and E. P. Combast, of New York, Vice-President. M. J. Farris, President of the Citizens Bank, is Treasurer, and A. E. Hundley, Secretary, both of Danville. (March 15, p. 382.)

DULUTH, RAINY LAKE & WINNIPEG.—The bridge over Rainy lake is to be finished and through service begun September 1, on the extension of the Duluth, Virginia & Rainy Lake to the Canadian boundary at Rainier, where connection is to be made with the Canadian Northern. The road now extends from Virginia, Minn., north 93 miles. It is said that the company now proposes to build the line from Virginia south to Duluth, about 65 miles. (March 15, p. 383.)

DULUTH, VIRGINIA & RAINY LAKE.—See Duluth, Rainy Lake & Winnipeg.

ESQUIMALT & NANAIMO.—See Canadian Pacific.

INDIAN CREEK VALLEY.—Announcement is made that regular passenger trains have begun running on this road, recently finished from Indian Creek, Pa., northeast five miles to Normalville. It is also said that an extension is to be built from Normalville northeast to Ligonier, 25 miles. The road was built chiefly for the business of the McFarland Lumber Company, which has options on coal land north of Normalville and the proposed extension is to be built to develop this property.

INTERURBAN CONSTRUCTION COMPANY.—A franchise has been granted to this company to build a line from Denver, Colo., north to Greeley, 50 miles. The route of the proposed road is parallel to the Union Pacific for most of the way. Work must be started within six months, and be finished within two years. E. N. Reaser, President, Denver.

KANSAS TRACTION COMPANY.—Surveys are being made and rights of way secured for this proposed electric line to be built from Coffeyville, Kan., northeast via Lawrence and Topeka to Kansas City, Mo., 200 miles. Contracts are to be let for the work in November. It will be low grade, mostly heavy, with 5½ miles of [illegible] construction. F. B. Shirley, President, Coffeyville.

LAKE ERIE, ALLIANCE & WHEELING.—See Lake Shore & Michigan Southern.

LAKE ERIE & YOUNGSTOWN (ELECTRIC).—This company, incorporated to build an electric line from Conneaut, Ohio, south to Youngstown, about 60 miles, has all the rights of way secured and will shortly begin the work. Plans have been made for the extension of the line into Youngstown, where connection is to be made with the Youngstown & Southern, which has been built to Columbiana, and is to be extended to East Liverpool, on the Ohio river, 100 miles from Conneaut. (April 12, p. 531.)

LAKE SHORE & MICHIGAN SOUTHERN.—Surveys, it is said, are under way for an extension of the Lake Erie, Alliance & Wheeling from its southern terminus at Piney Fork, in Jefferson county, Ohio, southeast to Martin's Ferry, 21 miles.

MEXICAN MILLING & TRANSPORTATION COMPANY.—This company has been authorized to build railroads in the municipalities of Guanajuato and La Paz, connecting with the Mexican Central near Santa Rosa, and a number of branches, a total of about 50 miles. The line must be located within three months, six miles built within 15 months and a similar amount finished each year, the entire work not to take over five years. An agreement has been entered into by the Department of Communications and Public Works and George W. Bryant to build the line.

MEXICAN PACIFIC.—A concession was recently granted to this company to build a branch in the state of Guerrero from Acapulco northwest via Pie de la Cuesta to a point on the Coyuca river, about 30 miles. According to the terms of the concession, location surveys must be begun within six months, three miles of the road must be built the first year, and the entire line finished within four years. The office of the company will be at Acapulco.

MICHIGAN ROADS.—A new logging road, it is reported, will be built by the Sawyer-Goodman Company in Mastodon township, Iron county, about 15 miles long. The proposed line is to penetrate a large tract of timber owned by the Sawyer-Goodman Company.

MIDCONTINENTAL TRACTION.—This company, recently organized by eastern capitalists to build an electric line from Tulsa, Ind. T., via Red Fork and Sapulpa, to the Glen Pool oil fields, about 21 miles, has completed financial arrangements and will shortly begin work. F. L. Smart, Kansas City, Mo., President; J. R. Burnham, Chief Engineer, Tulsa.

MIDLAND VALLEY.—The branch from Jenks, Ind. T., to Glen Pool, 6½ miles, has been opened for passenger service. (July 26, p. 111.)

MINNEAPOLIS, ST. PAUL & SAULT STE. MARIE.—An amendment to its charter has been filed by this company in Wisconsin, permitting it to build a branch from Brooton, Minn., northwest, 180 miles, to Superior.

MISSISSIPPI VALLEY (ELECTRIC).—Contract is reported let by this company to the Federal Construction Company of New York, to build its proposed electric line from Fort Madison, Iowa, south, via Keokuk, and thence east via Hamilton, Ill., to Carthage, Ill., 45 miles. Rights of way have been secured and capital, it is said, necessary to build the line has been obtained.

OCEAN SHORE (ELECTRIC).—The San Joaquin Valley Western, incorporated to build an extension of this road from Santa Cruz, Cal., east via Holester, is said to have located the line and secured the right of way for about 100 miles. Work will shortly be begun. The line when finished, including branches, is to be 220 miles long and to cost about $6,000,000. (March 15, p. 388.)

PENNSYLVANIA.—This company, it is said, has opened its Pittsburg, Brownsville & Monongahela Railroad, a new branch from Brownsville, Pa., to Rice's Landing, 15 miles.

PENNSYLVANIA ROADS (ELECTRIC).—The Mercer Construction Co. has been granted a charter in West Virginia with $25,000 capital to build an electric line from Mercer, Pa., northwest to Greenville, 15 miles. It is also proposed to build an extension from Greenville southwest to Sharpsville, 11 miles, where connection is to be made with the Sharon & Sharpsville. The proposed extension is to form part of a line to connect Erie with Pittsburg. The incorporators include J. M. Campbell, L. W. Orr and T. P. Filer, of Mercer; W. Hilderbrand, of Pittsburg, and S. D. Downs, of Greenville.

PITTSBURG, SHAWMUT & NORTHERN.—The Brookville & Mahoning, building from Hydes, Pa., southwest towards Pittsburg, to Freeport, 101 miles, for which contracts were let to the Miller Construction Company, of Lockhaven, has filed with the State Department of Pennsylvania a report of an increase of $500,000 in capital stock. The company was authorized some time ago to increase its capitalization from $1,350,000 to $10,000,000. (March 15, p. 390.)

ST. LOUIS & SAN FRANCISCO.—The Colorado Southern, New Orleans & Pacific has been formally leased to this company. The division from Houston east, it is said, is to be opened for traffic

September 15 to De Quincy, and possibly as far east as Opelousas. The remainder of the line east to New Orleans is to be ready for operation about January 1. (July 26, p. 111.)

San Francisco, Idaho & Montana.—This company, which was incorporated to build a line from Butte, Mont., southwest to San Francisco, according to a reported statement of E. R. Place, General Manager, has bought all the necessary right of way, with the exception of 12 miles near Winnemucca, Nev., for the branch from Caldwell, Idaho, to Winnemucca, Nev., 196 miles. As yet we have not heard of any contracts being let except for 16 miles from Caldwell to Homedale. Donald Grant, President, Faribault, Minn.; I. H. Richardson, Chief Engineer, Caldwell, Idaho. (March 15, p. 391.)

San Joaquin Valley Western.—See Ocean Shore.

San Pedro, Los Angeles & Salt Lake.—Freight and passenger service on the Caliente & Pioche, it is reported, has been established for 15 miles north of Caliente about half way to Pioche. (March 15, p. 380.)

South Dakota Central.—This company, building an extension from Rutland, S. Dak., north 75 miles to Watertown, has been finished to Nunda, six miles; the work has been delayed on account of lack of laborers. A large grading outfit has recently been put at work and the grading will be finished to Watertown by December. Work is now under way near Arlington, where the Chicago & North-Western tracks will be crossed. (May 10, p. 663.)

South Dakota Roads.—The promoters of the proposed line from Mitchell, S. Dak., northeast to Marshall, Minn., about 130 miles, recently held a meeting at Mitchell and appointed a committee to exploit the project. L. L. Ness, D. B. Miller, O. E. Cassem, of Mitchell; J. Wadden, J. Larkin, C. B. Kenned, of Madison; L. P. Johnson, R. F. Schulz, of Ivanhoe; G. West, E. Olson, F. Sherwin, of Brookings; C. L. Johnson, L. A. Larson, G. P. Skortum, of Hendricks; I. J. Todd, of Salem; W. S. Dotym, of Epiphany; C. W. Shirley, of Clarno, and A. Swanson, of Winnifred, are on the committee. The proposed line is intended eventually to be extended from Mitchell, southwest to the Missouri river at Wheeler, giving the south central part of South Dakota a more direct connection with Minneapolis and St. Paul.

Southern Wisconsin (Electric).—This company, formerly the Madison Street Railway Company, has petitioned the Wisconsin State Railroad Commission for a certificate of authority to build an interurban line from Madison southeast via MacFarland to Janesville, 40 miles. The Madison council about a year ago refused to grant the company a 40-year franchise for this purpose.

Stephensville North & South Texas.—This company was organized to build a line from Stephensville, in Erath county, Tex., south to Hamilton, 35 miles. It has been finished to Alexander, about 13 miles, and this section is said to be now open for traffic. The company expects to have the entire line to Hamilton finished about the middle of October. Read & Montgomery, Stephensville, contractors; McK. Johnstone, Chief Engineer. (Mar. 15, p. 388.)

Toledo, St. Louis & Western.—This road having acquired control of the Chicago & Alton, a connection is to be built from Panama, Ill., west to Litchfield, the eastern terminus of a Chicago & Alton branch, seven miles. By construction of this seven-mile link the two roads will together have a through route from Detroit and Toledo on the east to Kansas City on the west.

Wagner, Lake Shore & Aamoua Traction.—An officer writes that this company, which expects to let contracts in July for building its proposed electric line from Wagner, S. Dak., north via Lake Shore, Armour and Hillslide to Mitchell, 65 miles, has been unable to carry out its plans by reason of its failure to secure satisfactory franchises in the city of Mitchell. Work has been under way for some time on the power plants at Armour and Platte, and these are now being rapidly finished. (May 31, p. 760.)

Wisconsin Midland.—A franchise has been granted this company, which has a capital of $30,000, to build a line from the Chicago & North-Western at Chester, Wis., northwest, five miles, to Waupun. The line is eventually to be extended south from Waupun to a point beyond Beaver Dam. Thomas Mercein, of Milwaukee, is the principal promoter.

RAILROAD CORPORATION NEWS.

Belmont, Sour Lake & Western.—See St. Louis & San Francisco.

Central of Georgia.—The directors have passed the dividend on the $4,000,000 third preference income bonds. The usual dividend of 5 per cent. was declared on the first income bonds, but only 3.729 per cent. on the second incomes. For the last four years 5 per cent. has been paid on the first income bonds, the rate was 3 per cent. in 1902, 5 per cent. in 1901, 3¼ per cent. in 1900 and 2 per cent. in 1899 and 1898. On the second incomes 5 per cent. has been paid for the last two years, 2 per cent. in 1904 and nothing previously; on the third incomes 5 per cent. has been paid for the last two years and nothing previously.

Chicago & Alton.—See Toledo, St. Louis & Western.

Chicago, Milwaukee & St. Paul.—This company is about to begin the electrification of its line from Wilson avenue, Chicago, to Evanston, Ill., according to an ordinance of the city of Chicago. The Northwestern Elevated is to operate its cars over this line. The cost, estimated at $1,000,000, as well as the revenue from the service, will be divided between the two companies. It is expected that operation will begin in three months.

Colorado Southern, New Orleans & Pacific.—See St. Louis & San Francisco.

Erie.—The Directors have decided to pay the regular semi-annual dividend of 2 per cent. on the $47,892,400 first preferred and the annual dividend of 4 per cent. on the $16,000,000 second preferred stock in warrants which will run for 10 years and bear 4 per cent. interest.

Great Northern.—The first distribution of profits by the trustees of the Great Northern's iron ore property, leased to the United States Steel Corporation last fall, has been declared. It is $1 a share, payable September 16. The interest in the property was divided into 1,500,000 shares, with no fixed par value, which were distributed, share for share, to holders of Great Northern stock. It was announced last fall that a distribution of profits would be made at least once a year. In making this first distribution, however, the trustees did not say whether the present rate would be maintained or changed.

Interborough-Metropolitan.—See Metropolitan Street Railway.

Metropolitan Street Railway.—Movements have been started to form a protective committee of the stockholders of this company because it is feared that the 7 per cent. guaranteed dividend on the $52,000,000 stock may be reduced or passed entirely. The property is leased to the New York City Railway, the rental being the dividend referred to, the payment of which is guaranteed by the Metropolitan Securities Company, which owns all the stock of the New York City Railway. The Metropolitan Securities Company is controlled by the Interborough-Metropolitan Company. It is understood that the Metropolitan Street Railway has not been earning enough to cover the dividend and that the Metropolitan Securities Company has been making up the deficit. The last named company, however, has no apparent source of income other than what it gets from the stock of the New York City Railway. The Interborough-Metropolitan, it is said, has decided not to pay unearned dividends on the Metropolitan Street Railway stock if the Metropolitan Securities Company is not able to do so.

Northwestern Elevated.—See Chicago, Milwaukee & St. Paul.

Rock Island Company.—See Toledo, St. Louis & Western.

St. Louis & San Francisco.—The Colorado Southern, New Orleans & Pacific's property has been leased to the St. Louis & San Francisco. The road is under construction from Baton Rouge, La., to De Quincy, 138 miles; from De Quincy to Beaumont, Tex., 47 miles, the tracks of the Kansas City Southern are to be used and the Beaumont, Sour Lake & Western, which ran from Beaumont to Sour Lake, 22 miles, and was acquired some time ago by the St. Louis & San Francisco, has been rebuilt and extended to Houston. Connection is ultimately to be made between Baton Rouge and New Orleans.

Southern.—A semi-annual dividend of 1¼ per cent. has been declared on the $60,000,000 non-cumulative 5 per cent. preferred stock, payable October 17. The annual rate has been 5 per cent. since 1901, when it was 4 per cent. It was 3 per cent. in 1900, 2 per cent. in 1899, and 1 per cent. in 1898 and 1897. After reducing the dividend, the Directors announced that, though feeling that the unusual results of last year were not liable to be repeated, they believed it best to limit the distribution of profits until the permanent effects of high prices, increasing taxes and legislative reduction of earnings could be fairly measured.

Toledo, St. Louis & Western.—This company is to buy control of the Chicago & Alton from the Rock Island Company and interests associated with it. In return for $6,380,000 preferred and $14,420,000 common stock of the Chicago & Alton out of $19,544,000 preferred and $19,542,800 common outstanding, the Toledo, St. Louis & Western is to issue collateral trust bonds to be turned over to the Rock Island Company. For the preferred stock bought, 4 per cent. collateral trust bonds are to be issued at par and for the common stock collateral trust bonds are to be issued at 35, which are to bear interest at 2 per cent for five years and then 4 per cent. For further comment on this purchase, see editorial column and also a short article with map published in this issue.

RAILROAD GAZETTE

ESTABLISHED IN APRIL, 1856.

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EDITORIAL ANNOUNCEMENTS.

THE BRITISH AND EASTERN CONTINENTS edition of the Railroad Gazette is published each Friday at Queen Anne's Chambers, Westminster, London. It contains selected reading pages from the Railroad Gazette, together with additional British and foreign matter, and is issued under the name Railway Gazette.

CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.

ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

OFFICERS.—In accordance with the law of the state of New York, the following announcement is made of the office of publication, at 83 Fulton St., New York, N.Y., and the names of the officers and editors of The Railroad Gazette:

CONTENTS

VOL. XLIII., No. 10. FRIDAY, SEPTEMBER 6, 1907.

ELECTRIFICATION ON THE SOUTHERN PACIFIC.

The Southern Pacific has directed its electrical engineer, Allen H. Babcock, and Frank J. Sprague, who has been retained as consulting engineer, to study the possibilities of increasing the capacity of the Sacramento division of the old Central Pacific by electrifying between Rocklin, Cal., and Sparks, Nev., 134 miles over the Sierra Nevada mountains. These gentlemen constitute a sub-committee within a committee of five, consisting of themselves and three engineers of the Harriman lines, not yet named. This committee will consider the relative advantages of a number of proposed plans for relieving the present congestion of traffic over this important connecting link between the Union Pacific and the Southern Pacific coast lines, and will make final recommendations to Mr. Kruttschnitt, Director of Maintenance and Operation of the Harriman lines.

This electrification is perhaps the most difficult and important installation which has so far been seriously considered. The New York Central and the New Haven electrifications are simple problems compared to it. The New York Central was compelled by law to abandon steam locomotives in the Park avenue tunnel, and it planned its electric equipment, not so much with the idea of immediate economy in operation, as with the belief in great expansion of business in the future in a thickly populated territory which could be handled more profitably and with greater comfort to passengers by electric trains than with steam trains. The New Haven went even farther and designed its installation with the idea of immediate economy of operation and the ultimate extension of electricity over the greater part of its network of lines in Connecticut.

The economy of electric operation is still open to some discussion. The possibility of increasing the carrying capacity of a given piece of track by substituting electricity for steam as motive power is perhaps more easily proved, yet heretofore this has been a consideration of secondary importance. In the Southern Pacific's problem it is the first important consideration; reasonable economy must, of course, be attained, but it would be worth while to increase the cost of operation slightly if it was found possible to increase the capacity of the line one-half or more. Any of the plans proposed will cost enormous sums to carry out, and the committee will have to decide which method will best meet present and future needs for the least ultimate cost.

The Sacramento division crosses the Sierra Nevada mountains at an elevation of 7,018 ft. It is the most direct route to San Francisco, and all the through traffic of the Union Pacific which is not diverted north over the Oregon Short Line to Portland or south over the San Pedro, Los Angeles & Salt Lake to Los Angeles must be carried up the steep slopes on one side and down the equally steep slopes on the other side. The traffic is heavy, but quite irregular and blockades are frequent in the yards at both ends of the division. The road is single track with few sidings, and because of the difficult location it is practically impossible to double-track it throughout or to greatly increase the length of the sidings. The road is full of sharp curves, and between Rocklin and Sparks there are more than 31 miles of tunnels and snow sheds. Rocklin, at the foot of the eastbound grade, has an elevation of 250 ft. and from that point to the summit, 83 miles, there is a total rise of 6,768 ft., an average of 81½ ft. per mile, with a maximum of 116 ft. per mile. Westbound the maximum grade begins at Truckee, and the rise to the summit, 14 miles, is 1,198 ft., an average of 85½ ft., with a maximum of 105 ft. per mile. In the winter the snow often accumulates to a depth of from 15 to 20 ft. in the exposed places.

Various methods have been proposed and carefully looked into for relieving in part the congestion of this very much overworked line. An entirely new single-track line has been located some distance away which has slightly more favorable grades, and if built would be equivalent to providing a second track on the present location. Tunneling the Sierras at a lower elevation and thus reducing the length, as well as the steepness of the grades on each side, has also been proposed.

Mr. Babcock has been studying the possibilities of a change in motive power from steam to electricity for nearly three years and has collected much of the necessary data on which a report can be based. It is by no means assured, however, that the company will decide to adopt electricity instead of the difficult construction work for a new line or the daring scheme of a long tunnel under the mountains, for the difficulties of installing and maintaining the necessary electrical equipment may be found to be too great. The principal advantage of electricity as a motive power would be that it could be installed in much less time than a new line could be built, and the results would be noticeable from the beginning of operation of the first section. In case a tunnel was built it would be necessary in any event to use electricity as a motive power.

Some of the difficulties to be overcome if electric operation of the entire division is finally decided upon are: Installation and maintenance of transmission lines to withstand heavy snows and violent storms without interruption. Provision for wide variations in load

with heavy but very intermittent traffic. Danger from fire in snow sheds during the summer and from short circuits due to melting snow in the spring. Extreme cost of substantial and permanent overhead line construction and danger to trainmen in tunnels and snow sheds if this method should be employed. Interference by snow in the open if third rail construction is used.

The two engineers who will report on this problem have not as yet decided on any of the details of the apparatus which might be employed. They are approaching the subject with open minds, and it is possible that after a thorough consideration of the problem they may report to the committee that the scheme is not practical. In any event, their report, when made, will be an interesting study of the possibilities of electric operation along lines which are beginning to attract serious attention.

RAIL SECTIONS AND SPECIFICATIONS

The Progress Report of the Special Committee on Rail Sections of the American Society of Civil Engineers, embodying the "Recommended Specifications for Bessemer Steel Rails" is given in full herewith. As stated by the committee "in the designing of heavier sections, particular attention is being given to the advisability of increasing the percentage of metal in the webs and flanges, as compared with the existing sections recommended by your society." This proposed change would probably prove a decided step in the right direction, in that it would not only increase the strength and stiffness of the rail, but would allow of a much lower finishing temperature in rolling than is possible with the present thin flanges.

For convenience of comparison and discussion these recommended specifications are printed below in parallel columns with those adopted by the American Railway Engineering and Maintenance of Way Association and those passed to letter ballot by the American Society for Testing Materials at its recent annual meeting. A discussion of the report made to the American Society of Civil Engineers by the special committee has been made an order of business for the annual meeting to be held in January next, and a committee of the American Railway Association is also engaged in the study of the problem of rail sections and rail specifications. The time seems opportune, therefore, to call attention to some of the differences in the above specifications.

It is believed that a specification embodying the best features of the three specifications here cited with adequate provision for tests would insure a safe rail of good wearing properties. It may be safely asserted that the unsatisfactory experience within recent years with rails under modern service conditions have been due mainly to the fact that the specifications under which such rails have been furnished were not sufficiently rigid, and that the mills have been disinclined to accept orders under specifications designed to insure a better and more uniform material. It is certain, however, that no matter how exacting the specifications may be made in the letter, the standard of excellence that they are designed to secure cannot be insured without more rigid inspection than has been customary in the past.

The three specifications referred to are as follows: (For convenience of comparison the sequence of the paragraphs has been slightly modified to adapt them to the specifications recommended by the special committee of the American Society of Civil Engineers.)

AMERICAN SOCIETY OF CIVIL ENGINEERS.

"Recommended Specifications for Bessemer Steel Rails.*

"*Process of Manufacture.*—The entire process of manufacture and testing shall be in accordance with the best state of the art, and the following instructions shall be faithfully executed:

"Ingots shall be kept in a vertical position in the pit heating furnaces until ready to be rolled, or until the metal in the interior has had time to solidify.

"No bled ingots shall be used.

"There shall be sheared from the end of the blooms formed from the top of the ingots not less than twenty-five per cent., and if, from any cause, the steel does not then appear to be solid, the shearing shall continue until it does. If, by the use of any improvements in the process of making ingots, the defect known as piping shall be prevented, the above shearing requirements may be modified.

"The number of passes and speed of train shall be so regulated that on leaving the rolls at the final pass, the temperature of the rail will not exceed that which requires a shrinkage allowance at the hot saws, for a 33-ft. rail of 100-lb. section, of 6 7-16 in., and 1-16 in. less for each 5-lb. decrease of section. These allowances to be decreased at the rate of 1-90 in. for each second of time elapsed between the rail leaving the finishing rolls and being sawn. No artificial means of cooling the steel shall be used after the rails leave the rolls, nor shall they be held before sawing for the purpose of reducing their temperature."

"*Chemical Composition.*—Rails of the various weights per yard specified below shall conform to the following limits in chemical composition:

	70-79lb. Percentage.	80-89lb. Percentage.	90-100lb. Percentage.
Carbon	0.50-0.60	0.53-0.63	0.55-0.65
Phosphorus shall not exceed	0.085	0.085	0.085
Silicon shall not exceed	0.20	0.20	0.20
Sulphur shall not exceed	0.075	0.075	0.075
Manganese	0.75-1.00	0.80-1.05	0.80-1.05

*Chemical composition may be varied to suit local conditions.

AMERICAN RAILWAY ENGINEERING AND MAINTENANCE OF WAY ASSOCIATION.

SPECIFICATIONS FOR BESSEMER STEEL RAILS.

STANDARD SPECIFICATIONS.

(1) (a) The entire process of manufacture and testing shall be in accordance with the best current practice, and special care shall be taken to conform to the following instructions:

(b) Ingots shall be kept in a vertical position in the pit heating furnaces until ready to be rolled, or until the metal in the interior has time to solidify.

(c) No bled ingots shall be used.

(d) There shall be sheared from the end of the blooms formed from the top of the ingots not less than twenty-five (25) per cent., and if, from any cause, the steel does not then appear to be solid, the shearing shall continue until it does. If, by the use of any improvements in the process of making ingots, the defect known as piping shall be prevented, the above shearing requirements may be modified.

(2) Rails of the various weights per yard specified below shall conform to the following limits in chemical composition:

(5) The number of passes and speed of train shall be so regulated that on leaving the rolls at the final pass, the temperature of the rail will not exceed that which requires a shrinkage allowance at the hot saws for a 33-ft. rail of 100-lb. section of 6 7-16 in., and 1-16-in. less for each 5-lb. decrease of section, these allowances to be decreased at the rate of 1-90-in. for each second of time elapsed between the rail leaving the finishing rolls and being sawn. No artificial means of cooling the steel shall be used after the rails leave the rolls, nor shall they be held before sawing for the purpose of reducing their temperature.

	Percentage 70-79 lbs.	80-89 lbs.	90-100 lbs.
*Carbon	0.50-0.60	0.53-0.63	0.55-0.65
Phosphorus shall not exceed	0.085	0.085	0.085
Silicon shall not exceed	0.20	0.20	0.20
Sulphur shall not exceed	0.075	0.075	0.075
Manganese	0.75-1.00	0.80-1.05	0.80-1.05

*Carbon may be reduced to suit local conditions.

AMERICAN SOCIETY FOR TESTING MATERIALS.

PROPOSED STANDARD SPECIFICATIONS.

1. (a) The entire process of manufacture and testing shall be in accordance with the best current practice, and special care shall be taken to conform to the following instructions: (b) Ingots shall be kept in a vertical position in the pit heating furnaces until ready to be rolled or until the metal in the interior has time to solidify. (c) No bled ingots shall be used. (d) There shall be sheared from the end of the blooms formed from the top of the ingots not less than x %,† and if, from any cause, the steel does not then appear to be solid, the shearing shall continue until it does.

†The percentage of minimum discard in any case to be subject to agreement and it should be recognized that the higher this percentage the greater will be the cost.

4. The number of passes and speed of train shall be so regulated that on leaving the rolls at the final pass the temperature of the rail will not exceed that which requires a shrinkage allowance at the hot saws, for a 30-foot rail of 100-pound section of 6 11-16 inches, and 1-16 inch less for each 5-pound decrease of section. These allowances to be decreased at the rate of 0.01 inch for each second of time elapsed between the rail leaving the finishing rolls and being sawed. No artificial means of cooling the rails shall be used between the finishing pass and the hot saws.

2. Rails of the various weights per yard specified below shall conform to the following limits in chemical composition:

	Carbon.	Phosphorus, shall not exceed.	Silicon, shall not exceed.	Manganese.
50-59 lbs., per cent.	0.35-0.45	0.10	0.20	0.70-1.00
60-69 lbs., per cent.	0.38-0.48	0.10	0.20	0.70-1.00
70-79 lbs., per cent.	0.40-0.50	0.10	0.20	0.75-1.05
80-89 lbs., per cent.	0.43-0.53	0.10	0.20	0.80-1.10
90-100 lbs., per cent.	0.45-0.55	0.10	0.20	0.80-1.10

*Progress report of the Special Committee on Rail Sections, A. S. C. E.:

Gentlemen:—Your committee respectfully report that they have given the report, which they submitted under date of Jan. 17, 1906, and which was referred back to them, careful consideration, and would now report that they are in consultation with committees representing other societies and organizations, as well as other interested parties, on the subject of modified rail sections, with the purpose of preparing and submitting to your society a new series of such sections. In this designing of heavier sections, particular attention is being given to the advisability of increasing the percentage of metal in the webs and flanges as compared with the existing sections recommended by your Society. This they hope to accomplish in due time, and in the meantime respectfully submit to the society for its consideration the following specifications for the manufacture of Bessemer and open-hearth rails:

A. S. C. E.

Drop Test.—One drop test shall be made on a piece of rail, not less than 4 ft. and not more than 6 ft. long, selected from each blow of steel. The test piece shall be taken from the top of the ingot. The rails shall be placed head upward on the supports and the various sections shall be subjected to the following impact tests under a free falling weight:

70 to 79 lb. rails	18 ft.
80 to 89 lb. rails	20 ft.
90 to 100 lb. rails	22 ft.

"If any rail breaks, when subjected to the drop test, two additional tests may be made of other rails from the same blow of steel, also taken from the top of the ingots, and if either of these latter rails fail, all the rails of the blow which they represent will be rejected, but if both of these additional test pieces meet the requirements, all the rails of the blow which they represent will be accepted.

"The drop-testing machine shall have a top of 2,000 lb. weight, the striking face of which shall have a radius of not more than 5 in., and the test rail shall be placed head upward on solid supports 3 ft. apart. The anvil block shall weigh at least 20,000 lb., and the supports shall be part of, or firmly secured to, the anvil. The report of the drop test shall state the atmospheric temperature at the time the test was made."

"*Section.*—The section of rail shall conform, as accurately as possible, to the templet furnished by the railroad company, consistent with the paragraph relative to specified weight. A variation in height of 1-64 in. less, or 1-32 in. greater than the specified height, and 1-16 in. in width will be permitted. The section of rail shall conform to the finishing dimensions.

"*Weight.*—The weight of the rails will be maintained as nearly as possible, after complying with the preceding paragraph, to that specified in contract. A variation of one-half of 1 per cent. for an entire order will be allowed. Rails will be accepted and paid for according to actual weights.

"*Length.*—The standard length of rails shall be 33 ft. Ten per cent. of the entire order will be accepted in shorter lengths varying by even feet to 27 ft., and all No. 1 rails less than 33 ft. long shall be painted green on the ends. A variation of ⅛ in. in length from that specified will be allowed.

"*Drilling.*—Circular holes for splice bars shall be drilled in accordance with the specifications of the purchaser. The holes shall conform accurately to the drawing and dimensions furnished, in every respect, and must be free from burrs.

"*Straightening.*—Care must be taken in hot-straightening the rails, and it must result in their being left in such condition that they shall not vary throughout their entire length more than 5 in. from a straight line in any direction, when delivered to the cold-straightening presses. Those which vary beyond that amount, or have short kinks, shall be classed as second-quality rails and be so stamped.

"Rails shall be straight in line and surface when finished—the straightening being done while cold—smooth on head, sawed square at ends, variation to be not more than $\frac{1}{32}$ in., and, prior to shipment shall have the burr occasioned by the saw cutting removed, and the ends made clean. No. 1 rails shall be free from injurious defects and flaws of all kinds.

"No. 2 rails shall be accepted up to 5 per cent. of the whole order. They shall not have flaws in their heads of more than ¼ in., or in the flange of more than ½ in. in depth, and, in the judgment of the inspector, these shall not be so numerous or of such a character as to render them unfit for recognized second-quality rail uses. The ends of No. 2 rails shall be painted white, and shall have two prick-punch marks on the side of the web near the heat number brand, and placed so as not to be covered by the splice bars. Rails from heats which failed under the drop test shall not be accepted as No. 2 rails.

M. of W.

(3) One drop test shall be made on a piece of rail not less than 4 ft. and not more than 6 ft. long, selected from each blow of steel. The test piece shall be taken from the top of the ingot. The rails shall be placed head upward on the supports, and the various sections shall be subjected to the following impact tests under a free falling weight:

70 to 79 lb. rails	18 ft.
80 to 89 lb. rails	20 ft.
90 to 100 lb. rails	22 ft.

If any rail breaks when subjected to the drop test, two additional tests may be made of other rails from the same blow of steel, also taken from the top of the ingots, and if either of these latter rails fail, all the rails of the blow which they represent will be rejected, but if both of these additional test pieces meet the requirements, all the rails of the blow which they represent will be accepted.

(4) The drop-testing machine shall have a top of 2,000 lbs. weight, the striking face of which shall have a radius of not more than 5 in., and the test rail shall be placed head upward on solid supports 3 ft. apart. The anvil block shall weigh at least 20,000 lbs., and the supports shall be part of, or firmly secured to, the anvil. The report of the drop test shall state the atmospheric temperature at the time the test was made.

(7) Unless otherwise specified, the section of rail shall be the American Standard, recommended by the American Society of Civil Engineers, and shall conform, as accurately as possible, to the templet furnished by the railroad company, consistent with paragraph No. 8, relative to specified weight. A variation in height of one sixty-fourth (1-64) inch less, or one thirty-second (1-32) inch greater than the specified height, and one-sixteenth (1-16) inch in width, will be permitted. The section of rail shall conform perfectly to the finishing dimension.

(8) The weight of the rails will be maintained as nearly as possible, after complying with paragraph No. 7, to that specified in contract. A variation of one-half (½) of one per cent. for an entire order will be allowed. Rails shall be accepted and paid for according to actual weights.

(9) The standard length of rails shall be 33 ft. Ten per cent. of the entire order will be accepted in shorter lengths, varying by even feet to 27 ft., and all No. 1 rails less than 33 ft. shall be painted green on the end. A variation of one-fourth of an inch in length from that specified will be allowed.

(10) Circular holes for splice bars shall be drilled in accordance with the specifications of the purchaser. The holes shall accurately conform to the drawings and dimensions furnished in every respect, and must be free from burrs.

(11) Rails shall be straight in line and surface when finished—the straightening being done while cold—smooth on head, sawed square at ends, variation to be not more than $\frac{1}{32}$ in., and, prior to shipment shall have the burr occasioned by the saw cutting removed and the ends made clean. No. 1 rails shall be free from injurious defects and flaws of all kinds.

(12) Care must be taken in hot-straightening the rails, and it must result in their being left in such a condition that they shall not vary throughout their entire length of 33 ft. more than 3 in. from a straight line in any direction, when delivered to the cold straightening presses. Those which vary beyond that amount, or have short kinks, shall be classed as second quality rails and be so stamped. The distance between supports of rails in the gagging press shall not be less than 42 in.

(15) No. 2 rails will be accepted up to five (5) per cent. of the whole order. Rails that possess any injurious defects, or which for any other cause are not suitable for first quality, or No. 1 rails, shall be considered as No. 2 rails; provided, however, that rails which contain any physical defects which impair their strength shall be rejected. The ends of all No. 2 rails shall be painted white in order to distinguish them. Rails rejected under the drop test will not be accepted as No. 2 rails.

A. S. T. M.

3. One drop test shall be made on a piece of rail not less than four feet and not more than six feet long, selected from each blow of steel. The test shall be taken from the top of the ingot. The rail shall be placed head upward on the supports, and the various sections shall be subjected to the following impact tests under a free falling weight:

Weight of rail pounds per yard	Height of drop feet
45 to and including 55	15
More than 55 to and including 65	16
More than 65 to and including 75	17
More than 75 to and including 85	18
More than 85 to and including 100	19

If any rail breaks when subjected to the drop test, two additional tests taken from the top of the ingot, will be made of other rails from the same blow of steel, and if either of these latter tests fails, all the rails of the blow which they represent will be rejected, but if both of these additional test pieces meet the requirements, all the rails of the blow which they represent will be accepted.

5. The drop testing machine shall have a top of 2,000 pounds weight, the striking face of which shall have a radius of not more than five inches, and the test rail shall be placed head upwards on solid supports three feet apart. The anvil block shall weigh at least 20,000 pounds, and the supports shall be part of, or firmly secured to, the anvil. The report of the drop test shall state the atmospheric temperature at the time the test was made.

7. Unless otherwise specified, the section of rail shall be the American standard, recommended by the American Society of Civil Engineers, and shall conform, as accurately as possible, to the templet furnished by the railroad company, consistent with Paragraph No. 8, relative to specified weight. A variation in height of 1-64 of an inch less, or 1-32 of an inch greater than the specified height, and 1-16 in. in width will be permitted.

8. The weight of the rails will be maintained as nearly as possible, after complying with Paragraph No. 7, to that specified in contract. A variation of one-half of 1 per cent. for an entire order will be allowed. Rails shall be accepted and paid for according to actual weights.

9. The standard length of rails shall be 30 ft. Ten per cent. of the entire order will be accepted in shorter lengths, varying by even feet to 24 ft., and all No. 1 rails less than 30 ft. shall be painted green on the end. A variation of one-fourth of an inch in length from that specified will be allowed.

10. Circular holes for splice bars shall be drilled in accordance with the specifications of the purchaser. The holes shall accurately conform to the drawing and dimensions furnished in every respect, and must be free from burrs.

11. Care must be taken in hot-straightening the rails, and it must result in their being left in such a condition that they shall not vary throughout their entire length more than 5 in. from a straight line in any direction when delivered to the cold-straightening presses. Those which vary beyond that amount, or have short kinks, shall be classed as second quality rails and be so stamped. The distance between supports of rails in the gagging press shall be not less than 42 in. Rails shall be straight in line and surface when finished—the straightening being done while cold—smooth on head, sawed square at ends, variations to be not more than $\frac{1}{32}$ in., and, prior to shipment, shall have the burr occasioned by the saw cutting removed, and the ends made clean. No. 1 rails shall be free from injurious defects and flaws of all kinds.

14. No. 2 rails will be accepted up to 10 per cent. of the whole order. Rails which possess any injurious defects, or which for any other cause are not suitable for first quality, or No. 1 rails, shall be considered as No. 2 rails; provided, however, that rails which contain any physical defects which impair their strength shall be rejected. The ends of all No. 2 rails shall be painted white in order to distinguish them.

A. S. C. E.

"*Branding.*—The name of the maker, the weight of the rail, and the month and year of manufacture, shall be rolled in raised letters on the side of the web; and the number of the blow shall be plainly stamped on each rail where it will not subsequently be covered by the splice bars.

"*Inspection.* The inspector representing the purchaser shall have free entry to the works of the manufacturer at all times when the contract is being filled, and shall have all reasonable facilities afforded him by the manufacturer to satisfy him that the finished material is furnished in accordance with the terms of these specifications. All tests and inspection shall be made at the place of manufacture prior to shipment.

"The manufacturer shall furnish the inspector, daily, with carbon determinations for each blow and a complete chemical analysis every 24 hours, representing the average of the other elements contained in the steel, for each day and night turn. These analyses shall be made on drillings taken from small test ingots. On the request of the inspector, the manufacturer shall furnish drillings for check analyses.

"*For Basic Open-Hearth Rails.*—The specifications for rails made by the Basic Open-Hearth process shall be the same as for Bessemer rails, excepting that a full chemical determination shall be furnished for each heat and two drop-tests from each. Their chemical composition shall be:

	Per cent.		
	70 to 79 lbs.	80 to 89 lbs.	90 to 100 lbs.
Carbon	0.53 to 0.63	0.58 to 0.68	0.65 to 0.75
Phosphorus*	0.05	0.05	0.05
Silicon*	0.20	0.20	0.20
Sulphur*	0.06	0.06	0.06
Manganese	0.75 to 1.00	0.80 to 1.05	0.80 to 1.05

*Shall not exceed.

M. of W.

(13) The name of the maker, the weight of rail and the month and year of manufacture shall be rolled in raised letters on the side of the web, and the number of blow shall be plainly stamped on each rail where it will not subsequently be covered by the splice bars.

(14.) The inspector representing the purchaser shall have free entry to the works of the manufacturer at all times when the contract is being filled and shall have all reasonable facilities afforded him by the manufacturer to satisfy him that the finished material is furnished in accordance with the terms of these specifications. All tests and inspection shall be made at the place of manufacture prior to shipment.

(6) The manufacturer shall furnish the inspector daily with carbon determinations for each blow, and a complete chemical analysis every 24 hours, representing the average of the other elements contained in the steel, for each day and night turn. These analyses shall be made on drillings taken from small test ingots.

"For Basic Open-Hearth Rails.—The specifications for rails made by the basic open-hearth process shall be the same as for Bessemer rails, excepting that their chemical composition shall be:

	Per cent.		
	70 to 79 lbs.	80 to 89 lbs.	90 to 100 lbs.
Carbon	0.63 to 0.73	0.68 to 0.78	0.75 to 0.85
Phosphorus*	0.03	0.03	0.03
Silicon	.075 to 0.20	.075 to 0.20	.075 to 0.20
Sulphur*	0.06	0.06	0.06
Manganese*	0.90	0.90	0.90

*Shall not exceed.

A. S. T. M.

12. The name of the maker, the weight of rail and the month and year of manufacture shall be rolled in raised letters on the side of the web, and the number of blow shall be plainly stamped on each rail where it will not subsequently be covered by the splice bars.

13. The inspector representing the purchaser shall have free entry to the works of the manufacturer at all times when the contract is being filled and shall have all reasonable facilities afforded him by the manufacturer to satisfy him that the finished material is furnished in accordance with the terms of these specifications. All tests and inspections shall be made at the place of manufacture prior to shipment.

6. The manufacturer shall furnish the inspector, daily, with carbon determinations for each blow, and a complete chemical analysis every 24 hours, representing the average of the other elements contained in the steel, for each day and night turn. These analyses shall be made on drillings taken from a small test ingot.

The more important points of difference between the above specifications will now be briefly considered:

Process of Manufacture.—The American Society of Civil Engineers and Maintenance of Way specifications provide for a discard of 25 per cent. from the end of the blooms formed from the top of the ingots, and it is added that "if, by the use of any improvements in the process of making ingots, the defect known as piping shall be prevented, the above shearing requirements may be modified," whereas the American Society for Testing Materials specifications leave the percentage of minimum discard blank with the provision that "the percentage of minimum discard in any case is to be subject to agreement, and it should be recognized that the higher this percentage the greater will be the cost."

It is frequently claimed by the manufacturers that a minimum discard of 25 per cent. is excessive, and that many of the failures of rails in service which are ascribed to piping are really due to other causes. Nevertheless, it can hardly be denied that piped steel is responsible for many cases of rail failure which might have been avoided by a more liberal discard. This important problem of piping would seem to be one deserving of the most careful investigation through the co-operation of all parties in interest with a view of determining by what means and to what extent it may be controlled. If, for example, it should appear that by the use of steel of certain chemical composition, cast at a lower temperature than is now customary, the piping can be reduced the specific percentage of minimum discard may then be modified accordingly. There can be no question that the safety of the rail should be the first consideration, irrespective of incidental increased cost, and that until the amount of piping can be more definitely controlled it is preferable that the discard be somewhat excessive rather than too low.

The claim that with large discard the accumulation of bloom ends cannot be advantageously utilized should not be regarded as valid so long as such heavy discards are really necessary to insure solid metal. Moreover, the bloom ends may frequently be used, at least in part, for rolling light rails, as has been done in the past at certain mills. Such materials under proper restrictions might also be utilized for heavy rails of second grade to be put in sidings.

In each of these specifications the importance of securing a sufficiently low finishing temperature in rolling is recognized, and it is aimed to secure the same by specifying the maximum allowable amount of shrinkage for rails of different weights. This provision is undoubtedly in the right direction, but the conditions are complicated by the fact that the present rail sections do not lend themselves readily to low finishing temperatures by reason of insufficient metal in the web and flange, as compared with the head. With the proposed increased thickness of metal in web and flange the requirements in this particular can be much more satisfactorily met.

In this connection attention may be called also to the trouble caused by too heavy reductions in the early passes in the blooming mill, tending to tear the metal. Such defects, although they may apparently disappear during subsequent rolling to the extent of escaping surface inspection, may become sources of weakness in service and direct causes of failure.

The tendency on the part of the mills to use an insufficient number of passes in rolling in the rail mill is also calculated to have a detrimental effect on the product, and it is believed that mill practice in this respect might be modified to good advantage.

The percentage of second quality rails to be accepted, which is fixed at 5 per cent. by the American Society of Civil Engineers and Maintenance of Way specifications and at 10 per cent. by the American Society for Testing Materials specifications, also influences the quality of the product indirectly to an important degree. The lower this percentage the greater becomes the incentive to the manufacturer to exercise care at every stage of manufacture to avoid the accumulation of rejected rails, which under a larger percentage would be accepted as second quality.

In each of these specifications the importance of allowing sufficient time for the ingots to properly solidify is provided for in a general way, but in practice it is difficult to insure strict compliance with this provision.

Referring to the above features collectively, it is believed that an earnest effort on the part of the mills to secure improved conditions of manufacture in the directions indicated, together with the adoption of a heavier and better balanced rail section, would obviate the present difficulties to a large extent.

Chemical Composition.—The American Society of Civil Engineers and Maintenance of Way specifications prescribe that the phosphorus shall not exceed 0.085, with a range in carbon of 0.55 to 0.65 for the heaviest sections, whereas the American Society for Testing Materials specifications fix the phosphorus limit at 0.10 and the carbon limits at 0.45 to 0.55. The maintenance of way specifications provide, however, that the carbon limits "may be reduced to suit local conditions."

It is generally admitted that a higher percentage of phosphorus tends to increase brittleness, especially with higher carbon content. The supply of low phosphorus ores is, however, said to be insufficient to permit of the general adoption of the 0.085 percentage of phosphorus. If the validity of this claim be admitted there is apparently no good reason for not rolling such rails to the extent

to which low phosphorus ores are available for use in situations in which quality is of first importance. It is likely that the conditions in this respect will also be improved by the use of rails made of open hearth steel.

While it is conceded that good rails have been made in the past with a phosphorus content not exceeding 0.10, this limit is believed to be too high for rails of the present weight and section under the conditions of manufacture usually prevalent and for the present heavy service conditions. If the section be suitably increased with the added metal distributed between the web and flange it is possible that with proper care at every stage of manufacture a percentage of phosphorus not exceeding 0.10 for Bessemer steel rails will be found admissible.

Drop Tests.—The American Society of Civil Engineers and Maintenance of Way specifications call for one drop test from each blow of steel with 22 ft. height of fall on 90 to 100 lb. rails, whereas the American Society for Testing Materials specifications require one drop test from every fifth blow and a 19-ft. fall on a 85 to 100 lb. rail. It is important to note that each specification requires the test piece to be taken from that portion of the rail representing the top of the ingot.

The provision in the American Society of Civil Engineers and Maintenance of Way specifications, by which one test is required from every heat of steel and higher drop tests are called for than in the American Society for Testing Materials specifications, seem reasonable and preferable, especially since the present average quality of rails has proven unsatisfactory, and it is therefore desirable that the requirements should be raised rather than lowered.

Length of Rail.—The American Society for Testing Materials specifications require a standard length of 30 ft., as against 33 ft. adopted in the other two specifications. The only justification for adherence to a 30-ft. length is believed to be the shortage in cars of suitable length for hauling the longer rails, but since this difficulty is rapidly disappearing it may doubtless be assumed that the 33-ft. length will soon be adopted as a general standard.

Straightening.—All of the specifications recognize the importance of having the rails as straight as possible when they come from the cooling beds and two of the specifications limit the distance apart between the supports of the rails in the gagging press to not less than 42 in. This is one of the most important clauses in the specifications, as serious injury may be done to the rail in gagging, and any improvement that can be made either in section of rail or in rolling to avoid this severe treatment would be an important gain. The omission of any reference to the distance between supports of rails in the gagging press in the American Society of Civil Engineers specifications is believed to be undesirable. On the other hand the restriction of the camber to 3 in. in these, as well as the maintenance of way specifications, is doubtless preferable to the 5-in. limit prescribed by the American Society for Testing Materials specifications, and it is believed that the lower limit does not impose undue hardship on the mills.

No. 2 Rails.—The bearing of the allowable percentage of second quality rails to be accepted on the question of manufacture has already been referred to above under "process of manufacture." Aside from this it is believed, however, that the provisions governing the classification of No. 2 rails in all of these specifications are too lenient, and that rails embodying certain of the defects stated should be rejected absolutely as unfit for use.

Basic Open Hearth Steel Rails.—The American Society for Testing Materials specifications contain no reference to basic open hearth rails. The American Society of Civil Engineers specifications prescribe a limit of 0.05 for phosphorus and a carbon range of 0.65 to 0.75 for 90-100-lb. rails, as against a limit of 0.03 for phosphorus and 0.75 to 0.85 for carbon in the Maintenance of Way specifications, the aim of the latter being doubtless to secure a rail of equal wearing properties and decreased brittleness. The latter specifications are believed to be preferable, and it is to be hoped that the small range of ten points in carbon can be met by the manufacturers of basic open hearth steel, since it is a well-established fact that the carbon content cannot be controlled in this process as readily as in the case of the high carbon steels manufactured by either the acid open hearth or Bessemer processes.

It will be noted that the maintenance of way specifications contain the same provisions for drop tests for basic open hearth steel as for Bessemer steel, whereas the American Society of Civil Engineers specifications call for two drop tests from each heat of open hearth steel and a full chemical determination for the same. Both of these provisions are believed to be desirable to insure uniformity of product in the case of open hearth steel.

In conclusion it may be said that in the use of the [illegible] process the desirability of a change of section, as well as the exercise of due precaution at every stage of manufacture [illegible] the important question of finishing temperature is just as great as in the case of the Bessemer process, although possibly experience will show that an increased weight of section will be necessary for open hearth rails. The *Railroad Gazette* will welcome discussion of this subject in its columns, not only from the committee [illegible] whom the subject has been entrusted, but also from railroad officers who may differ from any of the conclusions expressed above.

The *Electric Traction Weekly*, quoting what we said concerning the recent disastrous collision at Salem, Michigan, and particularly that "the only way to cure the faults in the despatching system is to abolish the system and use in its place the block system," says:

"This would be most encouraging if, unfortunately, roads equipped with block systems did not have as many collisions as roads where the block has not been installed. How can the uncertain human factor be eliminated from train movements? How, for instance, after the most perfect system that human genius can devise has been put in force, can you make sure that the operator will make his dots large enough between the station name and the schedule figures?"

The implication that collisions are as frequent under the block system as on roads not thus worked, must be based on data from trolley roads which use various electrical arrangements that are not block signals in the true sense of the term. Where has our contemporary found any statistics really comparable, to justify the statement made? The best way to "eliminate the uncertain human factor" is to adopt the electrical and mechanical safeguards of the true block system. With that, the question how to make sure of an operator's dots no longer troubles.

The action of the Master Car Builders' Association, in providing a virtual penalty for putting paper and cloth advertisements on freight cars, is now taking effect. The Pennsylvania Railroad has given instructions to agents to see that shippers do not violate the rule and, in any event, to see that cars do not go forward with advertisements posted on them. Other roads have taken similar action. If any one misses the mental stimulus of these varied advertisements, he still can gaze, any day, at any station, on some big, yellow refrigerator car, bearing on its side in vivid and artistic (?) lettering the advertisement of the firm owning the car.

The increase in the express business which has been so widespread in the territory east of the Missouri river during the past few years, leading to the establishment, both for through and way business, of separate trains for the carriage of parcels, appears to be confined to no particular section of the country. The Southern Pacific has decided to run one train each way daily throughout its principal lines for the accommodation of the express company's business, namely, from San Francisco to Ogden, Utah; to Portland, Ore., and to El Paso, Tex. Some of these trains will incidentally carry a limited number of local passengers, but their main business will be to carry the express company's traffic. The through passenger trains will of course by this relief be enabled to shorten their stops and thus more surely maintain their schedule time. The aggregate length of these three routes is 2,844 miles.

Central of Georgia.

The 1907 year of the Central of Georgia is especially interesting for two primary reasons; first, because the $5,000,000 capital stock of the company which has been held by the reorganization committee of the Richmond Terminal Company since 1896 was sold during the year to Oakleigh Thorne and Marsden J. Perry, and, second, because of the company's inability on the face of published earnings to pay the full dividend on the second series of income bonds or any dividend at all on the third series, and the contest instituted by a committee representing income bond holders, who maintained that the equity of the earnings of the Ocean Steamship Company of Savannah should be used to provide for the return on the income bonds of the railroad company.

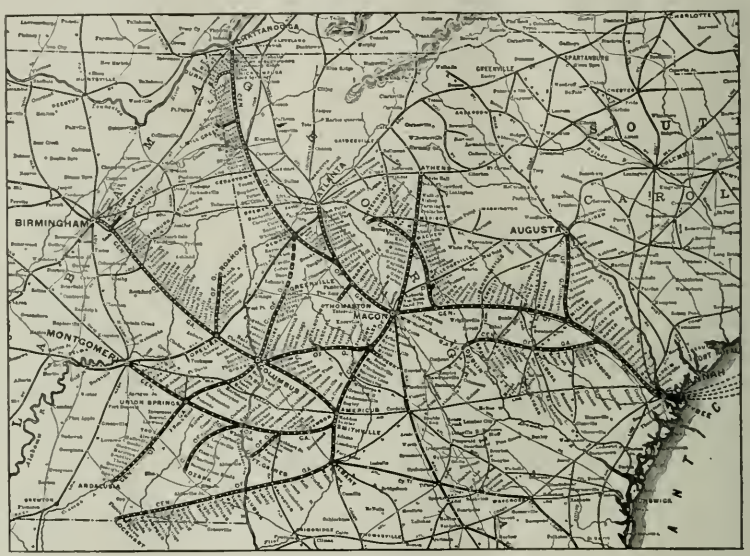
It will be recalled that in 1895 the company succeeded to the foreclosed property of the Central Railroad & Banking Company of Georgia. The capital stock of the company has remained unchanged at $5,000,000, which is at the rate of only about $3,348 a mile, and ownership of this stock has never been advertised, except that President Spencer, of the Southern Railway Company, stated in his testimony in 1899 that the Southern was entitled to the financial benefit of any sale of the stock, though it did not assume to control the railroad. The operation of the property may, therefore, be described as having been on a semi-independent basis, friendly to the Southern Railway.

Last June, Adrian H. Joline, Chairman of the Richmond Terminal reorganization committee, announced that the committee had sold to Mr. Thorne and Mr. Perry all the stock of the Central of Georgia, the net proceeds of which were to be paid to the Southern

Railway, while the new owners declared their purpose to operate and develop the system independently for the benefit of the shareholders, and announced that they would hold at least 60 per cent. of the stock for at least two years.

On August 14 a meeting took place in New York of the owners of the property and of representatives of the larger bond holders to formulate a plan for the retirement of the income bonds, the face value of which is $15,000,000, about one-fifth of which is held in Savannah, Ga., and perhaps one-third in New York. It is understood that the plan proposed was that the 5 per cent. income bonds should be exchanged for an equal amount of 4 per cent. bonds with interest as a part of the fixed charges, but there was a disagreement, as has been mentioned above, as to the payment of the interest on these bonds through the medium of a dividend which the Central of Georgia presumably could receive if it chose to do so from its subsidiary company, the Ocean Steamship Company of Savannah, which operates a fleet of 10 excellent steamships (including a new one not quite completed) between New York and Savannah and Boston and Savannah.

Details of the capitalization of the Ocean Steamship Company are not to be found in the railroad company's report, but the rail company guarantees $1,579,000 bonds for the water company and owns its entire capital stock of $2,000,000, of which $1,995,000 is pledged as security for the collateral trust bonds, and also owns the entire capital stock of the New England & Savannah Steamship Company, practically the entire issue of which is pledged as security for the consolidated mortgage bonds. These two companies may to all intents and purposes be considered as a single going concern, operated with the same ships and financed with the same capital. No dividends are paid on the marine stock, but the value of the 10 sea-going vessels could not be appraised at less than $3,000,000, and their earnings should certainly be large in view of the fact that they are continuously fed with traffic by a railroad company and perform an active and doubtless a profitable service, the six newer vessels being particularly well designed to carry a maximum amount of freight on a minimum coal consumption. The attitude taken by the railroad company is that the equity in the earning of the marine properties belongs not to the income bonds but to the stock of the company. It is not our province to pass judgment upon this contention, but merely to indicate the interesting and unusual facts, which furnish an exceedingly clear illustration of the principle of a subsidiary concern with concealed earnings, since it must be assumed that a considerable portion of the cost of the marine fleet has been paid for out of its own earnings, as was done in years past with such marked success and profit by the White Star Line of transatlantic steamships.



Central of Georgia.

Gross earnings of the railroad company in 1907 were $12,082,777, as compared with $11,396,123 in 1906; an increase of $686,655, but operating expenses and taxes increased $1,371,004 in the same period and charges increased $155,514, with the net result that the balance available for interest on the income bonds was $448,126, as against $1,250,671 in 1906. Out of this sum, $12,937 was credited direct to profit and loss; 5 per cent. interest was reserved for the $4,000,000 first preference income bonds; 3.729 per cent. was reserved for the second incomes, and $32.95 was carried forward. In 1905 and 1906 all three classes of income bonds received their full 5 per cent.; in 1904 the second preference received their first payment, 2 per cent.

The increase in operating costs was caused by increased costs of labor and materials, in addition to a condition both of local and of general congestion. Presumably on account of this congestion, the average train load of revenue freight decreased from 218 to 212 tons, although the average car loading increased from 13.52 to 14.60 tons. According to Mr. Hale's figures, the Georgia Central, for the first six months of the current fiscal year, made a good showing in percentage of cars in service, but a rather poor one in ton miles per car per day, as compared with the other railroads in its territory. The ton-mile earnings for the year also fell off from 1.655 to 1.569, and the passenger mile earnings from 2.455 to 2.419, and there is the unmistakable inference that, as the result of recent legislation in the southern states, these unit earnings are likely to show even a further decrease in the 1908 year. There is also a strong indication that taxes have been materially increased and are likely to figure still more largely next year, but they are lumped with general expenses, so the figures cannot be given.

In spite of this disadvantageous feature, the expenditures on maintenance account were consistently liberal, as they have been for several years past. The company has 40 more locomotives in service than it had a year ago, and spent an average of $2,460 for the maintenance of each of the 292 in use, including renewals, doubtless, but not the undistributed charge for superintendence, etc. The maintenance charge for cars in passenger service was on the basis of $914 per car, which is, of course, a very high average, and freight cars were charged at $102, which means that the amount spent for renewals under this head was greater than the amount spent for ordinary maintenance. Way and structures were charged at $824 per mile of main track operated, and at the rate of $727 per mile of single track, estimating, roughly, that two miles of spur tracks and sidings are equivalent in maintenance cost to one mile of main track. This is a good figure for the southern states, although much remains to be done, as indicated by the fact that the company had 531 miles of 56-lb. rail in service on June 30.

The following table of increased unit costs tells an important story, although it must be borne in mind that the congested conditions of traffic referred to above affected economical working unfavorably.

Cost Per Mile Run; Cents.

	1907.	1906.
Wages of engineers and firemen	7.042	6.326
Wages of roundhousemen	1.471	1.209
Repairs	6.206	4.452
Fuel	9.996	8.214
Water supply	.490	.472
Oil, tallow and waste	.228	.186
Other supplies	.093	.073
Total, per locomotive-mile	25.526	20.932

The traffic returns show an increase of 33.41 per cent. in manufactures and miscellaneous freight carried; of 24.83 per cent. in forest products; of 19.86 per cent. in product of mines, and of 20.19 per cent. in products of agriculture; an excellent showing. Bituminous coal and manufactured articles have shown particularly noteworthy gains in the last few years; the total freight tonnage has doubled since 1900, and the bituminous coal tonnage has increased in seven years from 251,508 tons to 854,303 tons.

The total impression gained from a careful reading of the report is that the company is in excellent shape as regards its traffic, and is making up deficiencies in physical condition from earnings as well as from new capital expenditures, as fast as can be done, but that, in common with every railroad in the south, it is genuinely suffering from high costs forced upon it from the inside and from low rates decreed by legislative bodies, at the very time that it is of the most urgent importance, from the standpoint of railroad and commonwealth alike, that rates should be increased, to strengthen the company's credit and make much needed improvement work possible.

The following are the principal statistics of the year's operation:

	1907.	1906.
Average mileage operated	1,899	1,878
Gross earnings	$12,082,777	$11,396,123
Maint. way and structures	1,579,010	1,845,793
Maint. of equipment	2,249,318	1,712,132
Conducting transportation	4,887,176	3,892,830
General expenses and taxes	890,712	784,457
Operating expenses and taxes	9,606,216	8,235,213
Net earnings	2,476,561	3,160,910
Other income	311,939	274,621
Total income	2,778,500	3,435,531
Interest and rentals	2,330,374	2,184,860
Balance	448,126	1,250,671

NEW PUBLICATIONS.

Hendricks' Commercial Register of the United States. For Buyers and Sellers. Sixteenth annual edition. Cloth. 1,224 pages. 7x10 in. Published by Samuel E. Hendricks Co., 74 Lafayette Street, New York. Price, $10, express charges prepaid.

Hendricks' Commercial Register is designed to be a complete and reliable index of the architectural, mechanical, engineering, contracting, electrical, railroad, iron, steel, mining, mill, quarrying, exporting and kindred industries. The present volume contains over 350,000 names and addresses of manufacturers and over 15,000 business classifications with full lists of the manufacturers and of the dealers in everything employed in the manufacture of material, machinery and apparatus used in these industries. The publication is well indexed by the class of goods manufactured with sub-classifications by states. Thus, for example, a list of makers of gas engines, sub-divided into 29 states, is given. Eight manufacturers are named for so highly specialized a product as a screw pitch gage. The book is well planned and has apparently been carried out in a thorough manner. It is an extremely useful publication.

CONTRIBUTIONS

Curve Mechanics and the Woodlawn Wreck.

Waltham, Mass., Aug. 29, 1907.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The communication on "Curve Mechanics and the Woodlawn Wreck," in your issue of August 23, suggests the following notes:

If the leading locomotive exerts a retarding force on the rest of the train, the direction of that force will be tangential and not in the direction I. G. (See figure on page 198.)

The reactions of the rails, through friction, are additional forces acting on the lever I F K, which have been ignored.

Under the worst conditions, with no brakes on any other vehicle of the train and with the driving wheels of the leading locomotive at the point of sliding, on a 3½ deg. curve, this retarding force will fall far inside the rear driver, its transverse component will be less than 1,000 lbs.; and, according to the transverse location of the resultant rail reaction, this 1,000 lbs. would be distributed among several or all of the wheels.

With brakes applied to all of the vehicles, the force acting between the locomotives is so small that it is uncertain whether it is one of tension or compression, depending on the percentage of braking power of the loaded vehicle and the coefficients of friction involved.

If such a force as that described by your correspondent had existed, it would have derailed the rear driver instead of the trailing wheel on such a curve as that at Woodlawn.

The difference between the forces required to guide the center of gravity of a body in a given path and those required to change the rotative velocity of the body about its center of gravity, has been lost sight of. The former is the centrifugal force, and the latter is the subject of Mr. Henderson's investigation.

All of the mechanical points in dispute in connection with the Woodlawn wreck have been of an elementary nature, and there is evident a need of much more attention to the subject of mathematical mechanics.

O. E.

Complimentary Tickets.

New York, Aug. 28, 1907.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In the *Wall Street Journal* I find the following:

It is difficult to persuade some people that there is a law against passes. Many still believe that they are entitled to free transportation, and some of these men are so important that railroad presidents find it impolitic to refuse their requests. One prominent railroad man [presumably a president] pays from $500 to $600 a month out of his own pocket to buy railroad tickets over his own road, to give to such applicants for passes as he feels unable to turn away.

This is as it should be. I assume that, of course, this $6,000 to $7,200 yearly expense is covered by the president's salary. (We ordinary officers, receiving from $3,000 to $6,000 yearly, are almost unanimous in the opinion that salaries of $35,000 to $60,000 can "cover" a contingent expense of $7,000 without damage to the social fabric.) If my assumption is correct, this president's policy puts the free-ride item on the same basis as "legal expenses" and other railroad expenditures which for years it has been deemed necessary to charge to some account where they will not be too conspicuous. In giving free passes and making no account of the mileage traveled on them, an injustice is done to the "conducting transportation" department. Unless the prohibition of gratuitous railroad service is going to be made to cover everything from 5-cent cigars to complimentary tickets allowing a non-passenger to walk up and down the train platform, the railroad company should have some place in which to charge complimentary rides; and the president's salary is just the place. If a railroad cannot give away anything whatever, why, it is time that President Roosevelt began paying fare for his wife and children on the "Mayflower."

But what if Professor Adams should decree that railroad presidents' salary vouchers be apportioned among the 258 different accounts into which he has classified railroad expenses?

A. M. P.

The Brick Arch.

Cuyahoga Falls, Ohio, Aug. 26, 1907.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Permit me to have space in your valued paper to direct thought to this subject. It was referred to recently in a technical paper in the words in quotation marks, which prompt my comments in the words thereafter following:

"It is of interest to note that in the recent convention of the Master Boiler Makers' Association, the remarks of the speakers indicated a general abandonment of the brick arch in locomotive practice, chiefly because of the unreliability of arch tubes as generally applied, together with some vague impression that its use was detrimental to the back firebox sheets, and possibly the side sheets. To one unacquainted with the process by which devices rise and fall and railroads, in general, those conditions might appear somewhat absurd. But to those familiar with the idiosyncrasies developed on railroads, the conclusions are not surprising. The factor of fuel economy is given so little regard in this country that a very little trouble with any device tending to such an end is sufficient to condemn it."

It may be admitted as true that the "factor of fuel economy is given so little regard" on railroads, that they take very little trouble." But the boilermakers, having had daily opportunities for close observation, were able to speak at their convention from their own experience, and that experience, which would be legal evidence in a court of justice, should not be lightly discredited. Without commenting on their reasons, I would suggest thought on two other reasons why the brick arch should be abandoned:

First.—Carbon dioxide is one of the products of combustion. It is the resultant of the perfect union (combustion) of carbon and oxygen. It is not combustible. It is 50 per cent. heavier than air. In its own heat it has energy aided by the draught to rise and pass out of the firebox to the smoke stack, but if it has not sufficient heat to energize it, or if there be not sufficient draught to draw it out of the furnace, or if its exit from the furnace be hindered by a brick arch, it spreads over the firebox as a diluent, and the temperature of the furnace is reduced by its failure to fully move out with the draught.

Second.—The gases which rise from the firebed gain nothing by contact with a brick arch. Their tendency is to lose heat in touching a solid.

JOHN LIVINGSTONE.

Reducing Black Smoke on Soft Coal Burning Engines.

The committee of the Traveling Engineers' Association, reporting on this subject, sent out to members a circular letter with questions, some of which were:

How do you prepare your coal before putting on tender?

How do you prepare your fire when starting train?

What grades of coal do you use?

Have you noticed any difference in the smoke with the different grades of coal.

Answers to the first question showed that only a few roads prepare their coal. Those that do get good results, the general method being to break the large pieces into lumps from 4 to 6 in. in diameter. One method which appears practical and inexpensive is to provide coal sheds with breakers made by placing ¾ in. x 3 in. iron bars set on edge about 5 in. apart. On these breakers the coal is dumped and must be broken into pieces less than 5 in. in diameter before it will fall through. The value of such practice should not be overlooked by railroad companies.

In answer to the next question, almost without exception the same plan is advocated for preparing the fire. It is built up gradually until a good level bed of coals is secured of sufficient thickness to hold without tearing under heavy exhaust, and thereafter the use of the single scoop system in replenishing the fire. When stops are made the fire should be in such prime condition that it will not be necessary to put on much green coal when starting train, and the engineer should use every effort to assist the fireman in holding his fire by pulling out carefully, and when the stop is to be a short one the fireman should endeavor to have his fire in such condition that no green coal need be added until the train has left the station. The blower should be used to pull just enough air through the fire to combine with gases, and grates and ash-pan should be kept clean and in good condition. The condition of grates has much to do with the suppression of black smoke.

The replies to the third question show that probably the great-

est stumbling block in the way of eliminating black smoke is the grade of coal used by the roads and the use of a great many different grades on a single system. The poorest grades of coal seem to be received by most of the roads, and as many as 17 or 18 different grades on a single road. Since this is the case, the problem of reducing black smoke is even more troublesome than it should be. A fireman who gets one grade of coal trip after trip so that he can get accustomed to using it to the best advantage, even if it is of the poorest quality, can get better results than the fireman of equal ability who gets a good grade of coal on one trip and a poor grade on the next.

Only one report indicated satisfactory coal conditions. In this instance 50 per cent. of bituminous and 50 per cent. of anthracite coal was used, and little trouble was experienced from smoke, as it could be regulated by increasing the percentage of anthracite at times when excessive smoke was objectionable.

The last question is supplementary to the one preceding and the replies further prove the disadvantage of having several grades of coal to contend with. Fine coal is found to produce more smoke than lump, as it ignites more rapidly and the smoke and gases formed have less chance of being burned off. This is also true of the lighter grades as compared with the heavier. Also, it is more difficult to prevent smoke with coking coal than with no coking, and still more difficult with slack coal.

On roads where several grades are in use there is no benefit derived from the use of the best grades except in that they produce steam more satisfactorily, and the better the grade of coal the more carbon it contains and the more smoke it will discharge. This is only true, of course, because the fireman does not get the good coal frequently enough to become accustomed to firing it properly. If the better grades were used exclusively and the firemen became acquainted with the right method of handling it, much less smoke would result and lighter firing would be possible.

In summarizing the report, the committee advocated the serious consideration of two things:

First, a campaign to bring about the standardizing of grades of coal furnished for locomotives. That, both in the line of economy and convenience, better grades of coal would be desirable is unquestionable, but if managements cannot be brought to realize the economy of good coal or if it is impossible to obtain it at all times, efforts should be made to insure the furnishing of one particular grade at all times in place of from half a dozen to twenty different varieties. No mechanic on earth could turn out satisfactory work if the style and pattern of his tools were changed daily, and it is just as impossible for the fireman to do himself justice or work for the best interests of his employers if a continual change is being made in the kind of fuel he must use.

Second, a realization of the fact that the present tendency toward still heavier power must necessitate a change in the old methods of handling a locomotive. Mechanical devices to assist the fireman in the duties that now overtax his strength must sooner or later be put in use, both in the interest of economy to the company and in fairness to the engineer. What devices will best accomplish the desired results is still a question, for the reason that the managements of railroads are backward in taking up anything that looks like an additional expense in maintaining power, while the mechanical departments dread the trouble and nuisance of experimenting with new devices. The enginemen themselves are probably as much to blame as any one for blocking changes that are bound to come at no distant date. New conditions to-day are making necessary new devices, and the really progressive railroad man will meet the conditions and do all that he can to discover which are the best means of making it possible for the fireman to fire his engine as it should be fired to prevent black smoke, to hold his steam and to waste as little coal as possible.

The report is signed by Jno. Lynch, chairman; W. H. Bradley, C. L. Brown, Martin Whelan and W. J. Toy.

Disastrous Collision Near Charleston, Ill.

In a butting collision between a passenger car, with a trailer, and an express car, on the Charleston & Mattoon Interurban Electric Railroad, near Charleston, Ill., on Friday last, 11 passengers were killed and 65 were injured. The collision occurred on a sharp curve, and the passengers had neither warning nor chance to escape. So high was the speed with which the cars approached each other that the crowded motor car and trailer were both completely wrecked. A misunderstanding of telephone orders is said to have caused the disaster. The line on which the collision occurred is but twelve miles long. Telephones are placed every few miles, by which orders are transmitted to conductors and motormen passing over the road. Who is to blame for the confusion of orders is not stated. This is said to be the third disastrous wreck on this line in the last two years, all caused by cars meeting on curves. As a result of the last one, John A. Backus, who was in charge of the despatching system, committed suicide.

Two Strike Documents.

During the present strike of commercial telegraphers, the wires have been kept open through the good services of loyal employees, junior officers of the company and volunteer telegraphers of experience. The men handling the keys at the central office in New York are well known to the strikers, who watch their movements closely. One of these men has handed us a copy of the following "Summons," which he believes was sent to every one at work last week.

SUMMONS

FROM THE REAL FRIENDS OF THE NON-STRIKERS:
READ IT CAREFULLY—PONDER IT WELL.

Do you realize that you have been charged in the Court of Human Nature with the highest form of crime known to mankind—Treason—a crime against humanity?

If you are pronounced guilty do you know what the penalty will be?

It is because the history of the world, in all days had among all races of people, barbarian and civilized, says with a unanimous voice of thunder:

> Ye who are ostracised, shunned and hated by every man, woman and child, your relatives, brother, sister, father and YOUR MOTHER. Ye, indeed, shall suffer the tortures of the severest punishment known this side of hell.

It is because we do not want TO PASS this terrible SENTENCE upon you WITHOUT A TRIAL that we hand you this notice.

You are hereby summoned to appear at Room 317 . 56 Pine St. on or before 12 o'clock noon Tuesday Aug 29. 1907 TO ANSWER THE CHARGE MADE AGAINST YOU. If you appear we shall listen with care and sympathetic consideration to your defense.

If you do not appear, you shall be adjudged guilty by default.

What is your answer?

God Almighty made Hell for Traitors. Pray to God to give you light and strength.

We know that seductive influences have been at work on your feelings; that you have been coaxed or bulldozed; that every form of lie within the scope of the imagination of a soulless corporation has been told you, but we can not believe that you have been bought with a box of candy or a cigar. Perhaps money, the curse of an imperfect civilization, has played its part with a few of you, but we are charitable, as to the majority, and honestly believe that the horrors of THE COMPANY'S BLACKLIST, pictured to you, no doubt, with corporation ingenuity and inhumanity, has had its effect.

Still frightful as the Company's Blacklist may be, it is as day to night when compared with THE BLACKLIST OF MANKIND—LIVING DAMNATION!!

Why not come and be one of us? ALL WILL BE FORGIVEN

With anxiety for your future welfare, we are

Yours,

THE COMMERCIAL TELEGRAPHERS' UNION OF AMERICA.

To this fervid appeal to avoid living damnation and to come and be forgiven, the following reply was made:

New York, N. Y., Aug. 29, 1907.

THE COMMERCIAL TELEGRAPHERS UNION OF AMERICA,
56 Pine Street, New York City.

Referring to the "summons" to appear in room 317, No. 56 Pine street, on or before 12 o'clock noon of a certain day to answer the charge of treason, etc.

Treason is a crime committed against a state or government, to whom the party accused owes allegiance. Do you have the supreme impudence to assert that we owe allegiance to you? Have we ever authorized *you* to act as sponsors, to dictate what we shall, or shall not do? Who gave you the authority to direct the affairs of your fellowmen?

The constitution of this land guarantees to all life, liberty and the pursuit of happiness, and we are controlled and regulated only by the laws made by the duly accredited representatives of the people. Your body does not represent government, nor order, and you have no authority to "hereby summon" any one, by any right whatsoever, unless it be by the red flag of anarchy, and by that treason of which you yourselves are guilty, in thus arrogating to yourselves the laws of God, and of your country, in a criminal attempt, by threats and high sounding phrases, to deprive a few men of the right to mind their own business. You say "God Almighty made Hell for traitors." This is correct, and while you are warning others to be careful of yourselves, for if ever a crude composition bore the imprint of his satanic majesty's press, your circular does.

"Treason"; just why you attempt to apply this word to those who are faithful to their trusts, while your small clique are the ones who have actually undertaken a rebellion, is a mystery, except that perhaps in your "lost cause," it is a last desperate attempt to intimidate those who are endeavoring to be loyal to their employers.

Then there is that other word which you use, "Deserter." The definition of which is "one who leaves his position, his party, or his friends, particularly a soldier or seaman, who quits service without permission and in viola-

tion of his agreement. This is exactly your position. You have forsaken your position and quit the service without permission and in violation of your obligations. If we operators now at work were in a similar position and had received a summons from the company to answer such a charge, we would without doubt appear before the proper officers with an appeal for forgiveness. Our position, however, is reversed. You are the so-called soldier or "scab." Is the case

You ask why not come and be one of us, to which we reply,—because yours is a *lost cause*, and you are unable to control or retain those who have previously united themselves with the union.

We ask why be so foolish as to prolong this controversy, depriving a few honest men from earning a living to support their families, who are made victims, when there are daily those being employed by the telegraph companies who are assigned to the good positions which you have deserted? In a word, who pays your salary when you are not working?

A LOYAL EMPLOYEE.

P. S.—I request that this letter be published in your publication entitled "Fair Play."

Wire Testing.

BY L. M. JONES,
Assistant Superintendent Telegraph, A. T. & S. F.

In the successful operation of a telegraph system, carrying, as most systems do, a volume of business almost equal to the capacity of the facilities under favorable conditions, it is of the utmost importance that all the wires available be kept in use as nearly all of the time as possible.

To do this, some one must be made responsible for all delays in locating and removing trouble, which can best be done by the division of the territory into wire testing districts.

The proper location of the wire testing offices is very important, as there are usually many things to be taken into consideration. Almost invariably there exists on every wire testing district a necessity for repeaters or quadruplex apparatus, and in order to have these located under the direct supervision of the wire chiefs, the office is located where the repeaters and multiplex apparatus are required.

In order to secure the best results, the hours of duty should not be such as to overtax the physical ability of the wire chief. The 24 hours may best be divided into three tricks of eight hours each, corresponding with those worked by train despatchers. The first trick, 8 a.m. to 4 p.m., can be taken care of by the manager of the office, with the dual title of wire chief and manager; the second trick, 4 p.m. to midnight, and the third trick from midnight to 8 a.m.

The wire chief and his assistants, to be successful, must, in addition to having had experience in wire testing, be fully posted in the handling of multiplex apparatus.

One thing very essential to the successful wire chief is patience. Few operators at way offices understand thoroughly their switchboards and circuits even when regular, consequently when asked to make a patch, they lack confidence in their own ability, and should the wire chief lose patience, the result will probably be a wrong connection, and the loss of much valuable time. Each wire testing office should be supplied with, in addition to a spring jack switchboard and spare sets at the board for testing purposes, a milammeter and voltmeter of suitable scale ranges.

In the location and clearing of trouble, the methods in use are much the same everywhere; however, I will enumerate separately those which are usually followed, and from which satisfactory results are obtained.

FOR A GROUND.

The margin or pull of the relay magnet will give you a good idea as to whether the wire is grounded near you; then proceed by having offices open the wire until the ground is located between two offices.

FOR AN OPEN CIRCUIT.

If the circuit is a comparatively long one, and paralleled by other working circuits, place your voltmeter in the circuit for a moment. If near you, the needle will remain almost stationary; if very unsteady, the open place is probably some distance from you. Or place the open wire on a battery of preferably more than 100 cells, then cut in a test set and let the relay spring down low, opening and closing your key. If the break is comparatively close, a very short dot will follow the opening and closing of the key; if further away, the dot will become perceptibly plainer, increasing with the distance from the test office to the open. A large number of relays in the circuit, however, will detract from the sensitiveness of this latter test. This will save time in tracing for the location. Have different offices ground the wire until located in an office, or between two offices. If the wire is broken between offices, one end will usually touch the ground and remain grounded, while the other will remain open. This, if known, will give you a good idea as to the location outside of an office. However, the usual office tests should be made.

FOR A CROSS.

When two or more wires are crossed, have the proper terminal open all wires affected except the most important, were affected. Then locate by having different offices open one or more of the wires which are cut. When located between offices, have the usual office tests made to be sure it is outside.

FOR AN ESCAPE.

An escape may be either an escape to a ground, or to another wire. An escape to a ground is located in the same manner as a ground. An escape to a cross is located the same as a cross. If only slight, it may only be felt with a voltmeter and resemble closely poor insulation.

OFFICE TESTS.

In testing for trouble in an office, first have the wire cut out at the bottom of the board, removing the instrument plugs. This will clear the wire if trouble is not in the board. If this does not clear it, have the wires removed from the top of the board and the ends twisted together. This will clear if in an office. The same test at the other of the two offices between which the trouble was located will definitely locate it outside of an office.

To clear a switchboard of a burned lightning arrester, remove the grounded wire temporarily until the plate can be removed and filed or scraped, and insulated with mica. If an office has hinge or gate cutouts instead of a switchboard, the wire should first be cut out, then if the trouble does not disappear, the removal of the ground wire from the cutout will have the same effect as taking the wires out of the top of the switchboard. A plug cutout or one-wire board should be handled in the same manner as a switchboard.

Wire chiefs often complain of failure of operators to follow instructions, especially when requested to remove wires from the top of switchboards and cutouts. This is sometimes due to the fact that linemen have used pliers to tighten nuts, and the operator not having a pair, is unable to take the wires out, and rather than tell the wire chief he cannot do so, makes a bluff by waiting a sufficient length of time and probably saying, "Now," leading the wire chief to believe the wires have been removed.

In order that a lineman may not be given a wrong location, for example, the day chief locates trouble on his district, which, the lineman being at some distant point, and train service such as to make it impossible to reach the trouble before dark, instead of notifying him at once, transfers the trouble to the second trick chief; he re-tests and transfers to the third trick chief, who re-tests and notifies the lineman. In this way, no time is lost in clearing the trouble, and the lineman is not disturbed in case the wire comes clear in the meantime. If an interruption is reported to a lineman by the first or second trick chief, and he fails to clear the trouble before dark, he reports this to the wire chief on duty. The wire should then be re-tested and the lineman advised if still in, or of any new developments.

All wires should be tested by the third trick chief before daylight. Linemen understand if no trouble is reported to them none exists, leaving them free to carry out any projected work on hand.

The train wire is of first importance, and must be made good, if need be at the expense of everything else. The through quadruplex wires are of next importance. After locating and patching trouble out of a circuit, the patched circuit should not be again disturbed until it is known that the trouble has been removed. However, the section where trouble exists must be watched closely and tested frequently without waiting for the lineman to call for a test. In testing, the through circuit should be left intact, and the section where the trouble existed tested by using a local circuit.

When cleared and circuits are regular again, if a quad wire, the offices having the quad sets should be notified at once in order that a new balance may be taken, if necessary. The taking out of 50 or 75 miles of iron wire from a copper circuit often working on a very narrow margin may so affect the balance as to make the wire almost unworkable.

In order that there may be no delay in clearing wire trouble, it is necessary for the wire chief to at all times know the exact location of the division line repairer. Early each morning, say 7 a.m., each line repairer should file a work report giving movements for the day, stating explicitly just where he will be and on what trains he will move, if away from headquarters, advising the wire chief immediately of any change in his plans.

In case of unusual conditions prevailing, wire chiefs should be authorized to direct the movement of construction or repair gangs, as communication with the superintendent's office may be entirely cut off by wire trouble at any time. In case of a sleet storm or any unusual interruption affecting all wires, so as to cut off communication with the general office, each wire chief should immediately advise his superintendent fully of the conditions on his own district, and continue to do so at intervals until communication is again restored, using Western Union or Postal wires, if working. If all commercial wires are down the telephone toll lines should be used if available.

I have noticed a tendency on the part of some wire chiefs to

discourage operators calling for a balance, which often results in operators working for some time on a wire almost unworkable, which could be remedied by a balance, and its capacity often doubled.

The third trick chief should, in addition to testing all wires early in the morning, carefully inspect his repeaters and quadruplex apparatus, especially the points of his pole changers and transmitters, and balance his quadruplex sets, for the reason that during the early hours of the morning possibly only one or two corners have been in service, and the wires are too busy to be taken out of service for this purpose after the arrival of the first trick chief. While the use of files for cleaning points is very necessary at times, it should be borne in mind that a clean smooth point is by far more desirable than a clean rough one, or one with sharp edges or corners.

Once a week all wires should be measured for insulation and current strength of different circuits measured. Quad batteries should also be measured, compensating resistances of quadruplex sets adjusted, and a full report mailed to the superintendent of telegraph. For insulation tests a battery of approximately 100 cells should be used, all wires to be removed from this battery while being used for this purpose. The wires should be removed for the reason that otherwise the current strength will vary, being governed by the demands upon the battery, due to the opening and closing of the other wires.

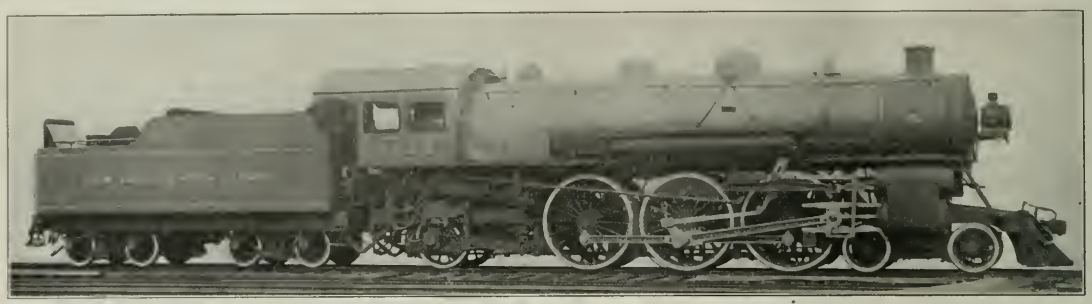
In making insulation tests we use a battery of 100 cells if available, or a current of 90 volts potential, inserting a voltmeter in the different circuits, having the distant terminal open the wire, noting and recording its deflections. If the needle shows an escape, intermediate offices are called in until the point of escape is located as nearly as possible. The lineman is then advised and instructed to report when covered. Upon receiving his report the wire is again tested and the lineman advised of the result.

The current readings are taken by inserting a milammeter in the different circuits while conditions are as nearly normal as possible. In this way we secure a report showing the actual amount of current being furnished for the operation of each wire.

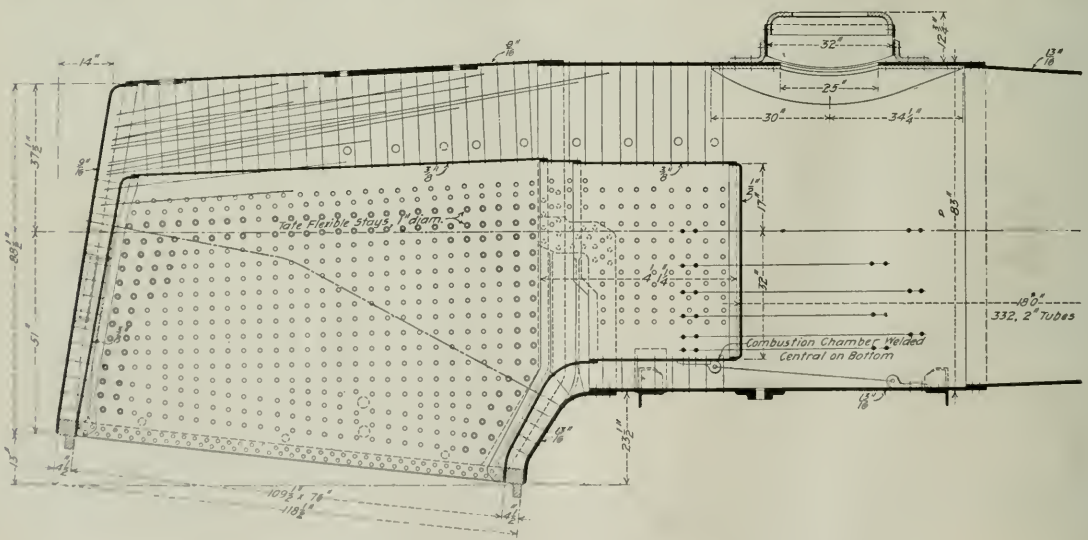
Pacific Locomotive for the Lake Shore & Michigan Southern.

In 1901 the first prairie locomotive on the Lake Shore & Michigan Southern was put in service. Since that time it has been the favorite type for heavy passenger work. Recently an order was given to the American Locomotive Company for 25 Pacific engines, one of which is illustrated here. The engine is interesting as marking the introduction of a new type on the Lake Shore and also because some of the new engines have the combustion chamber in the firebox, a feature that is being tested in a number of places. Also, these engines are the heaviest passenger engines the builders have ever made, excepting those of the same type built for the Pennsylvania.

As compared with the heavy prairie engines already alluded to, these new locomotives have about the same weight on the driving wheels and carry the same boiler pressure, but, with cylinders ½ in. larger in diameter, they have a greater tractive power. As three of the order are to be fitted with combustion chambers and as there will be but little difference in the equated firebox heating surface, this order will afford an excellent opportunity for checking the action of the boiler with and without the combustion chamber.



Pacific Locomotive with Combustion Chamber; Lake Shore & Michigan Southern.



Firebox of Boiler for Pacific Locomotive; Lake Shore & Michigan Southern.

The following table gives the ratios and some of the principal dimensions of the Pacific engines with and without the combustion chamber and the prairie engines that have been used up to the present:

	Prairie.	Pacific— Without combust'n chamber.	Pacific— With combust'n chamber.
Total weight, lbs	214,700	261,500	261,500
Weight on drivers, lbs	170,000	170,700	167,000
Tractive eff rt, lbs.	27,850	29,200	29,200
Cylinders, diameter, In.	21½	22	22
Piston stroke, In.	28	28	28
Drivers, diameter, In.	79	79	79
Total heating surface, sq. ft	3,905	4,195.0	3,409.3
Tube, heating surface, sq. ft	.....	3,960.6	3,112.5
Firebox heating surface, sq. ft.	.....	206.2	268.4
Arch tube heating surface, sq. ft	.....	28.4	28.4
Grate area, sq. ft	55	56.3	56.3

Weight on drivers / Tractive effort	5.1	5.83	5.72
Weight on drivers / Total weight	69.17	65.01	65.91
Total weight / Tractive effort	8.9	9.63	9.04
Tractive effort x diameter drivers / Heating surface	561.0	559.0	67[illegible]
Heating surface / Grate area	71.0	74.5	66.5
Firebox heating surface / Total heating surface		4.91	7.87
Weight on drivers / Total heating surface	43.6	40.6	48.9
Total weight / Total heating surface	62.7	62.4	76.7
Volume of two cylinders, cu. ft. / Total heating surface	11.76	12.61	12.61
Volume two cylinders / Grate area	308.0	340.0	276.0
Volume two cylinders / Firebox heating surface	4.68	4.46	4.16
Tube heating surface	6.17	4.92	8.62
Tube heating surface equated to firebox heating surface (Vaughan formula)		888.3	734.1
Total equated firebox heating surface	1,061.0	1,091.0	1,002.3
Ratio equated to actual heating surface	1—3.68	1—3.81	1—3.41
Tractive effort x diameter drivers / Equated heating surface	2,070.0	2,114.0	2,302.0
Total weight / Equated heating surface	230.0	239.0	260.6

It will be noticed from this table that in the Pacific engine without the combustion chamber 340 sq. ft. of heating surface has been provided for each cu. ft. of cylinder volume. This is a trifle more than was allowed in the prairie engine and considerably more than in the Pacific having a combustion chamber. But if we compare them on the basis of equated heating surface, the figures become: 98.72 sq. ft. for the prairie, 86.52 sq. ft. for the Pacific without the combustion chamber, and 79.48 sq. ft. for the one with the combustion chamber. This means that experience with the combustion chamber has shown that the boiler is slightly more efficient with it than without it, as indicated by the Vaughan formula, a variation that might well be due to an increased efficiency of combustion due to the larger volume of the firebox, as has been pointed out previously.

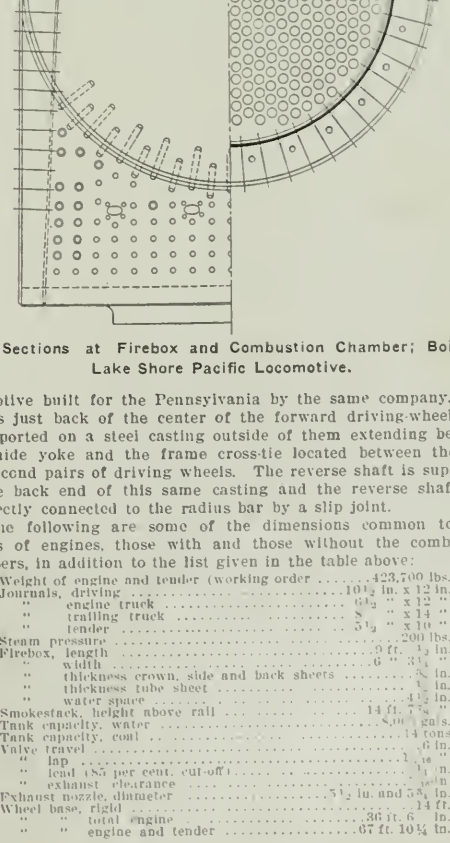
The difference in boiler ratios between the prairie and Pacific engines without the combustion chamber is insignificant, as in designing the latter, especial attention was given to provide the same satisfactory proportions that had obtained in the older engine. The boilers with the combustion chamber are radial stayed with conical connection, the outside diameter of the first or smallest course being 72 in. Those without the combustion chamber have 379 tubes, 2 in. in diameter and 20 ft. long. The boiler with the combustion chamber, shown in the accompanying illustration, is exactly like those of the other engines of the order, excepting the introduction of the combustion chamber and a reduction in the number and length of the tubes. The tube sheet has been moved ahead so that the tubes are 18 ft. long, or only 2 ft. shorter than in the engines without the combustion chamber, although the combustion chamber is 4 ft. long. The number of tubes has been reduced to 332. These changes reduce the tube heating surface 848 sq. ft., or 21.4 per cent., while the firebox heating surface is increased 62 sq. ft., or 33.4 per cent. Results from the use of the combustion chamber on the Northern Pacific have shown that the increase in firebox heating surface fully offsets the decrease in tube heating surface and the evaporative efficiency of the boiler is in no way decreased. The relative steaming qualities of the two boilers here described are best shown by a comparison of the figures for equated heating surface in the above tables. These figures are obtained from H. H. Vaughan's formula which equates the total firebox heating surface to the tube heating surface divided by the square root of the length of the tubes in feet. By such a comparison, it will be seen that although the total actual heating surface has been reduced 786 sq. ft., or 18.7 per cent., the total equated heating surface has been reduced only 89 sq. ft., or 8.1 per cent., which would indicate that the engine with combustion chamber will steam fully as well as those not so equipped.

As will be noticed in the illustration, the combustion chamber is stayed to the shell of the boiler by radial stays on the crown and sides and expansion stays on the upper section. A number of 1¼ in. rod braces between the chamber and the shell of the boiler serve to further stiffen it. The water space between the chamber and the shell of the boiler is about 5½ in. at the bottom and 7 in. where the chamber is nearest the sides, which gives ample room for good circulation.

There are two rows of flexible staybolts at the ends and top with crosters in the upper corners. The use of the bolts at the top and ends and in clusters at the corners is standard practice, but as to whether there shall be one, two or three rows seems to be a matter of personal judgment with no agreement of individual opinions. The bolts are put in where experience has shown that most stays break, and these places, of course, are those where the distance between the inner and outer sheets varies most. It would appear that the better combustion resulting from the use of the chamber would raise the temperature at the front end of the firebox and thus expand the sheets more than in a similar boiler without the combustion chamber, so that more flexible bolts should be used.

The application of the combustion chamber to these engines, as well as to two of a duplicate order of 20 for the same road, and to the six decapods recently built for the Buffalo, Rochester & Pittsburg, shows the increasing popularity of this feature as a means of reducing boiler trouble.

Another interesting feature of the design is the arrangement of the Walschaert valve gear. This is similar to that on the Pacific



Half Sections at Firebox and Combustion Chamber; Boiler of Lake Shore Pacific Locomotive.

locomotive built for the Pennsylvania by the same company. The link is just back of the center of the forward driving-wheels and is supported on a steel casting outside of them extending between the guide yoke and the frame cross-tie located between the first and second pairs of driving wheels. The reverse shaft is supported on the back end of this same casting and the reverse shaft arm is directly connected to the radius bar by a slip joint.

The following are some of the dimensions common to both classes of engines, those with and those without the combustion chambers, in addition to the list given in the table above:

Weight of engine and tender (working order)	423,700 lbs.
Journals, driving	10½ in. x 12 in.
" engine truck	6½ " x 12 "
" trailing truck	8 " x 14 "
" tender	5½ " x 10 "
Steam pressure	200 lbs.
Firebox, length	9 ft. 1½ in.
" width	6 " 3½ "
" thickness crown, side and back sheets	⅜ in.
" thickness tube sheet	½ in.
" water space	4½ in.
Smokestack, height above rail	14 ft. 7⅝ "
Tank capacity, water	8,000 gals.
Tank capacity, coal	14 tons
Valve travel	6 in.
" lap	1 1/16 "
" lead (85 per cent. cut-off)	1/4 in.
" exhaust clearance	1 3/16 in.
Exhaust nozzle, diameter	5½ in. and 5⅝ in.
Wheel base, rigid	14 ft.
" " total engine	36 ft. 6 in.
" " engine and tender	67 ft. 10¼ in.

The Risks of the Trade.*

If a farmer sends two of his hired workmen to the woods to chop timber and one of them carelessly lets slip his hold on the ax, sinking the blade into his fellow workman's leg, it would strike the average intelligence of mankind as unjust to hold the farmer liable or accountable in damages to the injured man. It is not easy to distinguish such a case in principle from the case of a man engaged in driving rivets in a boiler shop, who carelessly lets slip his hold on the handle of the hammer and strikes out his fellow workman's eye; or from the case of a switchman working for a railroad company, who in a moment of carelessness leaves the switch open and derails an on-coming engine, injuring the engineer. Yet many of the states have enacted statutes making the employer of labor on railroads or in factories or in mines, absolutely liable to an employee injured by the personal carelessness or negligence of his own fellow workmen.

In June of last year the Congress of the United States passed a law applicable to railroads engaged in interstate commerce, more drastic in its provisions than any legislation heretofore enacted by any of the states—providing upon this particular subject, in effect, that the fact than an employee was injured or killed solely by the negligence of his own fellow workmen should constitute no defense to the railroad company. This was followed up by the President of the United States in his last annual message to Congress, in which we find, among other things, the following forcible expression:

"Among the excellent laws which the Congress passed at the last session was an employer's liability law. It was a marked step in advance to get the recognition of employers' liability on the statute books, but the law did not go far enough. . . . Compensation for accidents or deaths due in any line of industry to the actual conditions under which that industry is carried on should be paid by that portion of the community for the benefit of which the industry is carried on—that is, by those who profit by the industry. . . . It is therefore clear to my mind that the law should place this entire 'risk of a trade' upon the employer."

Before this Federal statute, so heartily approved by the President was six months old, and within 30 days from the delivery of the President's message, the law was declared by two Circuit courts of the United States to be unconstitutional. The high commendation the law had received at the hands of the President did not in any degree tend to cure its obvious and glaring illegalities, nor affect to any appreciable extent the opinion of the bench and bar upon the subject.

In the state of Pennsylvania no employee injured by the personal negligence of another employee can claim any right to compensation for his injury, from their common employer; no matter what the rank of the negligent employee may be, whether superior or inferior of the injured servant, except only, such employees as are injured by the negligence of heads of departments. A number of other states adhere to this principle with more or less consistency. The theory which has governed legislation and actuated the courts of Pennsylvania on this particular branch of the law of negligence is this: that it is better for the working man, to enforce such laws as will have a tendency to prevent accidents and casualties and the consequent maiming and death of employees, than to afford to an injured employee compensation after he has been hurt; that an ounce of prevention is worth a pound of cure.

Proceeding on this general theory, it is consistently held in Pennsylvania that when an employee knows that if he is injured by the negligent act of a fellow servant he must look alone to that fellow servant for redress, when he knows that if his own negligent act injures a fellow servant, the injured man must look alone to him for redress; thereby a powerful and effective incentive to vigilance, forethought, attention and care on his own part is ever present, constraining him to the utmost precaution for his own safety and imperatively moving him, by vigilance, to detect repeated acts of forgetfulness on the part of his fellow servants likely to injure him or others, and to promptly report them. It is the theory and the practice of the Pennsylvania law that this tends in the first instance to preserve the lives and limbs of the working men. So far indeed has the legislature and the courts of Pennsylvania carried this principle, that since 1868 there has stood upon the statute books of Pennsylvania a law which provides: "That if any man who is employed by a third person to work about the railroads, depots, cars or premises of a railroad company, shall be injured by a railroad employee, that his rights to recover against the company are only such as they would be if he were employed by the company," and of course the effect of that statute is to make the many thousands of men who are employed in mills, furnaces, yards and elsewhere about the tracks and cars of railroad companies, fellow servants of trainmen, and for their negligence injuring any of these there can be no recovery. The argument is that inasmuch as these men are subjected to precisely the same risks as railroad men, working shoulder to shoulder with them, loading cars, unloading cars, or working upon cars, that the same motive of vigilance, care and attention will have the same salutary and preventive effect, if their rights against the employer are thus limited. This statute has been viciously assailed by text writers and more than once denounced by courts of foreign jurisdiction.

An interesting case involving this statute was not long ago decided by the United States Supreme Court. A postal clerk employed by the Government, while working on a mail train running between Cleveland and Pittsburg was injured by the derailment of his train which ran into an open switch, carelessly left open by a railroad switchman. He brought suit against the railroad company in Ohio for heavy damages, and it came within the scope of my employment to defend the case for the railroad company. As the accident happened in the state of Pennsylvania, the railroad company pleaded that the law of Pennsylvania governed his rights; that he was employed by a third person, that is, the United States Government, to work upon a car of the railroad company; that under the statute of 1868, to which I have already alluded, his rights were such only as they would have been if he had been employed by the railroad company, and that such being the case, he was a fellow servant of the switchman who left the switch open, and for the negligence of that switchman the railroad company was not liable under the laws of Pennsylvania. The plaintiff in reply admitted all this, but averred that the statute of 1868 was contrary to the Constitution of the United States, in several respects; that it was an attempt of the state to regulate interstate commerce; that it deprived the plaintiff of equal protection of the law; and that it deprived him of property without due process of the law. The case was tried through all the courts of Ohio, and through the Supreme Court of that state—every court holding that this statute was not unconstitutional, but was valid, and denied a recovery against the company. The plaintiff then proceeded, doubtlessly aided in his litigation by the postal clerks' union, to the Supreme Court of the United States, where the case was argued in Washington last November. In December the case was decided, the court holding that the statute was in accordance with the Constitution of the United States, and in accordance with the amendments thereof, and was in no wise violative of any of the provisions of the Constitution, and that the plaintiff could not recover.

Turning now to the state of Ohio, we find the fellow servant law still existing, but much diluted by judicial refinement and legislative amendment. There the question of liability turns upon the rank of the negligent servant. If an employee having any authority whatever to direct another servant, inadvertently injures him, the company is liable; or if one servant who has control over another carelessly injures a servant over whom he has no control, but which servant has no control over anybody else, the railroad company is liable. The result is, to take a familiar illustration: If a train be moving through Ohio toward the Pennsylvania line and a conducter through some act of inadvertence or carelessness, no matter what, injures one of his brakemen, the company is absolutely liable in damages to the injured employee; but if before the accident happens the train has moved, even ten feet, across the line into Pennsylvania, and the employee is injured in the same way, there is no liability whatever upon the part of the company.

All over the United States the same contrariety of judicial decisions, and the same conflict of statutory laws prevails. Of course it goes almost without saying that if injury or sudden death overtakes a workman by reason of some negligence on the part of his employer to repair broken machinery, or cars or appliances, or to make the place of work reasonably safe for that purpose, the employer is absolutely liable, and justly so; or if the employee fails to observe the precautions and safeguards prescribed by Congress or by the state legislatures, such as the using of automatic couplers, or automatic air brakes, certain required hand holds upon its cars, guards or fenders over exposed cog wheels meshing into each other, or railings or shields about revolving wheels or cranks, or saws, in all these instances, injury or death arising from their absence creates liability. Yet all this is subject to one very material condition. If the employee knows that a machine is defective, or broken, or out of order, or that the safeguard has been omitted, and continues to work with it, or about it, without obtaining promise to repair the defect, and is injured by it, he is conclusively held to assume the risk of that danger and cannot recover.

Referring again to the suggestions of the President of the United States contained in his last message, we find the following recommendation: "If the entire 'trade risk' is placed on the employer, he will promptly and properly add it to the legitimate costs of production, and assess it proportionately upon the consumers of his commodities." Thus the employer of labor in the United States would be an insurer of the safety and the lives of his employees. The employer would make compensation for injury or death, whether the accident resulted solely from the negligence of the unfortunate person, or from the negligence of another workman, or from the master's negligence. This proposition is not so startling as at first blush it appears. If the President had gone further

*From a paper read before the Railway Club of Pittsburg, by James I. Wilson.

and suggested a fixed scale of indemnity reasonable in amount, and graduated according to the extent of the injury, or in case of death, determinable by the decedent's earning capacity, so that the employer thus made an insurer might know the exact extent of his liability, so that he might in all instances insure against it and tax the amount of premium he pays to the trade, he would then, in effect, have recommended the adoption in this country of that policy and practice which has for many years been adopted and enforced in many of the countries of continental Europe. In Belgium, Norway and Sweden, Switzerland, France and Germany, and of late in Great Britain, legislation is constantly tending to a universal liability of employers for injury or death to the employes, in any of the industrial arts, regardless of the manner of the accident, or whether it resulted from the negligence of the injured party, or his fellow servant, or his employer. In all of those countries, however, the amount to be paid in each specific instance, whether of injury or death, is graduated and determined by a fixed and unalterable scale, being in general a certain percentage of the previous earning capacity of the unfortunate employee, varying according to the extent of the disability, whether temporary or permanent, or in case of death, by the previous earning capacity of the deceased, and the amount of compensation exacted by law of the employer is so reasonable and moderate that, as a matter of general experience, the aggregate amount paid by the employers of labor, under the continental system, is absolutely less than the amount paid by the employers of labor in America, who pay upon the theory that only those who are deserving of compensation shall be paid.

In Norway and Sweden the government insures all workmen against accident or death. The premium is paid by the employer, but the expense of administering the insurance department is defrayed by the state. The amounts paid are based upon a percentage of the last yearly wages earned by the injured or deceased person. These benefits are paid so long as the disability, either partial or total, continues. The percentage varies in proportion to the severity of the injury. In case of death the widow gets 60 per cent. of the last annual wages for life, and each child under fifteen gets 15 per cent. until it reaches that age. The employer is not permitted to deduct the premium he pays from the employees wages, but he has, doubtless, long since anticipated the advice of President Roosevelt, added it to the cost of his product, and taxed it to the trade.

In Switzerland, while the government has not gone into the insurance business, it compels an employer of labor to take out accident insurance for his workmen, and the premium may not be deducted from their wages.

In Germany the government requires that all those manufacturers engaged in a certain line of production shall stand the entire risk of the injuries or death to employees engaged in any of the plants where those lines of manufacture is carried on. This risk must be insured against, and the insurer graduates the premium in proportion to the relative risks in the different plants. Thus all workmen are insured. For all total permanent disability two-thirds of the last annual earnings are paid for life, and proportionately less for partial temporary or partial permanent disability. In case of death 60 per cent. of the annual wages go to the widow for life, and 20 per cent. to the children during minority.

In France there is a fixed scale of price to be paid, but insurance against those risks is optional with the employer. The Government enjoins: First, the payment of all medical and funeral expenses. Second, commencing with the fifth day after the accident for temporary incapacity, one-half wages during the time of his disability. Third, for a total permanent disability, two-thirds of the annual wages for life, and proportionately less for partial, permanent or temporary disability. In case of death two-thirds of the annual wages go to the widow, and 15 per cent. to minor children during minority. Against the risks the employer in France protects himself, either by ordinary indemnifying insurance, or by mutual protective insurance associations organized among the employers, or by insurance in the Government National Accident Insurance Bank. The premiums may not be deducted from the wages, but are undoubtedly added to the price of the article, and most cases collected from American tourists, who in turn, become smugglers with more or less success.

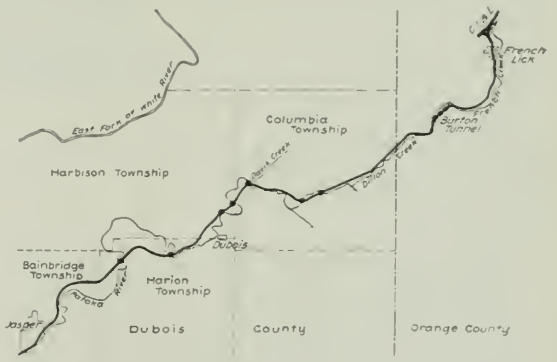
In Great Britain, since 1897, payment [illegible] railroads, factories, mines, quarries or engineering works [illegible] case of death, not more than the last three years' annual earnings shall be paid to the widow or dependent family, and in no event shall an amount be paid exceeding three hundred pounds and proportionately less if the family be not dependent. In case of permanent partial disability, from 50 per cent. of the annual earnings down, but in no case to exceed one pound per week.

For obvious and sound reasons the application of such a system to the industrial conditions of the United States would be attended by extreme difficulty, if indeed its adoption be at all possible or desirable. In the first place, the Federal government is admittedly without authority to enact or enforce laws of that character. As we have seen, the employer's liability act of the last Congress, even though limited in its operation to railroad companies engaged in interstate commerce, met with disaster in the first United States Court which tested the authority of Congress to enact it.

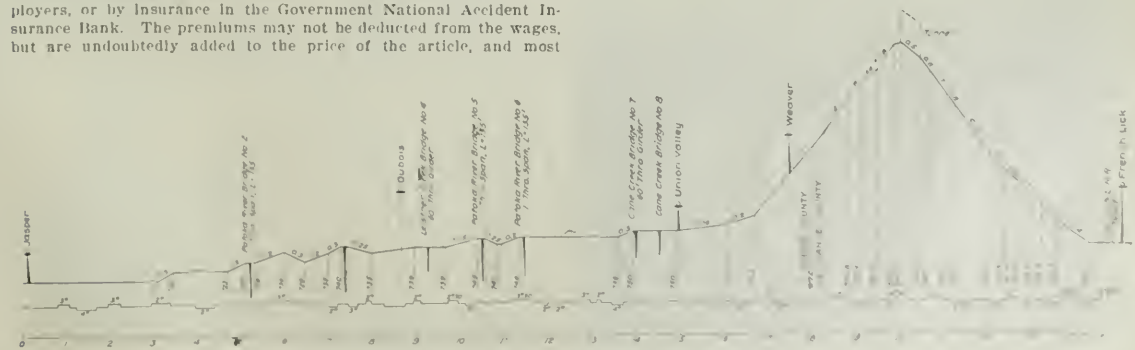
The individual states alone may legislate the subject within their own territorial limits. We have already noted the vast difference, the utter contrariety of existing laws upon this subject in the various states of this Union, the diverse theories and principles which obtain in different localities. What reasonable ground for expectation have we that all the states would ever agree to fasten a general liability upon all employers of labor? A system which to some of them may appear beneficent, to others is most repugnant. If by a wild flight of fancy we can imagine that all the states would agree to such a law, who so rash as to venture to suggest the adoption by all of a uniform, limited, reasonable and moderate scale of payments and indemnities in case of injury or death, such as the nations of Europe administer with humane results, for their people? What state legislature so deaf to the unthinking clamor of the multitude, so blind to its own political fortune, as to stand against extortionate demands for high and ruinous rates of compensation?

The Southern's New Line from Jasper, Ind., to French Lick.

The St. Louis-Louisville lines of the Southern Railway have a short branch running south from Huntingburg, Ind., to the Boonville coal field, with spurs to three different points on the Ohio river, one of which is Evansville. There is also a seven-mile spur north from Huntingburg to Jasper. Practically all of the coal now produced by this field is taken north by the Southern for delivery



Map of Jasper-French Lick Line.



Condensed Profile of the Jasper-French Lick Line.

by its main line either at Louisville or St. Louis. To reach the Chicago market it must either go north over the Chicago, Indianapolis & Louisville (Monon) from New Albany, Ind. (opposite Louisville), or over the Evansville & Terre Haute and Chicago & Eastern Illinois from Princeton, Ind., the junction point with the Southern. It has thus been unable to compete in the Chicago market with coal fields having a direct outlet and as a result has been largely shut out from the most desirable and profitable market of the Central West. The establishment of a direct line of transportation to Chicago would mean not only the development of this particular field, with the resulting augmented tonnage to be hauled, but also it would doubtless mean stimulated output and increased tonnage from all southern Indiana coal districts served by the Southern not now directly connected with the Chicago market.

The spur north from Huntingburg to Jasper has been mentioned. The Monon has a branch line 18 miles long running from Orleans, on its main line between Chicago and Louisville, southwesterly to French Lick Springs, a watering place of some prominence and distant from Jasper only 19 miles by air line. A connecting line between these two points would therefore supply the necessary link in the desired direct route. But the intervening country is quite rugged, making the construction difficult and costly. The traffic possibilities, however, appeared to justify the expenditure and work was begun on such a line by the Southern in the fall of 1905.

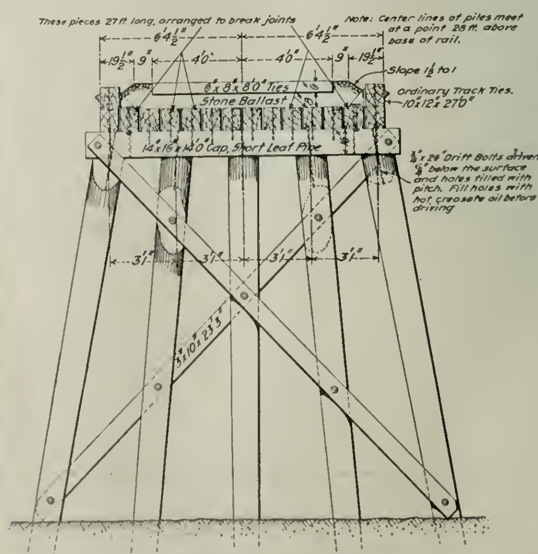
The length of the new line is 24.8 miles. As indicated by the accompanying map, from Jasper it takes the general direction of the Patoka river, which it crosses four times, to Dillon creek, which it follows closely to French Lick. The maximum gradient is 0.8 per cent., compensated, and the maximum curve 6 deg.; there is only one of these, however, also one of 5 deg., and a few of 4½ and 4 degs. The curves are mostly 3 deg. and under. As the profile shows, the highest point on the line is at mile-post 20, which is 157.5 ft. higher than Jasper. There is a tunnel at this point 2,200 ft. long, and the maximum gradient of 0.8 per cent. occurs only at the approaches to this tunnel. The controlling gradient elsewhere is only 0.4 per cent., and this will be the rating gradient of the line, the intention being to double the trains over the heavier summit grades and through the tunnel. For this purpose, passing tracks are provided at suitable points on each side of the tunnel.

The line was to have been ready for traffic by April 1 last, but unusually heavy and continued rains caused repeated slides in the larger cuts and fills that delayed the work six months at least. The most prominent example of the difficulties which have attended the work, due to the extremely wet weather, is at "big cut," 8.5 miles from Jasper. The original estimate was for 50,000 yds. of material, rated 80 per cent. rock. The rock, however, proved to be stratified throughout with soapstone, and the ground being surcharged with water, slide after slide has occurred until the total amount of material which will finally be removed will be at least four times the original estimate. This cut proved to be the critical point in the work, as tracklaying had, of course, to be done from the Jasper end of the line, and although most of the grading had been finished, the condition of the big cut prevented getting materials through to lay track beyond. A photograph of this cut is reproduced herewith. However, it fails to give an adequate idea of the character and extent of the real conditions.

Method of Timber Framing Heading in Burton Tunnel.

The tunnel is, of course, the most important single feature of the line. It is called Burton tunnel and, as already mentioned, is 2,200 ft. long. The four miles of line from French Lick to the tunnel were built prior to beginning work on same to enable machinery, supplies, etc., to be carried to it. The material pierced by

Big Cut, Where the Most Serious Sliding Occurred.



Ballasted Deck Trestle.

Jasper-French Lick Line of the Southern; Looking East from Station 40.

the tunnel is shale, principally. The method used in driving the tunnel was that of taking out side and top drifts around a central core, which was afterward removed with a shovel. Sections of the tunnel are reproduced in the drawings. It is a single-track bore, the size of the opening through the natural material being 20 ft. wide by 26 ft. 3 in. high, and the clearance dimensions being 16 ft.

Combination Roadway and Waterway Arch.

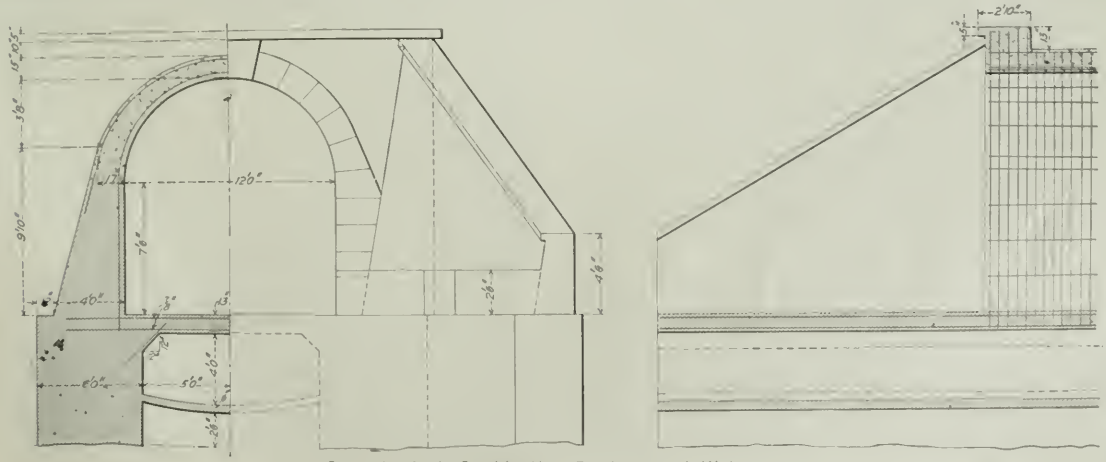
and 21 ft. 6 in. respectively. The excavation of the material was closely followed by timber lining, as shown by the illustration. Inside the timber lining a reinforced concrete lining is now being placed, which includes a concrete bottom of unusual section. This bottom has parapets, 12 in. high, 6 in. wide at the top and 10 in. at the bottom, on each side of the rock ballast, and all drainage is cared for by the gutters between these parapets and the side walls. Weep holes of 3-in. vitrified tiling are provided every 20 ft. on each side. The side walls and arch of the concrete lining are reinforced with ¾-in. Johnson corrugated bars placed as shown, the vertical bars extending horizontally into the bottom concrete 2 ft. 6 in. The quantity of material per lineal foot of lining is 4.132 cu. yds.

The approach to the south end of the tunnel is on a 4½ deg. curve. Also at this point there is a small creek which comes down

Rear View of Abutment; Potaka River Crossing.

the hillside from the west and crosses the right-of-way. Some thought was given to the best method to take care of this creek, and fluming it over the track was considered. But the objections to the presence of the overhead structure, and the cost of maintaining same, caused the idea to be given up in favor of conducting the water beneath the track and into a ditch along the east side of the tunnel approach cut. There are seven creek or river crossings on the line, four of which is Dubois, about 8¾ miles from Jasper. The profile shows of these are 135-ft. riveted through truss spans, and one 150-ft. The three creek crossings are 60-ft. through girder spans. The substructures for these crossings are reinforced concrete on pile foundations, and the superstructures are standard Southern designs for Cooper's E-50 loading. There are also a number of 20-ft. and 12-ft. reinforced concrete arches. These latter include a design of combined roadway and waterway, the drawings of which are included in the illustrations. In the particular design shown, a waterway 10 ft. wide and 4 ft. high at the center of the invert is provided immediately below the roadway, the 13-in. reinforced floor of the latter forming the roof to the waterway. The roadway entrances to the arch are protected on the waterway side by parapets 30 in. high and 26 in. thick. All of the concrete used on the work is a 1:3:5 mixture, and the reinforcing is Johnson corrugated bars. All trestles on the line have ballasted decks, the design being shown herewith.

At French Lick a yard of 350 cars capacity, with the necessary



Concrete Arch Combination Roadway and Waterway.

terminal facilities, is being built, for joint use with the Monon. Also a new joint passenger station will be built. During the season there is a considerable passenger traffic to French Lick, hitherto reached only by way of the Monon branch already referred to and therefore most inconvenient of access from the west and southwest. This new line of the Southern makes this resort directly accessible from those regions.

There is at present only one town on the line between termini, which is Dubois, about 8¾ miles from Jasper. The profile shows two other stations: Union Valley at mile post 15, and Weaver, between mile posts 17 and 18. There are only small settlements at these points as yet. The line is to be rock-ballasted and when thoroughly settled will be laid with 80 or 85-lb. rails. The first rails are 60-lb. relaying. Treated ties are being used throughout, the timbers being red and black oak, beech, elm and gum, preserved with zinc chloride. All bridge timbers are creosoted.

The seven-mile line from Huntingburg to Jasper is being revised and rebuilt to correspond with the new line. The grade is being raised above the high-water level of December, 1906, the highest recorded since 1840. The grades are being reduced to 0.5 per cent. controlling, and the alinement changed at one point to reduce a 5 deg. curve to 3½ deg. A 135-ft. crossing of the Patoka river, built 25 years ago and therefore suited only for very light loads, is being replaced by one of the riveted through-truss E-50 designs used on the new line. Also a new frame station of neat design has been built at Jasper.

The average cost of the new line was about $40,000 a mile. The contract for the entire work from Jasper to French Lick was let to McArthur Brothers, Chicago, the working being done under the supervision of Edward Gray, Engineer Maintenance of Way of the St. Louis-Louisville lines. The concrete work was done by Bates & Rogers and G. H. Scribner, both of Chicago, one-half to each, except the tunnel lining, which is being done by the Cullen-Friestedt Company, Chicago. All of the concrete and bridge work was designed in Mr. Gray's office, and the steel work for the bridges was furnished by the Louisville Bridge & Iron Company.

The Strenuous Life of the Freight Agent.

The recent doubling of the rate to be paid for interchange freight cars, increasing the need of moving all foreign cars with the least possible delay, has led Mr E. E. Betts, Car Service Agent of the Chicago & North-Western, to re-issue the per diem rules; and in connection with switching service and reclaims he says:

Switching service is the movement of a car to be loaded or unloaded, or the movement of a car between railroads, at a charge for the service rendered within designated switching limits, the road performing the service not participating in the freight rate.

It will be observed, therefore, that this campany pays 50 cents to the car owners for each day a per diem car is on our rails, whether in switching or road service. It is incumbent on this office to keep an absolutely correct record of all cars on our line in order that we may pay car owners what is due them, and *no more*. To do this we must have correct and legible interchange reports from agents at junction points. If one figure of a car number, or the initial, is wrong, it means sending out a correction to the agent to get it right, and this makes much additional work on our part and on the part of the agent. Bear in mind, please, that we have 40,000 individual car records daily, and if only 1 per cent. are wrongly reported it means 400 correction sheets and 400 replies. It takes much longer to correct than to report right in the first place. Then, again, we are likely to pay out money unnecessarily when cars are incorrectly reported, and it doesn't require many 50 cents to amount to considerable money, so let me urge on agents to see that their interchange reports are correct.

Where per diem cars are switched for connections, we pay the per diem to car owner and are entitled to reclaim from the line for whom switching is done an agreed number of days—in Chicago five, but usually in country three to four days. As day of receipt is not counted, it really gives us some additional time, depending on the hour of the day the car is received. If we handle the car in less than agreed time, we are ahead; if we take more than the agreed number of days, we lose, therefore promptness in placing, releasing and returning cars is profitable. To get the best results requires continual watchfulness. Agents should keep a pad constantly before them of all cars received for switching, showing date, and fill in the date of return. Keep this on the regular reclaim form, then you will know all the time how many cars you have in your possession. Bear in mind this fact: We are entitled to a reclaim on every per diem car we switch (system excepted), no matter what disposition is made of it after unloaded. If you are getting cars from connections faster than they can be placed account disability of consignee, your remedy is collection of demurrage. We cannot hold the bag for switching revenue must be net revenue. The reclaim must equalize the per diem at least, to effect this result.

A car day ends at midnight. There is a difference of 50 cents to our company between a delivery of a car effected at 11.59 p.m. and 12.01 a.m. All cars made empty each day, or cars loaded for connecting lines, must be switched out in preference and delivered before midnight, and where no night switch engine is worked, you must see that the day engine does this work at the latest hour possible, so as to get all available cars. If no engines are employed, have the way-freight engine to do it. If cars are set on transfer track after 6 p.m. and no receipt can be obtained, arrange with connecting line agent for a bill box, and cars are delivered when set on this track and billing deposited in designated place. Do not take empties unless order has been placed with you by the industry, and when you do take them, see that they are placed at once, and collect demurrage after expiration of free time. If you do not place the cars promptly, either loaded or empty, you are holding the bag instead of the other fellow. All we want is what is right, but cars are made to transport freight, not to stand idle, either to be loaded or unloaded, and the more promptly we handle the shipper's loads and unloads, the more cars there will be for those wanting them. If shippers could be made to realize this and act accordingly, it would increase the car supply in this country 15 per cent.

General Manager Smith to Be Tried for Manslaughter.

Justice Giegerich, of the Supreme Court of New York, has decided that Alfred H. Smith, general manager of the New York Central & Hudson River, must stand trial on his indictment for manslaughter in connection with the derailment of an electric train near Williamsbridge on February 16. Mr. Smith, through his attorneys, DeLancey Nicoll and John D. Lindsay, entered a demurrer, which was disallowed by Justice Giegerich, who says in his opinion:

On the day named the defendant was vice-president and general manager of the corporation, and as such officer he had charge and control over the maintenance of tracks, roadbeds, the curves and the operation of all trains over the line, and of the engineers running the engines.

And it was then and there the duty of the said Alfred H. Smith, as such officer and general manager, thus in charge of and control over the operation of the said trains and the employment and instruction of the said locomotive engineers, to ascertain and know at what speed it was safe for the said trains to pass along the said line of railroad and around the said curve, and to use and exercise and cause to be used and exercised all proper, reasonable and effective measures and all means within his power to prevent said train from passing along the line of railroad and around the curve at a speed faster than was safe for the train to pass, and to place the train under the government and control of a locomotive engineer properly trained and experienced and competent to run the train with safety along the line of railroad and around the said curve; but defendant, knowing the facts and his duty, as aforesaid, wholly omitted to ascertain at what speed it was safe for the train to pass around the curve, and placed the train under the control of a locomotive engineer not properly trained and not experienced and not competent to run the train with safety around said curve. It is further alleged that by reason of the culpable negligence of the defendant the train was run at a dangerous speed, and left the rails and was wrecked, thereby causing the death of one Clara L. Hudson, a passenger.

I am asked to take judicial notice of the obligations imposed upon the defendnt as general manager of the great railroad system of which he was in charge, and of the fact that by reason of their magnitude, the defendant could not have been charged with the personal performance of the duties the indictment alleges were imposed upon him. It is said that the court should not entertain the idea that it is ever one's personal duty to do that which is impossible for him to do personally. It is enough on this point to say that no such case is presented. It was not only possible for the defendant personally to cause proper measures to be taken for ascertaining what was a safe rate of speed around the curve in question and for providing proper regulations against running trains in excess of such speed, and for procuring trained and competent engineers, but it is manifest that in any properly conducted system of railroad administration such personal duty must have rested upon some one. Duties of supervision and management are just as much personal as are the manual duties of the least skilled employee of the road. If this particular duty, which the indictment avers was the defendant's, in fact belonged to some other officer of co-ordinate rank, or had been entrusted by the defendant to some carefully chosen and competent subordinate, so as to relieve him from further personal responsibility, these are facts that can be shown at the trial; but for the present purposes the allegations of the indictment must be taken as veritles, and those allegations are that it was a part of the defendant's employment to perform the acts of supervision and management specified, which he in part failed to perform and in other respects improperly performed. That the death described in the indictment was a direct and immediate consequence of such acts and omissions is also sufficiently alleged

Washing Out and Filling Boilers with Hot Water.

The essential feature of an economical system for heating water to be used in washing and filling boilers, embodies the principle of utilizing the heat contained in the water discharged for raising the temperature of the water to be used for washing and filling. Utilization of exhaust steam from various sources provides a means of maintaining the temperature of the water when locomotive boilers are not being blown off. A system operated according to this principle requires a battery of heaters located at some convenient point in or near the roundhouse, where the heat contained in the water and steam blown off may be utilized in heating the water used for washing and filling. The heaters are connected by suitable permanent mains and adjustable connections with the locomotive boiler blow-off cocks in order that all water and steam blown off will be delivered to the heater. The heat so utilized is supplemented by delivering waste steam from the exhaust of stationary engines and air compressors. The economical feature of this system is that heat which would otherwise be wasted is utilized to good advantage and the water for washing and filling is heated at an extremely low cost. Where it is necessary to obtain live steam from a boiler to operate the heaters, the economical feature of the system is destroyed.

To wash a maximum number of boilers two pipe lines are necessary between the heaters and the blow-off connections at the boiler. One pipe is for blowing to the cistern and the other is for delivering hot water to the boiler during the process of cooling after the steam has been blown off. Such an arrangement establishes a pressure in the boiler and discharges the water more rapidly than it would escape by gravity alone, because of the frictional resistance of the pipes. It is considered undesirable to blow water and steam from the boiler at the same time and allow scale and mud to stand on the hot metal without being covered by water. For this reason water should not be let out of the boiler until the temperature of the metal is the same as the temperature of the water that will be used for washing.

Heating systems may be so arranged that the heat of the steam released when the boiler is blown off may be used to heat the water for both filling and washing, or the boiler may be washed out with the water originally drawn from the boiler and the filling water alone heated by the steam blown off. Where the shop power house is equipped with condensing engines, the hot water from the condensers may be led to a pool or cistern and delivered to the roundhouse for washing boilers. Another method of providing hot water for washing is to deliver all water blown out of the boilers to a receptacle where it is allowed to settle, the same water being used many times. Arrangements are necessarily made to dispose of the scale and sludge that settle in the bottom of the receptacle.

A suggested method is to pipe the roundhouse with water and steam connectors at each pit and provide a portable injector to be carried from one engine to another.

When cold water is used for washing and filling boilers about seven or eight hours are usually consumed to blow off, wash out, fill up and raise steam to 100 lbs. pressure. To perform the work in less time is apt to cause detrimental results to the boiler. Where hot water is used for washing out and filling, a boiler can be blown off from 150 lbs. pressure in 20 minutes. It may be washed almost immediately with hot water and by filling with water at a temperature of 212 deg. F., a pressure of 100 lbs. may be raised in 30 minutes from the time the fire is started. The actual time consumed at the point from which these figures are quoted is usually about three hours for blowing off, washing out, filling up and raising steam. Boilers have been washed out at this point in less than two hours and there are other instances on record of equally short time. It is believed, however, that two hours will hardly represent general or regular practice.

While opinions vary as to the time actually saved by washing and filling boilers with hot water, it is generally considered that an engine will be ready for service in at least one-half of the time usually required when washing and filling with cold water.

The actual cash saving to be obtained by utilizing the heat in the water blown off depends upon a number of variable factors and can hardly be determined with any degree of accuracy; inasmuch as the same figures would not apply to all cases. Several authorities consider that a saving of 50 per cent. is effected; another advises 33 per cent.; a representative of one road says, side-sheets 75 per cent., flues and stay-bolts 50 per cent.; another believes that an average of $1 per boiler is saved.

The actual economy obtained depends, among other things, upon the size of the boiler, the amount of heat in the steam blown off, the initial temperature of the water to be used for washing, the size of grate, as well as the heating value and the price of the fuel used. The results of some experiments showed that locomotives with a grate surface of 54 sq. ft. could be fired up with about 1,200 lbs. of coal when the boiler was filled with hot water, and a good fire was left on the grate. To fire the same engine when the boiler was filled with cold water required from 2,200 to 2,400 lbs. of coal.

With a locomotive having 72 sq. ft. of grate area [illegible] coal were required to fire up when the boiler was filled with hot water, the greater amount of coal used as compared to the case of 54 sq. ft., being due to the difference in size of grates. When the boilers were filled with cold water there was very little difference in the amount of coal used on the two grates.

At a certain locomotive terminal where 95 boilers are washed per month the cost of labor and fuel for each boiler washed is as follows:

Seven hours' labor, one man, at 18 cents per hour	$1.26
1,500 lbs. coal for building fire, at $2 per ton	1.50
200 lbs. coal for pumping about 6,000 gals. water to cool boiler	.20
Total	$2.96

With a system of hot water washing investigated by those in charge of this terminal three hours per boiler washed was considered a conservative estimate. The corresponding cost per boiler washed with the hot water system would be:

Three hours' labor, one man, at 18 cts. per hour	$0.54
1000 lbs. coal for building fire, at $2 per ton	.90
Total	$1.44

According to these figures, the saving in labor and fuel for each boiler washing would be $1.52. Washing 95 boilers per month would represent a saving of $144.40 per month, or $1,732.80 per year. Estimating the cost of installing the necessary equipment for a hot water system to be $9,000, the figures quoted would represent an interest of 19 per cent. on the original investment.

A further economy represented by the hot water system is in the shorter terminal detention. The earning capacity of a locomotive is realized when it is on the road and not when it is in the roundhouse undergoing repairs.

The figures quoted show that an engine may be ready for service in four hours' less time when washed with hot water than when cold water is depended upon. Assuming the average engine mileage to be 10 m.p.h., the time saved would represent 40 engine miles, and at, say, 960 tons per train, the four hours' additional service of each engine would represent 38,400 ton miles. The 95 engines washed per month would then enable the road to obtain 3,648,000 more ton miles per month from engines cared for at the terminal under consideration. In busy seasons this additional ton mileage would represent considerable economy.

The number of boilers which should be washed per day to justify installing a hot water washing system would depend on the peculiar local governing conditions and the interest that would be represented by the investment. On the other hand the elaborateness of the plant might well vary with the amount of work to be done. For instance, if but very little boiler washing is done at a roundhouse, the use of a portable injector would seem practical, for it is more than likely that there is a boiler in the roundhouse for operating the washout pump, even if there are but five or six stalls in the house.

The results obtained by the hot water system of washing and filling boilers indicate that not only is much time saved in turning engines at terminals, but repairs to boiler in engine house and back shop are reduced by this method of caring for boilers. In bad water districts, the use of treated water in connection with the hot water system of washing and filling, results very successfully in lengthening the life of tubes and fire-boxes.

A representative from a Western road advises that before the installation of a hot water system in 1903, tubes were removed from freight engines every 10,000 miles and from passenger engines after 15,000 miles' service. Since this system has been in operation the mileage of the tubes has been doubled. A representative of a road that has had a hot water system in operation 15 months advises that engine failures due to leaking tubes and side-sheets have decreased 50 per cent. and that repairs for boiler work have decreased 22 per cent. Another representative says that before three hot water plants were put in operation on a division, the heavy power in freight service made 30,000 miles between flue settings. The same power is now making 50,000 to 60,000 miles, using the same feed water as formerly.—*From a committee report to the convention of the Traveling Engineers' Association.*

According to a press despatch from St. Petersburg the director of the Transcaucasian Railway, Colonel Neigebauer, has issued an order containing the announcement that in six months of the current year 30 officers of the Transcaucasian line have perished by violent death. Ten among them were of the highest rank. It has become customary to ascribe these appalling murders to revolutionary organizations, but it is believed that a majority have been caused by a desire to see situations vacant. Therefore the Director has ordered that all vacancies which have resulted from officials having suffered violent death shall be filled by persons transferred from the railroads in European Russia, and none by promotion of local candidates.

Reduced Passenger Rates in Georgia.

The order of the Georgia Railroad Commission reducing passenger rates, in effect Sept. 2, must be obeyed by every road in the state, or the officers of the road disregarding it will be indicted and prosecuted by Gov. Hoke Smith. This, according to the newspapers, is the Governor's threat. He has notified all judges and prosecuting officers in the state to watch for violations of the law and to prosecute. Up to this week the roads have been unable to get a Federal injunction. The Atlantic Coast Line, the Central of Georgia and the Atlanta & West Point went before United States Judge Shelby at Huntsville, Ala., and asked for an injunction, but the Judge refused to grant it. The Judge, however, ordered the Georgia commission to appear on Sept. 16 in Atlanta before some United States Circuit Judge to show cause why an injunction should not be granted. In refusing the restraining order Judge Shelby commented sharply on the action of the railroads in waiting until two days, one of them on Sunday, before an order was to take effect to ask an injunction, although the order reducing rates was made three months ago.

Judge Shelby holds that there is no presumption to begin with, that the commission has not acted in good faith, and that the order reducing rates is confiscatory. "I cannot hold," says Judge Shelby, "that the affidavit to the bill filed by the railroads outweighs the prima facie presumption that the action of the Georgia Railroad Commission is valid."

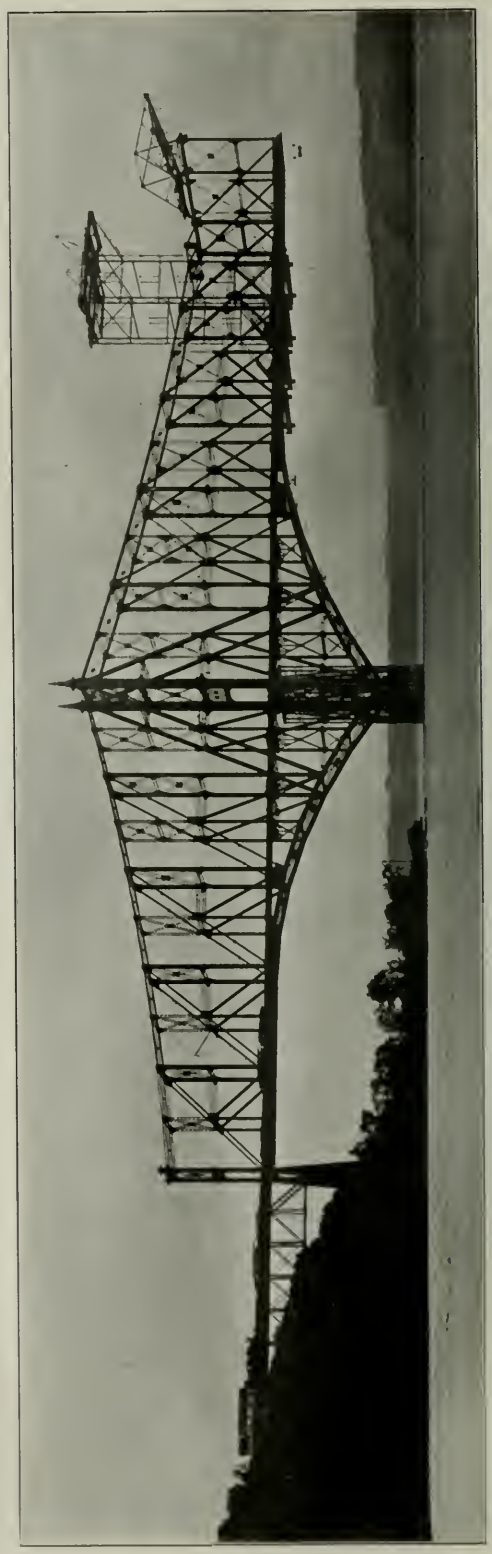
Collapse of the Quebec Bridge.

The south half of the Quebec bridge, which was being erected over the St. Lawrence river, collapsed on the afternoon of August 29, about half-past five. Of the 92 men who were working on the bridge at the time, 84 were killed or drowned and only eight were rescued, all of whom were injured. The entire structure fell and nothing was left standing except the approach span, which was carried on separate supports on the shore side of the anchorage. The south cantilever span had been erected and permanent riveting was nearly completed. Three panels of the suspended span over the middle of the river were in place and partially riveted up, and the erection of the fourth panel was in progress when the bridge fell.

While the exact cause of the failure has not been determined as we go to press, E. A. Hoare, Chief Engineer of the Quebec Bridge & Railway Co., the owners of the bridge, is reported to have said that the failure apparently took place near the main post, and that the collapse was vertical. The accompanying photographs of the wreckage, which are reproduced through the courtesy of *La Presse*, of Montreal, seem to substantiate the theory of vertical failure. The wreckage of the main posts is scattered on both sides of the pier and the other parts are almost directly underneath their former position in the structure. The anchorage supports are bent down toward the main pier, but the anchor eye-bars are intact in the foundations, indicating that the failure was not due to overloading and consequent overturning of the cantilever span. Nearly 15,000 tons of steel fell, and the principal members, which were the largest ever fabricated, are twisted, bent and broken so as to be hardly recognizable. The masonry of the main and anchorage piers seems to be but little damaged.

At the time the bridge fell there was a wind blowing about 28 miles an hour and a train of cars loaded with steel was being pushed out to the traveler at the end of the span. The engineer of the locomotive was carried down with the wreckage, but was rescued alive from the water by a boat which had just passed under the bridge. There were two travelers being used for the erection, which were both near the outer end of the span. The main traveler was about at the end of the cantilever span and the second traveler, running on the top chord of the truss span, was out over the third panel. While the weight of the two travelers and of the material piled near the end of the bridge was considerable, it was not more than the weight of the two remaining panels of the center span yet to be erected, and of the floor system of the entire half span which had not been put in place. It is not probable, therefore, the failure was due to excessive dead loads which had not been allowed for in figuring the erection stresses. If the failure was due to defective design, the error must be attributed to wrong assumptions or calculations of stress and not to insufficient loading.

While the failure came suddenly and without warning to the men on the bridge, who had no opportunity to escape, it is unfortunately true that the engineers in charge of the work had a warning that everything was not right, but the danger was not appreciated until it was too late. Early in the week one of the workmen on the bridge discovered and reported to the resident engineer, A. H. Birks, that one of the lower chord members in the third panel out from the main post was slightly buckled. N. R. McLure, inspector on the bridge for Theodore Cooper, who is consulting



The Quebec Bridge as it Appeared on August 15, Two Weeks Before the Collapse.

Anchor Pier, Showing Anchor Arm Supports Still Fast to the Masonry.

General View of the Fallen Bridge from the South Bank of the River.

engineer for the Quebec Bridge & Railway Co., was notified, and on Wednesday he left the bridge site and came to New York, arriving Thursday morning with his report, a copy of which had been forwarded to the office of the Phoenix Bridge Co., Philadelphia, the contractor for the steel work. Mr. Cooper received the report Thursday morning and immediately telegraphed the Phoenix Bridge Co. as follows: "Add no more load to bridge until full investigation is made. See report of McLure." This telegram was delayed and was not forwarded from New York until 12.15 p. m. It was received by the Phoenix Bridge Co. early in the afternoon and was put on the desk of Mr. Deans, Chief Engineer, who was not at his office. Mr. Deans returned about 5 p. m., and before he could telegraph ordering the men off the bridge it collapsed.

The Canadian Government has appointed Henry Holgate, Montreal; J. G. Kerry, Montreal, and Professor Galbraith, of Toronto University, to investigate the collapse and to determine, if possible, the cause. The loss is estimated at between $1,000,000 and $1,500,000, and two or three years' delay in completing the bridge. Work on the north half had only progressed to the point of erecting the false work to support the shore arm of the north cantilever span. Much of the material for the north half of the bridge is on the ground, and work will probably be resumed next year. The river channel was not seriously obstructed by the wreckage and is open for navigation.

View of the Wreckage from the River, Showing Approach Span Left Standing.

Near View of Wreckage Inside of Main Pier.

The Quebec Bridge & Railway Co. was chartered as the Quebec Bridge Co. in 1887 to build a highway and railroad bridge over the St. Lawrence river about seven miles above Quebec, to connect the railroads on the north and south shores of the river. It was granted a subsidy of $1,000,000 by the Dominion Government, $250,000 by the Province of Quebec, and $300,000 by the City of Quebec. The bridge was intended to be used by the Grand Trunk and the Intercolonial for an entrance into Quebec. Competitive plans were asked for in 1897, and in 1898 the Dominion Railway Committee approved the plan for a cantilever bridge with a channel span of 1,800 ft., the longest in the world. Bids were opened in 1899, and the contract for the piers and abutments was let to M. P. Davis in 1900. The corner stone was laid on October 2 of that year. The Phoenix Bridge Co., Philadelphia, Pa., was awarded the contract for the steel superstructure. The substructure was completed in November, 1902, and during the seasons of 1902 and 1903 the 210 ft. deck truss approach spans at each end of the bridge were erected by the Phoenix Bridge Co. The Quebec Bridge Co. was reorganized under the present name in 1903, and under an arrangement with the Dominion Government, which required the use of the bridge for a connecting link in the proposed Grand Trunk Pacific, the government guaranteed the bonds of the new company to the amount of $6,678,200. Work on the erection of the south half of the main structure was not begun until July, 1905. At the end of the working season, December 1, six panels of the anchor arm of the cantilever had been erected on falsework. During the season of 1906 the entire cantilever was erected and the falsework removed under the anchor arm. Erection had progressed to the fourth panel of the suspended truss during the present season.

The total length of the bridge between abutments is 3,220 ft., and it consists of two deck truss approach spans 210 ft. long, two

anchor arms each 500 ft. long, two cantilever arms each 562½ ft. long, and one suspended truss span 675 ft. long, the longest simple truss span built. The distance from center to center of main piers is 1,800 ft. The trusses are pin-connected and are spaced 67 ft. apart center to center. They vary in depth from 97 ft. at the portals to 315 ft. over the main piers. The main posts rise 400 ft. above the river and there is 150 ft. clear headway under the central span at high tide. The bridge was to have carried two railroad and two street car tracks, two roadways and two footwalks, all on the same level. The total weight of steel required was 38,500 tons. The main piers are concrete faced with granite, and each contains 35,000 cu. yds. of masonry. They are 30 ft. by 130 ft. at the top.

All of the detail plans for the superstructure were made by the Phoenix Bridge Co. and approved by E. A. Hoare, Chief Engineer of the Quebec Bridge & Railway Co., and by Theodore Cooper, Consulting Engineer for the Dominion Government and the Quebec Bridge and Railway Co.

The officers of the Phoenix Bridge Co. are: David Reeves, President; John S. Deans, Chief Engineer; P. L. Szlapka, Designing Engineer; A. H. Milliken, Superintendent of Erection, and A. H. Birks, Resident Engineer.

The officers of the Quebec Bridge & Railway Co. are: S. N. Parent, President; Ulric Barthe, Secretary; E. A. Hoare, Chief Engineer, and Theodore Cooper, Consulting Engineer.

Compound Ten-Wheel Locomotives for the Buenos Ayres Western Railway.

The Baldwin Locomotive Works has recently built five compound 10-wheel locomotives for the Buenos Ayres Western Railway. They were built throughout to drawings furnished by the railroad and have many special features.

As shown in the photograph, these engines are outside connected with slightly inclined cylinders. They are cross compounds, with the high-pressure cylinder on the left side and the low-pressure on the right side. The intercepting valve is placed on the left side above the high-pressure cylinder. It is of the piston valve type, as patented by Von Borries, and is worked in connection with the reversing gear. The receiver pipe between the high and low-pressure cylinders is copper, and is located in the smokebox. The slide valves are of bronze, and are balanced; they travel horizontally over vertical seats, the steam chests being placed between the engine frames. With this arrangement, a simple form of Stephenson link motion is readily employed. The eccentrics are placed on the second driving axle, while the links are suspended by double hangers immediately back of the first driving axle. The link blocks are connected to the valve stems by short transmission bars which pass over the leading driving axle. A suitable cross-tie, bolted to the frames, supports the valve-rod guides. Thus all parts of the motion are practically in the same plane, and the tendency for the gear to twist and spring is reduced to a minimum. The reversing mechanism is of the screw type.

The guides are of steel of the two-bar type, while the crossheads are of cast steel, with cast iron shoes lined with anti-friction metal. The piston rods are extended through the front cylinder heads; the pistons are of cast steel, with cast iron packing rings. All the driving wheels have cast steel centers, with tires held in place by shrinkage, retaining rings and set screws. The leading driving wheels have blank tires.

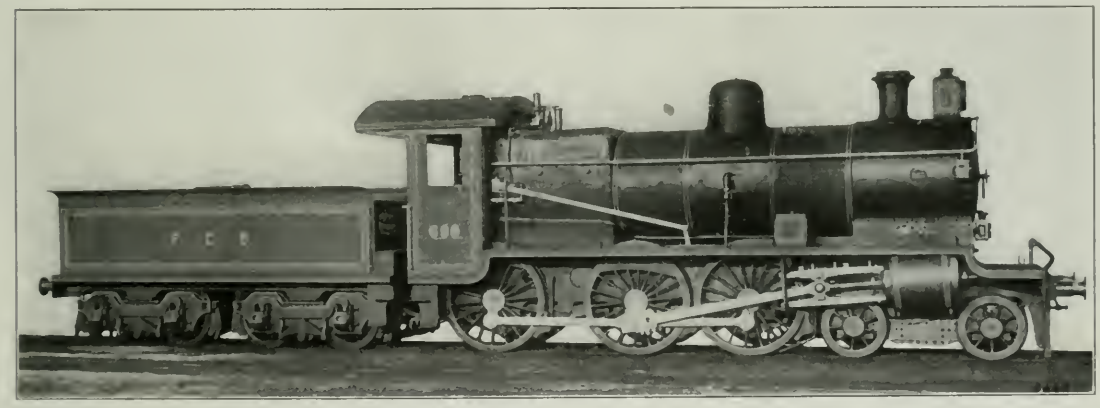
The frames are of the plate form, 1⅛ in. thick, and planed on both sides. The "horn blocks," or pedestals, are of cast steel, with wedge adjustments. All the driving springs are [illegible] and the driving wheel loads are equalized. The leading truck is of the swing-link type, designed to swing 1¾ in. on each side of the center line. The truck wheels are steel tired, with cast steel centers.

The boiler is steel, with the exception of the [illegible] back and crown of the firebox, which are copper. The firebox tube sheet is steel. The Belpaire system of staying is used, and the staybolts are bronze, with the exception of those in the throat and crown, which are Yorkshire iron. The throat sheet completely encircles the barrel to which it is united by a double row of rivets. An oval fire door opening is used, and it is formed with a wrought iron ring machined on both sides, to which the inside and outside sheets are riveted. The boiler barrel is built up of three rings. The circumferential seams are double riveted, while the longitudinal seams are butt jointed, with double covering strips and six rows of rivets. As is usual in British locomotive practice, the smokebox is separate from the boiler shell, to which it is united by a ring riveted to the barrel. The sides of the smokebox are fitted and bolted at the bottom, to the engine frames.

Among the boiler fittings may be mentioned two safety valves of the "Ramsbottom" type, which are mounted over the firebox; also two water gages which are placed in the cab. No gagecocks are applied. The grate, which slopes toward the front, is made up of plain bars of wrought iron. The boiler is fed by two injectors, one on each side, and also by one pump, which is driven from the left hand crosshead.

The engine is provided with steam brake equipment on the driving wheels, in addition to the vacuum brake for the tender and train. The sandboxes are placed on the runningboards, and steam sanding equipment is applied. The couplings are of the screw type, with draw hooks and spring buffers.

The tender is carried on two four-wheeled trucks of the swing link type, having steel-tired wheels with cast steel spoke centers. The frame is built of steel plates and angles. The tank has a water bottom and is of 4,200 gallons capacity. These locomotives will be used in both freight and passenger service.



Compound Passenger and Freight Locomotive for the Buenos Ayres Western Railway.

The following are some of the principal dimensions of the engines:

Gage	5 ft. 6 in.
Cylinders, diameter, h. p.	19 "
Cylinders, diameter, l. p.	27½ "
Piston stroke	26 "
Boiler material	Steel
" diameter	62 in.
" thickness of sheets	11/16 in.
Fuel	Coal
Steam pressure	200 lbs.
Firebox, material	Copper
" length	89 5/16 in.
" width	44⅝ "
" depth, front	74⅝ "
" depth, back	66⅝ "
" thickness all sheets	½ in.
" material of tube sheet	Steel
" water space	5 in.
Tubes, material	Iron
" number	211
" diameter	1⅞ "
" length	12 ft. 3⅛ "
Heating surface, firebox	132 sq. ft.
" " tubes	1,446 "
" " total	1,627 "
Grate area	29 "
Wheels, diameter, driving	68 in.
" " truck	28 "
" " tender	41 "
Journals, driving	7¾ x 9 "
" trucks	6 x 10 "
" tender	7½ x 9 "
Wheel base, driving	13 ft. 7 "
" " total engines	25 3 "
" " engine and tender	48 6 "
Weight on drivers	104,600 lbs.
" on truck	42,300 "

Weight, total engine	146,900 lbs.
" engine and tender	242,000 "
Tank capacity, water	4,200 gals.
Tank capacity, coal	220 cu. ft.
Tractive power	18,370 lbs.
Ratio of high to low pressure cylinder	1 to 2.09

$$\frac{\text{Weight on drivers}}{\text{Tractive power}} = 5.69$$

$$\frac{\text{Total weight}}{\text{Tractive power}} = 8.0$$

$$\frac{\text{Tractive power x diameter drivers}}{\text{Heating surface}} = 767.77$$

$$\frac{\text{Heating surface}}{\text{Grate area}} = 65.08$$

$$\frac{\text{Firebox heating surface}}{\text{Total heating surface}} = 8.11 \text{ per ct.}$$

$$\frac{\text{Total weight}}{\text{Heating surface}} = 90.29$$

Volume h. p. cylinder x 2 = 8.53 cu. ft.

$$\frac{\text{Heating surface}}{2 \text{ x Vol. h. p. cylinder}} = 190.73$$

$$\frac{\text{Grate area}}{2 \text{ x Vol. h. p. cylinder}} = 2.93$$

Tube heating surface equated to firebox heating surface (Vaughan formula)	418.71 sq. ft.
Total equated firebox heating surface	540.71 "
Ratio equated heating surface to total heating surface	1 to 3.00

Enginemen and Superheaters.

The engineman has his little part to play to accomplish the successful operation of the superheater and obtain from it the highest possible efficiency. While the engine is working, conditions permitting, the circulating tubes should be kept full of steam at boiler pressure, and to do this the engine should be worked with a full throttle and the cut-off regulated accordingly. While the effect of the superheater's work is to dry the steam on its way to the steam chests, it is just as essential and desirable that a reasonably low water level be carried in the boiler with the superheater as it is in the case of an engine using saturated steam. The engineer must see to it that the superheater damper is working properly at all times. The damper might stick in the closed position, in which case the superheater is useless and the total heating surface of the engine materially reduced, or the damper might stick in the open position, in which case there will be a deterioration of the superheater tubes, resulting in their finally breaking and causing an engine failure. Engines have been known to run for a month or more without a damper, and this, as well as other evidences, leads to the opinion that burning cinders in the smoke-tubes are partly responsible for the overheating and blistering of the return bends and the firebox ends of the circulating tubes; but be this as it may, it is essential that the engineer watch the damper and report it when it fails to work.—*From a committee report to the Traveling Engineers' Association.*

New Railroad Law in Georgia.

The Georgia Legislature, now in session, has passed the Candler-Overstreet bill, enlarging the State Railroad Commission from three to five members, and making radical amendments to the general railroad law of the state. The names of the members of the Commission as reorganized are given in another column. The Governor makes appointments to fill out the board, but with the next election the members will be elected as heretofore, and the term of each will be six years. The Commission will henceforth have supervision over telegraphs, telephones, street railroads, heat, light and power companies, docks, wharves and cotton compress corporations. The qualification for commissioner is to be 30 years of age, a qualified elector, and to be free from any interest in the businesses which the board is to control; "and a candidate is eligible without reference to his experience in law or in railroad business." We summarize the other principal features of the law.

Section 4. The Commission may employ two or more rate experts at a cost of not over $4,000 yearly in the aggregate.

Section 5. The power to determine what are just and reasonable rates and charges is vested exclusively in the said Commission.

Section 6 describes the powers of the Commission. It may investigate of its own motion, and may require common carriers and other public service corporations to establish and maintain reasonable service and facilities. It may require publication of time tables in local newspapers, may prescribe uniform accounting, the same to be, as far as practicable, in conformity with the regulations of the Interstate Commerce Commission.

Section 7. The Board is authorized to ascertain the cost of construction and the present value of corporation properties in Georgia; to require the construction of side tracks, and compel service on private sidings; to compel the operation of sufficient passenger service; to order the making and operation of physical connections between railroads at junctions; to prescribe penalties regarding the prompt movement of freight and rules for the transfer of cars through yards; to order the erection of stations and to regulate schedules of trains at junction points.

Section 8. Each corporation must furnish to the Commission a list of its stocks and bonds, and no corporation shall issue obligations for more than one year without the approval of the Commission, and then only so far as necessary for actual and reasonable expenditures. The decision of the Commission is to be final as to the validity of securities issued. Notes issued for one year or less shall not be refunded by long time obligations without the consent of the Commission.

Section 9. Penalties. A corporation violating this law shall be liable for all loss, damage or injury caused thereby; and if the violation of law is found by a jury to be wilful, the offender must pay a reasonable counsel's fee.

Section 10 prescribes the procedure for the enforcement of penalties.

Section 11 repeals sections 3 and 4 of the law of August 23, 1905, which gave the Commission power to regulate the transportation of freight, the present law taking the place of that.

Section 12 prescribes a penalty of $5,000 for violation of this act. Prosecutions for the recovery of penalties are to be brought in the name of the state of Georgia by direction of the Governor, and suits are to be given precedence in the Court over other business. The court shall not be adjourned until the suit is legally continued or is disposed of.

Section 13 makes it a misdemeanor to violate or aid or abet in violating this law, and any officer or agent found guilty shall be punished according to Section 1039 of the Penal Code of 1905; and besides this he shall be subject to indictment in any county where a subordinate employee by his approval violates either the law or the directions of the Commission.

Section 14 fixes the domicile of the Commission at the capitol in Atlanta, Fulton County, and no court outside of that county shall have jurisdiction in any suit brought against the Commission.

Section 15. The contingent expenses of the Commission shall not exceed $3,000 a year. The salary of the Chairman of the Commission is $4,000. (Salaries of other members not mentioned in this law.) The salary of the Secretary is $2,000. The printing fund is $2,000 a year. A stenographer may be employed at not over $1,200 a year.

Section 16. The Governor is authorized to appoint an attorney to the Commission for a term of four years at $2,500 a year. The attorney may be removed by the Governor at any time.

The Railroads of Mexico.*

BY FRDIS G. ROBINSON, C.E.,
Formerly of the Engineering Department of the Mexican Central.

IV.

LOCATION AND CONSTRUCTION.

A large part of the railroads of Mexico have been planned and organized by railroad men from the United States, and American standards of location and construction have been generally followed. The work has usually been in charge of engineers who gained their experience on the railroads of the United States, especially on those roads located through similar topographical conditions. Field parties for location work, as usually made up, include the engineer in charge, transitman, levelman and topographer, these four commonly being Americans, while the other members of the party are usually Mexicans, the labor being performed by the common peon. While a party thus constituted could not be expected to do an amount of work equal to that done by a well trained American party, yet there will often be developed from such workmen a chainman or rodman who will not suffer from a comparison with one of any other nationality. The daily wage paid these workers varies from 50 centavos to one peso, while one of exceptional ability would get better pay by the month. The company, while it provides tents for peon laborers, makes no provision for feeding them, and in this regard they must look after themselves.

The peon is originally a laborer on the haciendas of the country, and is held there by force if he happens to be in debt to the proprietors—a condition that is often easy to bring about. But when once freed from this debt under which he is held, he becomes a rover without home ties and feels as much at home in camps as elsewhere, so long as he has his family with him, a source of supply of strong drink within convenient distance, and no restraint upon his inclination to sing at all hours as much as it pleases him. The engineer or contractor who attempts to curb this inclination toward

*The first article was published in the *Railroad Gazette* of July 12, 1907; the second, in the issue of Aug. 9; the third in the issue of Aug. 30.

Mountain Construction, Showing Riprap Work.

wine, women and song" will find his camp unpopular and laborers difficult to obtain. The women members of the Mexicans' camp are not altogether an undesirable population, since they look after the board of the peons and do the washing and cleaning for the American members of the party

Engineers in charge of parties receive from 250 to 350 pesos, and the instrument men from 150 to 250 pesos a month. These receive their expenses while out and are well cared for by the railroad in the matter of cooks, supplies and camp equipment.

An engineer contemplating entering railroad work in Mexico should if possible prepare himself as well as may be, along two lines. First, he should learn as much Spanish as possible. It is evident that an engineer can render much more valuable service for his company if he can use the language of the country in instructing and directing his workmen, in conducting the necessary business connected with the survey, in making reports and carrying on the correspondence as needed. In this connection it is pleasing to note the tendency in our schools to include Spanish in the engineering courses, frequently at the expense of time formerly devoted to the study of other languages. Second, he should become familiar with the metric system of weights and measures. Years ago the Mexican Government adopted the metric system and required its use in industries and trades, and now the French standards have come into pretty general use. In the stores the measuring stick shows the meter on one side and the *vara* on the other. The carpenter's rule likewise gives inches and centimeters. The tape lines manufactured for use in that country similarly have both the English and French measures. In some of the districts the people still think in *phencgas, almudes, varas*, even if they are

Mountain Construction, Showing Riprap Work.

obliged to buy in hectolitres, kilogrammetros—even as some Americans sometimes still think in bushels, pounds and ton—and using the new standards. On the whole the change has made slow progress in eliminating the old units from the minds of the people, even in that country where the problem is a simple one compared to that which would follow a similar movement in other countries.

In the engineering operations connected with railroad building, the metric system is readily adapted and has some points of superiority. The length of chain now generally used on location and construction is one 20 meters long, divided into 100 links of 20 centimeters each. The curve formulas and tables found in the various handbooks or field books, based upon the use of a chain of 100 units, are readily used in laying out metric curves, for since 20 is one-fifth of 100, the curve data containing the radius as a factor will be found by dividing by five the corresponding tabular values based upon the chord of 100 units. There are certain tables published for use with the chord of 20 units, but as they are usually somewhat condensed it is probably shorter to make the simple division noted above than to use the shorter table and perform the necessary interpolations. For curve deflections, since the "degree of curve" is the angle subtended by one chord of 20 units, the deflection for one meter is one-fortieth part of the degree of curve and so equals in minutes 1.5 times the degree of curve. The advantages of the metric system are most apparent perhaps in construction work. On ordinary work cross sections are taken at each station, or 20 meters apart, and volumes are obtained by averaging end areas. Therefore the cubic contents of one station is found by adding the two end areas and multiplying by 10.

Standard Station Construction; Mexican Central.

The Mexican Government requires the railroad companies operating within its territory to submit for its approval plans and studies for the preliminary location or reconnaisance plans and profiles of the final location, as well as plans and estimates of the permanent structures. The maps prepared in this way for the government are required to show contour lines for a distance of one kilometer each side from the line of the survey, the contours being spaced for differences of level of two or five meters, according to the nature of the topography. Much valuable data are thus accumulated in the government files since the various railroad surveys have pretty well covered the country. Many lines are surveyed only to be abandoned, while others are surveyed to secure information to be used at a later time when some quick move may be needed in the great game played by the railroad managers.

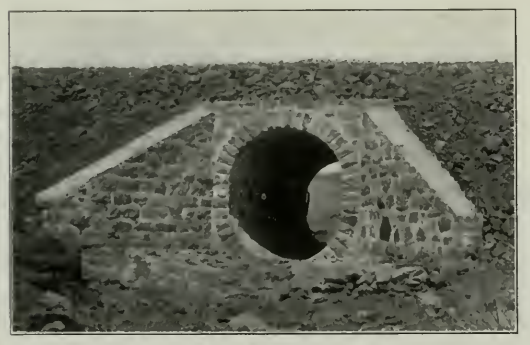
In location and construction the standards are as high as those used in this country. Thus, the Mexican Central, in its instructions

to engineers, while stating that the maximum grade is to be established as the preliminary survey may indicate, specifies that the maximum curve shall be of 6 deg. (20 meter chord, radius 627 ft.), and this degree was not exceeded in the location of that company's difficult Pacific line now under construction. It is provided that curves are to be compensated at the rate of .05 meter per degree of curve for curves of 0.7 degree and more, and at the rate of .06 meter for curves of less radius. Values of distance, rise and fall, unbroken tangents, etc., are given in conformity with the standards of other well located lines, while much stress is given to reducing the curvature to the smallest possible amount. Main line changes of location are based upon the cost of train operation as found from an examination of the records of the company and the amounts to be saved by the proposed change capitalized at 5 per cent. in the usual way.

When the final location is accepted and the work ordered the transit and level work of the location party are checked by the engineer in charge of construction, and drainage areas are determined (if this has not already been done by the location party) for proportioning the bridges and arriving at the openings required. Fortunate is the engineer who finishes this work before the arrival of the contractors, since he will be kept sufficiently busy thereafter.

The work is let by contract in the usual way, and the contractor sublets the least desirable parts of the work to others, often furnishing them such parts of their equipment as they do not require, or are pleased to be rid of. Many of these sub-contracts are let to small Mexican firms or individuals whose equipment is very meagre. In fact, many miles of embankment have been put in by Mexicans working only with shovel and basket, the earth being shoveled into a basket and carried to the embankment on the head or shoulders of the workmen.

Good scraper work on banks up to two meters is done with the small Mexican mules and native drivers, one such team being able to move from 45 to 50 cubic meters on a bank up to one meter high, and 25 to 35 cubic meters on banks up to two meters. These teams do not work to advantage on higher banks and in such cases the earth must be carried in carts or wheel scrapers from the cuts which are usually adjacent to the banks. In solid rock work of ordinary extent the drilling is done by hand by Mexican drillers. It is usually not difficult to secure skilled drillers, due to the training many men have had in the mines of the country. This work is paid for on the basis of amount of work done, and is often in charge of some disappointed though still hopeful American mine prospector. On larger works machine drills, conveyors, etc., are used as may be justified by the size of the contract.



Standard Arch Culvert, Rubble Masonry.

Classifications of material are inclined to be liberal but the work is required to be well done. The following prices may be taken as indicating those generally prevailing on heavy work:

	Pesos, per cu. meter.	Dollars, per cu. yd
Solid rock excavation in tunnel	7.50	2.87
Lava rock excavation	1.40	0.53
Solid rock excavation	1.30	0.50
Loose rock excavation	0.625	0.24
Earth hauled	0.25	0.13
Earth embankment	0.15	0.06
First-class masonry	15.00	5.75
Rubble masonry	8.00	3.00
Cement concrete masonry	9.00	3.50
Tunnel concrete in place	11.50	4.40
Tunnel concrete in blocks	19.00	7.25
Haul on rock, per kilo and mile	1.00	0.80
Clearing right of way 80 meter and yd.	0.01	0.005
Other items at cost plus 15 per cent.		

In this list of prices a number of classes of work may be paid for on the basis of force account plus a certain per cent. for contractors' profit. This method of payment is followed for such work as could not readily be covered by the usual classifications, or which if such classification were attempted would lead to disagreement. In these cases the engineer is kept informed as to wages paid for labor and keeps a check force account. The matter of clearing of right-of-way is a case of this kind. In many parts of the country the land is completely covered with low brush, and in this case the price listed above may stand. Where the line crosses heavy or scattered timber land the payment may be by force account. Other works, as wet excavation, dry retaining walls, etc., may be paid for in this way.

In bidding for the work the contractor must consider the low wages to be paid for labor (from 50 centavos to one peso per day), the scarcity of water, provisions and feed, and other items. Probably the greatest difficulty of the contractor arises from employing the cheap peon labor. The peons are a class unknown in this country. Poorly paid, poorly fed for generations, they lack the personal ambition which produces the best results in any work. They are continually moving from place to place, so that the engineer or contractor is always breaking in new men, whose breaking in is no small matter. Of late years there has been a good demand for labor, so that the supply in many parts of the country is hardly adequate for the needs. This has naturally led to an increase in wages. This increase in wages has only increased the scarcity, since a Mexican laborer whose wages have been increased will be satisfied to work fewer days. Since all he wants is to exist, he considers it bad financial management to accumulate a surplus. He has no fears of the "rainy day." In some regards the peon is not dissimilar to the imported labor now much employed in this country, but he is not held in restraint by any contract of employment firm, as often happens in this country, and is entirely independent in his comings and goings.

Peon Members of Location Party.

The following figures indicate the nature of the roads as built in Mexico, taking the Mexican Central as the type:

Gage of track	4 ft. 8½ in.	.....
Width of roadbed: earth excavation	23 ft.	7 meters.
Loose rock excavation	20 "	6 "
Solid rock excavation	20 "	6 "
Earth embankment	20 "	6 "
Length of free haul	820 "	250 "
Shrinkage from quantities measured in bank for:		
Scraper work	5 per cent.	.....
Wagon work	10 "	.....
Basket work	15 "	.....
Subgrade in rock cuts	1 ft.	0.30
Berms for banks:		
Less than 5 meters high	6.5	2.0
Higher than 5 meters	10.0	3.0
Distance between reverse curves	200.0	60.0

The following figures are gathered from records of track laying material yards, and from tie camps, and may be of interest in making comparisons of labor costs, etc. The costs given are in centavos, equal to one-half cent, American money:

Standard rail on new work	76 lbs.
Standard frogs, number	9
Cost of curving rail (60 lbs.)	$0.07
" " straightening rail	0.06
" " sawing rail	1.10
" " drilling rail per hole	0.07
" " unloading rail per car	0.22
" " loading rail, per car	0.79
" " loading car containing 800 angle bars, 100 kegs spikes, 15 kegs bolts	2.30
" " unloading ties and throwing clear of track, per tie	0.00½
" " loading ties from pile	0.00½
Labor cost of hewn pine ties in the woods, each	0.07
Labor cost of cull ties, each	0.04
(These prices paid workmen working on piece basis.)	
Paid for haul of ties, 2 to 6 kilometers, per tie	0.13 to 0.20
Size of standard tie	6 in. x 8 in. x 8 ft.
Number of ties cut by native axemen per day	10 to 15
Tie renewals per year	6 per cent.

(To be continued.)

GENERAL NEWS SECTION

NOTES.

Australian coal, imported by the Southern Pacific for locomotives, is being carried as far east as Sparks, Nev.

On the Chihuahua division of the Mexican Central train service has been interrupted by a strike of firemen.

The Seaboard Air Line has put in effect in the state of Georgia the passenger rate of 2½ cents a mile, ordered by the State Railroad Commission.

The General Superintendent of the New York, Ontario & Western has issued an order limiting the speed of all passenger trains to 50 miles an hour and, on descending grades and on certain curves, to 40 miles an hour.

The Kansas state railroad commissioners have notified the Pullman Company that empty "dead head" sleeping cars attached to crowded trains are an offense to them. They want such cars open for the use of passengers "at the usual Pullman rates."

At Bridgeport, Pa., 30 enginemen, conductors, firemen and brakemen of the Philadelphia & Reading have been suspended for violation of the company's rule relative to the use of intoxicating drinks. According to the newspaper reports, these suspensions are indefinite.

On the Baltimore & Ohio a number of "inspectors of Freight service" have been appointed, seven of them on the whole system. These men, formerly local agents and freight conductors, are to endeavor to secure the more careful loading and handling of freight with a view to reducing the bills for damages.

Texas, from being the most radical railroad regulator in the country, has lately become by comparison a very "slow" state; but the Railroad Commission has now aroused itself, and it is announced that within a month the Board will issue an order reducing passenger fares throughout the state 2½ cents a mile.

The Pennsylvania Railroad has established at Bedford, Pa., a school of telegraphy, with a view to increasing and improving the supply of operators to fill the several thousand positions of this kind on the company's lines east of Pittsburg. Bedford is 50 miles southwest from Huntingdon, which is on the middle division of the main turn.

The Long Island Railroad has made a slight increase in the pay of station agents and other station employees at a considerble number of stations, about 250 men being affected. The agents had presented to the superintendent a tentative schedule, but each individual case was dealt with on its merits, and there was no uniformity in the increases granted.

The Pittsburgh Car Service Association reports an average detention for the first seven months of this year as only 1.61 days, against 2.09 days in 1906. In this period the association reported 1,713,006 cars, of which 93 per cent. were released within free time. Of the average detention .47 was consumed by railroads and 1.14 by consignees. For the month of July 267,271 cars were reported, compared with 321,147 for July, 1906.

Hon. E. E. Clark, Interstate Commerce Commissioner, has been chosen as arbitrator of the dispute between the Colorado railroads and the Brotherhood of Railway Trainmen concerning the wages of yardmen, which recently caused a short strike on the Denver & Rio Grande. The railroad granted an increase of pay of 1 cent an hour, and the question for arbitration is whether the company shall grant an additional cent or any part thereof.

Chicago reports say that prominent shippers are beginning to complain loudly of the inability of the railroads to furnish them with freight cars of moderate size. In the constant movement toward a complete stock of large freight cars of uniform size the railroads have destroyed the old and smaller cars so rapidly that shippers of those kinds of freight which consignees want in 10-ton or 15-ton lots are being seriously inconvenienced.

Alpheus S. Frank, a young lawyer of New York City, has been sent to Sing Sing Prison for three years for subornation of perjury. Frank was the promoter of a fraudulent suit against the New York City Railway by a woman who claimed to have been injured while alighting from a street car, but who was found to be suing under a false name, and to have conspired with her husband, the conductor, to defraud the company, no injury having been obtained.

The State Corporation Commission of Virginia has ordered the adoption on October 1 of the revised passenger fares recently ordered by the Commission, on all of the roads of the state to which the reduction applies, except the Southern and the six other roads which secured injunctions in the United States Circuit Court. Under this order the rate will be 2 cents a [illegible] Richmond, Fredericksburg & Potomac, the Washington Southern, the New York, Philadelphia & Norfolk, the Virginia Southwestern and the Seaboard Air Line.

The Public Service Corporation, operating [illegible] In Jersey City, Newark and adjacent places in New Jersey, announced that, in consequence of the large number of accidents to passengers, especially those riding on the running boards, the use of open cars will be discontinued. The company has ordered 200 convertible cars—closed cars, which can be arranged for hot weather use so as to be as comfortable as open cars. The new cars are to have fenders hung much lower than those now used by the company, with a view to making it impossible for a person to be rolled under.

"The National Industrial Traffic League," which is the name of the organization of representatives of large shippers recently formed, proposes to meet in Washington, October 10, and its officers will call upon the members of the Interstate Commerce Commission. The League favors the addition to the Interstate Commerce Commission of a railroad man and a member familiar with commercial affairs. It also recommends the amendment of the anti-trust law so as to permit railroads to make traffic agreements with each other. The 48 persons who attended the first meeting of the league are said to represent 16,450 firms and corporations.

The new Railroad Commission of Georgia is as prompt in getting to work as the Public Service Commission in New York, and has already issued a number of orders to the railroads. One of these requires a complete and detailed statement of all free transportation issued during the month of September. Another, which applies also to street railroads, and telephone, telegraph, electric light and electric light companies and cotton compresses, requires by November 1 a full statement of the property of every such corporation; and a third notifies the railroads that they will be held to a high standard in the maintenance of accommodations for passengers on trains and at stations.

The Chicago, Peoria & St. Louis, a line lying wholly within the state of Illinois and dependent solely on local traffic for the support of its passenger trains, is said to have been running its three daily passenger trains between Peoria and Springfield since July 1 at less than cost, the passenger traffic being, under the reduced rate ordered by the legislature, insufficient to cover the expense of running the trains. An officer of the road has expressed the intention of taking off some or all of the passenger trains and carrying the passengers on freights. Just to keep the General Manager from dwelling too long on this matter, the firemen of the road have presented a request for an increase in pay of 12 to 15 per cent.

New York State Accident Reports.

Rules to govern the reporting of accidents by railroad and street railway companies have been promulgated by the New York State Public Service Commission, Second district. Immediate notice by telegraph must be sent to the Commission of all accidents resulting in loss of life to passengers or employees; accidents occurring at grade crossings, resulting in death or serious injury to any person; derailments of passenger trains or locomotives or cars in passenger trains; collisions involving freight or passenger trains whether resulting in loss of life or not; explosions of locomotive boilers and accidents to locomotive boilers resulting in death or serious injury to any person.

The Commission requires prompt report by mail of every accident, whether covered in a preliminary notice by telegraph or not, upon a form prescribed by the Commission, to be sent immediately after the circumstances attending the accident shall have been ascertained. This form calls for details similar to those required in the reports made to the Federal government.

Block Signals on the Rock Island.

The Chicago, Rock Island & Pacific is now equipped with automatic block signals from Chicago to Utica, Ill., 95 miles, and signals are under construction on a length of 10 miles additional. The company has now decided to extend these signals as far as Iowa City on the Iowa division and to Muscatine on the Missouri river line. Automatic signals are also to be put up on the line from Topeka, Kan., to Herington. When this work is finished the Rock Island will have automatic signals on 270 miles of double track and 80 miles of single track. On those parts of the road not equipped with automatic signals, the stations are being equipped with [illegible] for the more convenient working of the telegraph block system.

This system is already in use on 500 miles of Rock Island lines and is being rapidly extended.

The Buell Automatic Stop and Cab Signal.

At Cameron Run, Va., on the Southern Railway, August 30, a test was made of the Buell automatic signal. This apparatus, by means of track-circuit control, protects a train in a given block section by automatically stopping any following train. Apparatus is provided on the locomotives for setting the air-brakes and also for giving both a visual and an audible signal in the cab. The test is reported as having been successful. It was witnessed by members of the Block Signal and Train Control Board of the Interstate Commerce Commission.

Thermit Welding.

At the recent meeting of the Master Blacksmiths' Association an individual paper and a report were presented on the subject of thermit welding and the method was strongly commended in both. It was stated that the first thermit weld on the Southern Pacific was made on the frame of an engine in April, 1905. The cylinders had a diameter of 22 in. and a piston stroke of 30 in., and the weight was 184,000 lbs. The frame was broken at the root of the pedestal where the main driving axle is located. The frame is in service to-day and shows no sign of defect.

To prepare the surfaces of the broken section, the ends of the frame should be corrugated by drilling holes through the frame and the ends kept practically clean. A jack-screw was placed between the jaws of the frame referred to for the purpose of opening the fracture $^1/_{16}$ in. After the weld had been completed the frame was too short, consequently it should have been spread one-eighth of an inch. In every case the broken section should be enforced with a band of thermit extending about 3 in. each side of the fracture and being about ¾ in. thick.

The method of making the mould for the molten thermit is explained in the pamphlet of the Goldschmidt Thermit Co., New York. The shape of the mould must be changed to meet conditions. Three or four different shapes will meet all the conditions required for repairing frames. The mould is usually made in halves and bolted together on the frame. Care should be taken that the mould is a perfect fit around the portion to be welded. To produce the contour desired in the inside of the mould is to make a pattern of wood similar to the shape the reinforced portion of the frame is desired after being completed. The mould being bolted to the frame, the ends of the frame should be brought to a red heat by passing a pipe gasolene burner through the pouring hole. The crucible of thermit is now placed over the pouring hole and ignited. In a few seconds the work is completed.

As soon as the molten thermit begins to congeal release the jack-screw slowly so that the spring of the frame will compress the heated thermit and equalize the shrinkage that must take place by the metal cooling. Many frames have been repaired by this method with a small percentage of failure.

It also appears from the report that on one road thermit is used in the construction of new engines. The statement is that a class of engine is now being built that has the forward pedestal and front end combined. This part is made of steel and is welded to a wrought iron frame with thermit, doing away with the front end splice and thus making a continuous frame.

In addition to frame welding the method is also in use for welding connecting rods, of which there are seven in service. It is stated also that after the reinforcing collar was machined off and the rod finished to standard size, it was impossible to see by the use of a glass where the weld was made.

These rods are in service and one of the engines has since passed through the shop, and after careful inspection the rod was found in perfect condition. The method of doing this class of work is as follows: The broken part is drilled 2 in. from the broken line. The mould is made over the break, using a piece of material which is soft steel taking the place of the broken piece. To hold the new piece in line a clamp is used and as soon as the thermit has entered the mould we use this clamp to draw the new piece together from ½ to ⅝ in., when the thermit is in liquid form, thus making a perfect weld, doing away with all tendencies due to air cavities. After the welds are machined they are taken to the smith shop and heated to a red heat and looked over carefully. This is a simple method and often puts an engine back in service in a very short time.

All of the above welds have been made by heating the work through the riser opening to a red heat. Since this method has been used there have been no failures.

In spite of this endorsement of the process by both contributions to the subject the author of the individual paper, Mr. Uren, closes with the remark that he does not wish it to be understood that this method is as good as the blacksmith method, forge, steam-hammer and anvil. However, in emergency cases when an engine comes in with a broken frame, by the thermit method the frame can be repaired and go into service the next day, and oftentimes will serve the purpose until the engine comes in for general repairs. I should advise that when engines come in for general repairs the frames be closely examined, and if defects are found bring the frame to the blacksmith shop and have it put in perfect order.

New Jersey Demurrage Law.

The Legislature of New Jersey at its last session amended the railroad law of 1903 so as to forbid the collection of demurrage on freight cars until after three full days. The law has a proviso that if a car, on account of switching or otherwise, is off from the team track more than one working hour in a day, that day cannot be counted against the consignee. The law gives the railroad a lien on freight for demurrage charges assessed according to the law, but provides that if the consignee gives a bond of $50 (or double the demurrage charge) he may take his freight, notwithstanding the lien.

A Quiet Place.

Glenfield tunnel, on the Leicester & Swannington, a part of the Midland Railway system of England, is described as the oldest tunnel in the world. It is about a mile long. Only four passenger trains pass through the tunnel each week day, and from Saturday night until Monday morning it is closed by a padlocked door at either end.

Steel Rail Exports.

The exports of steel rails for the first seven months of 1907 show very little increase over the similar period of 1906, as far as value is concerned. This year exports have amounted to $5,387,947, as compared with $5,345,509 in 1906. The quantity shipped abroad has been about 20,000 tons less in this year, 180,720 tons being sent abroad in the seven months as against 203,352 in 1906. The aggregate value was brought up by the increased price which American manufacturers got for their products. During this year foreign consumers have paid an average price of $29.81 per ton for steel rails, as against $26.28 last year.

The exports appear in detail as follows:

Exported to	1907.	1906.
Europe	$1,178	$11,211
British North America	282,806	1,344,473
Central America and Br. Honduras	446,094	475,757
Mexico	728,088	426,879
West Indies and Bermuda	148,192	616,586
South America	1,640,233	1,890,360
Japan	195,534	237,425
Other Asia and Oceania	1,619,506	332,593
British Africa	7,741	9,849
Other Africa	17,885	376
Total	$5,387,347	$5,345,509

There is practically no market at all for American steel rails in Europe; but 52 tons have been sent there in seven months. The railroad development of British North America is much retarded at present, there being a decline of over $1,000,000 in its demand in the time under consideration. South America likewise showed a falling off.

The Far Eastern markets, outside of Japan, have been much more profitable. The territories grouped under "other Asia and Oceania," purchased $1,286,913 more than in the first seven months of 1906.

The Ashokan Dam.

The Board of Water Supply recently received bids for the building of the Ashokan dam, which is part of the new reservoir work under way in the Catskill mountains to supply water to New York city. The lowest bid came from the John Pierce Company and was $10,315,350, over $2,000,000 less than the engineer's estimates. This bid was not accepted. It is understood that the John Pierce Company told the Board that because of the company's inexperience in reservoir work it had underestimated the cost, although it stood ready to carry out the contract at the price offered. The contract was awarded to the MacArthur Brothers Company and Winston & Company, who jointly bid $12,669,775.

New Oriental Steamship Line.

The American & Manchurian Line has been organized in connection with the United States Steel Products Export Company, which handles the export trade of the United States Steel Corporation. The vessels will ply between New York and Dalny, Japan, China and Straits Settlements ports. The line will first be used to carry steel work to be used on the South Manchurian Railroad.

The first ship, the "Kabinga," left New York last Saturday, carrying 12,000 tons of steel, including 1,500 tons of bridge mate-

rial, 2,500 tons of rails, 110 cars, 18 locomotives and a large quantity of machinery. This consignment is the first shipment of a total of 167,000 tons of rails, 8,000 tons of bridge material, 259 locomotives and 3,000 cars that are to be used on the Manchurian road, and are to be shipped as soon as possible, the Carnegie mills having received instructions to rush the work as fast as they can. The "Kabinga" carries what is said to be the largest cargo of steel work that has ever been sent to the far East.

New York Rules for Boiler Inspection.

The New York State Public Service Commission, Second district, has formulated rules for the inspection of locomotive boilers. Detailed instructions are given as to the time and method of inspection of all parts, including steam gages, safety valves and staybolts. Each boiler must be washed out at least once a month and a thorough inspection made once every three months; and it must be tested by hydrostatic pressure not less than once a year. All inspections must be made by competent boilermakers and sworn reports filed with the commission within 10 days after each inspection.

Wells-Fargo Earnings.

Wells, Fargo & Co. earned during the fiscal year ended July 31, 1907, nearly 54 per cent. on its capital stock. The company pays 10 per cent. dividends. The earnings were as follows:

	1907.		Changes.
Gross earnings	$22,934,425	Inc.	$4,251,390
Expenses	19,566,103	"	3,428,313
Net earnings	$3,368,022	Inc.	$823,077
Other income	945,882	"	425,865
Available for dividends	$4,313,904	Inc.	$1,248,942

MANUFACTURING AND BUSINESS.

The Pennsylvania has ordered from Henry Pels & Co., New York, a large T-bar and angle shear for installation at the Juniata shops, Altoona, Pa.

The T. B. Arnold Supply Co., St. Louis, Mo., and Theodore Thomas & Co., Chicago, have been made agents of the Maryland Railway Supply Co., makers of the "spike-strut" rail fastener, Baltimore, Md.

A. Bruce has been appointed American representative of the Great Central Railway of England, succeeding F. Patman, who has left for England to take a higher office in the company. The New York office has been moved from 1 Broadway to 355 Broadway.

Barney Barkley, Superintendent of Construction in charge of the work which the Grigsby Construction Company, De Ridder, La., has been doing on the extension of the Jasper & Eastern, a Gulf, Colorado & Santa Fe line, has resigned to take a similar position with the Ball-Gardner Construction Company, Dallas, Tex.

The name of the Detroit Graphite Manufacturing Co., Detroit, Mich., has been changed to the Detroit Graphite Co. F. W. Davis, Jr., has been elected Vice-President, and T. R. Wyles, Second Vice-President. Extensive additions and improvements were recently made to the building and machinery departments, largely increasing the facilities.

At the annual meeting of the stockholders of the Locomotive Appliance Co., Chicago, held August 15, the following directors were elected for the ensuing year: Frank W. Furry, J. B. Allfree, Willis C. Squire, J. J. McCarthy, E. H. Allfree and Ira C. Hubbell, all of Chicago; Clarence H. Howard, C. A. Thompson and Ira B. Kegler, of St. Louis, Mo.; F. B. Olney, Ludington, Mich., and H. S. Gray, Benton Harbor, Mich.

Iron and Steel.

The North Georgia Marble Company, Ellijay, Ga., is in the market for second-hand light portable track or rails.

Bids were asked September 5 for about 5,000 tons of structural steel, castings, rails, etc., for the remaining material necessary to complete the Blackwells Island bridge approaches in the Borough of Queens, New York city.

The McClintic-Marshall Construction Co. has contracts for 13,000 tons of structural steel for new piers in New York; also an order for 1,700 tons for a viaduct for the Chicago, Milwaukee & St. Paul, and several smaller orders.

The rail mills of the Pittsburg district have received notice from the Baltimore & Ohio that it will need about 75,000 tons of rails for 1908 delivery, and that the specifications will be handed in later. The railroad is said to be holding back its orders awaiting the result of conferences between the [illegible] Railway Association and the Steel Corporation.

The National Transcontinental (Canada) has ordered about 36,000 tons of rails for the Grand Trunk Pacific, the orders being divided between the Dominion Iron & Steel Co. of Sydney, N. S., and the Algoma Steel Works, Sault Ste. Marie. The contract price of the Algoma company's rails, f. o. b. Fort William, was about $34 a ton, and that of the Dominion Steel Co., for delivery at Quebec, about 50 cents a ton less.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad associations and engineering societies, etc., see advertising page 21.)

Central Railway Club.

At the meeting of this club to be held at Buffalo, N. Y., Sept. 13, a paper on "Some of the Requirements of Modern Air-Brakes," by J. P. Kelly, of the Westinghouse Air-Brake Company, will be presented.

Railway Signal Association.

At the September meeting of this association, which is to be held at the Great Northern Hotel, Chicago, next Tuesday, beginning at 10 a.m., the subject for discussion will be the Committee Report on Standard Specifications for Electric Interlocking. The committee desires the views of members preparatory to making a final report at the annual meeting, which is to be held at Milwaukee October 8, 9 and 10.

Iron and Steel Institute.

At the autumn meeting of this Institute to be held in Vienna, Austria, September 23 and 24, the papers to be submitted will probably include the following: Steel and Meteoric Iron, by Professor F. Berwerth; Quantity of Blast Furnace Gas for a Given Make of Pig Iron, by Professor Josef von Ehrenwerth; Application of the Laws of Physical Chemistry to the Metallurgy of Iron, by Baron H. von Jüptner; Case Hardening of Mild Steel, by C. O. Bannister and J. W. Lambert; New Blue-Black Paint as a Protective Covering for Iron, by F. J. R. Carulla; Hardening of Steel, by L. Demozay; Structure of Hardened Steel, by Percy Longmuir; Case Hardening, by G. Shaw Scott, M. Sc.; Ageing of Mild Steel, by C. E. Stromeyer; Economical Distribution of Electric Power from Blast Furnaces, by B. H. Thwaite.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Alabama & Vicksburg.—See New Orleans & North-eastern.

Beaumont & Great Northern.—G. W. Pennell, Vice-President, has been elected also Treasurer, succeeding, as Treasurer, J. H. Pearcy, who remains Secretary.

Chicago, Cincinnati & Louisville.—The office of G. A. S. Graves, Assistant Treasurer and Purchasing Agent, has been moved from Cincinnati, Ohio, to Chicago, where the other general offices now are.

Chicago, Indianapolis & Louisville.—N. Staat, tariff and rate clerk in the freight department, has been appointed Assistant General Freight Agent.

Georgia State Railroad Commission.—S. G. McLendon has been elected Chairman. Under the law passed by the last legislature, the number of members of the Commission has been increased from three to five. The new members are Judge George W. Hillyer, of Atlanta, and Fuller E. Calloway, of La Grange.

Grand Trunk Pacific.—G. W. Caye, chief clerk to the General Manager, has been appointed Assistant to the Vice-President and General Manager, with office at Winnipeg, Man.

Mobile, Jackson & Kansas City.—The office of Assistant to the President, held by W. F. Owen, has been abolished. Mr. Owen remains General Manager. H. C. Snyder has been elected Assistant Secretary and Assistant Treasurer at New York, succeeding R. H. Sherwood, resigned.

New Orleans & North-eastern.—E. Ford, General Manager of this road and of the Alabama & Vicksburg and of the Vicksburg, Shreveport & Pacific, has been appointed Assistant to the President of the three roads. D. D. Curran, President, is now also General Manager.

Oklahoma Central.—D. I. Green has been appointed Auditor, with office at Purcell, Ind. T., succeeding W. P. Wissmann, resigned. G. W. Parker has been appointed Assistant Auditor, with office at Purcell.

Southern.—C. P. Cooper, General Superintendent of the St. Louis-Louisville lines, has been appointed Manager of these lines and his former position has been abolished.

Vicksburg, Shreveport & Pacific.—See New Orleans & North-eastern.

Operating Officers.

Alabama & Vicksburg.—See New Orleans & North-eastern.

Ann Arbor.—The headquarters of W. F. Bradley, Superintendent, have been moved from Owosso, Mich., to Toledo, Ohio.

Colorado & Southern.—See Denver & Rio Grande.

Denver & Rio Grande.—A. F. Brewer, Superintendent of Car Service of the Colorado & Southern, has been appointed Superintendent of Transportation of the Denver & Rio Grande, with office at Denver, Colo., succeeding W. A. Whitney, resigned.

Galveston, Harrisburg & San Antonio.—George S. Waid, Assistant Superintendent at El Paso, Tex., has been appointed Acting Superintendent at that place, succeeding to the duties of S. C. Marks, who has been given indefinite leave of absence because of ill health.

Louisville & Nashville.—James Allyn Morrison, who was recently appointed Assistant Superintendent at Birmingham, Ala., was born in 1868 at Sonora, Ky. After a public school education, he began railroad work, in 1886, as a telegraph operator on the Louisville & Nashville. After serving in different despatchers' offices as operator and, later, extra despatcher, he was made chief despatcher at Birmingham in 1892. He was transferred to the same position on the Montgomery division in 1897 and was appointed Trainmaster of the Decatur division in 1902, where he remained until his recent promotion.

Mobile, Jackson & Kansas City.—The office of General Superintendent, held by H. S. Jones, has been abolished. Mr. Jones remains Chief Engineer. See this company under Executive, Financial and Legal Officers.

New Orleans & North-eastern.—E. A. Kelly, Car Accountant of this road and of the Alabama & Vicksburg, and of the Vicksburg, Shreveport & Pacific, has been appointed to the new office of Superintendent of Transportation, and his former office has been abolished.

New York Central & Hudson River.—S. J. Kearns, chief despatcher of the Western division, has been appointed Assistant Superintendent of that division, with office at Syracuse, N. Y.

Oregon Railroad & Navigation.—The headquarters of the Assistant Superintendent of the Washington division have been moved from Starbuck, Wash., to Spokane. R. O. Cowling has been appointed Trainmaster at Starbuck.

Trinity & Brazos Valley.—Patrick Owens has been appointed Trainmaster at Teague, Tex.

Vicksburg, Shreveport & Pacific.—See New Orleans & North-eastern.

Traffic Officers.

Chicago, Cincinnati & Louisville.—T. C. Beyland, Assistant General Freight Agent, has resigned to go into other business.

Chicago Great Western.—C. D. Thompson, General Agent at Duluth, Minn., has resigned to go into other business.

Colorado Midland.—N. L. Drew, City Passenger Agent at Denver, Colo., has been appointed General Agent at Colorado Springs, Colo., succeeding C. S. Browne, transferred.

Denver & Rio Grande.—W. H. Paul has been appointed General Agent at Goldfield, Nev.

Georgia, Florida & Alabama.—B. C. Prince has been appointed Acting Traffic Manager, with office at Bainbridge, Ga., succeeding to the duties of J. H. McWilliams, resigned.

Missouri Pacific.—R. T. G. Matthews, traveling passenger agent at Louisville, Ky., has been appointed General Agent of the passenger department at Cincinnati, Ohio.

Seaboard Air Line.—J. G. Cantrell, Assistant General Freight Agent at Birmingham, has been appointed to the new office of General Western Freight Agent, with office at St. Louis, Mo. E. T. Steele succeeds Mr. Cantrell.

Engineering and Rolling Stock Officers.

Chicago, Burlington & Quincy.—W. F. Ackerman, superintendent of shops at Havelock, Neb., has been appointed Assistant Superintendent of Motive Power of the Lines West of the Missouri river, with office at Lincoln, Neb., succeeding J. Dietrich, transferred.

Mexican Central.—J. M. Fulton, Master Mechanic at Aguascalientes, has resigned to become general foreman of the El Paso & Southwestern shops at Tucumcari, N. Mex.

Texas Central.—A. S. Grant has been appointed Master Mechanic, with office at Walnut Springs, Tex., succeeding N. L. Smitham, resigned.

Wabash.—E. F. Needham, Master Mechanic at Springfield, Ill., has been appointed Superintendent of the Locomotive and Car Department, with office at Springfield, Ill., succeeding J. B. Barnes, retired. Mr. Needham began railroad work in 1880 as an apprentice in the Fort Wayne shops of the Wabash. He was made foreman of these shops in 1894 and was transferred to the same position at Springfield, Ill., in 1899. In December, 1901, he was appointed Assistant Master Mechanic at Decatur, Ill., and a few months later was transferred to the same position at Ashley, Ind. In the fall of 1902 he was made Master Mechanic at Fort Wayne, and in the spring of 1906 was appointed Master Mechanic of the Decatur and Springfield divisions, where he remained until his present promotion.

LOCOMOTIVE BUILDING.

The South Dakota Central is in the market for four second-hand locomotives.

The Isthmian Canal Commission, as reported in the *Railroad Gazette* of August 23, opened bids on August 30 on 12 four-wheel saddle tank 3-ft. gage locomotives. The lowest bid, according to press despatches, was that of the Davenport Locomotive Works, whose price was $36,996, or $37,956, ready for operation at Colon.

The Tonopah & Goldfield, as reported in the *Railroad Gazette* of August 23, has ordered eight simple freight locomotives from the Baldwin Locomotive Works.

General Dimensions.

Type	Simple freight
Weight, total	183,800 lbs.
Weight on drivers	165,000 "
Diameter of drivers	55 in.
Cylinders	22 in. x 28 "
Boiler, working steam pressure	180 lbs.
" number of tubes	344
" diameter of tubes	2 in.
" length of tubes	14 ft. 6 "
Firebox, length	121 "
" width	41⅝ "
" material	Homogeneous steel
" grate area	34.97 sq. ft.
Heating surface, total	2,792.9 "
Tank capacity	7,000 gals.
Coal capacity	13 tons

Special Equipment.

Air brakes	Westinghouse
Boiler lagging	Magnesia
Brake-shoes	Streeter
Couplers	Tower
Injector	Hancock
Piston rod packings	United States
Valve rod packings	United States
Safety Valve	Crosby
Sanding devices	Leach
Sight-feed lubricators	Nathan bull's-eye
Steam gages	Ashcroft
Tires—driving wheels	Midvale
Tires—truck wheels	Midvale

CAR BUILDING.

The Grand Trunk is in the market for 25 first-class passenger cars.

The Chicago Refrigerator Car Company, Chicago, is in the market for 100 refrigerator cars.

The Twin City Rapid Transit, Minneapolis, Minn., will build about 100 additional electric cars at its own shops.

The Denver & Rio Grande has ordered 1,000 steel ore cars of 100,000 lbs. capacity from the Pressed Steel Car Co.

The South Dakota Central is in the market for about 50 box cars and five hopper bottom gondola cars, all second-hand.

The Mississippi Central is in the market for two passenger coaches, two combination, baggage, mail and express cars and one compartment car.

The Union Pacific is building a number of 31-ft. steel trailer cars at its Omaha shops, similar in shape to the gasolene motor cars, except that they are four-wheel cars fitted up for baggage, mail and express.

The Union Pacific, as reported in the *Railroad Gazette* of August 9, is building 22 gasolene steel motor cars at its Omaha shops. These cars will weigh 60,000 lbs. and measure 56 ft. 11½ in. long, 9 ft. 8¼ in. wide and 12 ft. 1 7/16 in. high, over all. The special equipment includes:

Bolsters	Commonwealth Steel Co.
Brake beams	Waycott and Damascus
Brake shoes	Congdon type
Couplers	Climax
Curtain fixtures	Hartshorn tin rollers
Curtain material	Pantasote
Dust guards	Union Pacific standard
Paint	Sherwin-Williams
Seats	Union Pacific
Springs	Union Pacific
Trucks	Union Pacific built-up

The Harriman Lines are asking prices on 5,000 steel underframe box cars of 100,000 lbs. capacity, 250 steel underframe box cars

of 80,000 lbs. capacity, 500 steel underframe gondola cars of 100,000 lbs. capacity, and 250 steel underframe flat cars of 80,000 lbs. capacity.

The Virginia & Southwestern, as reported in the *Railroad Gazette* of August 23, has ordered 500 drop bottom gondola cars of 80,000 lbs capacity from the Western Steel Car & Foundry Company. These cars will weigh 35,000 lbs. and will measure 34 ft. 4¼ in. long and 9 ft. 5 in. wide, inside measurements, and 36 ft. 3 in. long and 8 ft. 3¾ in. high, over all. Bodies and underframes will be of wood. The special equipment includes:

Holsters	Scullin Gallagher
Brake beams	Simplex
Brake shoes	American Brake Shoe & Foundry Co.
Brakes	Westinghouse
Brasses	Ajax Plastic Bronze
Couplers	Major
Draft rigging	100 Miner; 100 Farlow
Journal boxes	Symington
Paint	Frazer Paint Co.
Springs	Railway Steel-Spring Co.

The Buffalo & Susquehanna, as reported in the *Railroad Gazette* of August 23, has ordered 200 steel underframe box cars of 80,000 lbs. capacity, 200 center dump hopper cars of 100,000 lbs. capacity, 500 gondola cars of 100,000 lbs. capacity and 100 general service cars of 100,000 lbs. capacity from the Pressed Steel Car Company, the box cars and the general service cars to be built by the Western Steel Car & Foundry Company. All are for October delivery, except that the general service cars are to be delivered after the completion of the hopper cars. The box cars will be 39 ft. 4⅜ in. long and 8 ft. 6 in. wide, inside measurements, and 40 ft. long and 9 ft. 1⅝ in. wide, over all. Bodies will be of wood and the underframes of steel. The center dump hopper cars will be 30 ft. ¼ in. long and 9 ft. 6 in. wide, inside measurements, and 31 ft. 6 in. long and 10 ft. 1½ in. wide, over all. Underframes will be of steel. The gondola cars will be 41 ft. 9 in. long and 9 ft. 4⅞ in. wide, inside measurements, and 43 ft. 3 in. long, 9 ft. 11⅞ in. wide and 7 ft. 5⅛ in. high, over all. Bodies and underframes will be of steel. The general service cars will be 41 ft. 9 in. long and 9 ft. 6⅜ in. wide, inside measurements, and 42 ft. 9 in. long, 10 ft. 2 in. wide and 8 ft. 9 in. high, over all. Underframes will be of pressed steel. The special equipment for all cars includes:

Bolsters	Pressed steel for gondola and general service
Brasses	Spiral
Couplers	Climax
Centerplates & side bearings	Hartman for general service cars.
Draft rigging	Miner
Dust guards	Gould
Journal boxes	Gould
Springs	Suitable for arch-bar trucks, for general service cars
Trucks	Arch bar for all except box cars
Truck frames	Arch type for box cars
Wheels	700-lb., for general service cars

RAILROAD STRUCTURES.

ALTOONA, PA.—The wheel foundry shop of the Pennsylvania, which has been in use for the past 30 years, is to be torn down and the site is to be used for a large boiler shop. Contracts for the new shop are to be let this fall.

DECATUR, ILL.—The Wabash, it is said, has recently given an order to put up a new roundhouse and machine shops here.

RUTHERFORD, PA.—The Philadelphia & Reading has given a contract to Augustus Wildman, of Harrisburg, to put up a brick power house on concrete foundations 56 ft. x 56 ft., a fan house 20 ft. x 24 ft. and a viaduct. The new plant will supply electric lighting for the entire yard and power and heat for the new shops. The cost of the new plant, exclusive of machinery, is about $25,000, and about $300,000 will be spent for machinery.

WASHINGTON, D. C.—Bids for furnishing material for a single-track steel railroad bridge over the Chagres river at Gamboa, Canal Zone, were recently opened at the office of the Isthmian Canal Commission. They were: Penn Bridge Company, Beaver Falls, Pa., $59,000; United States Steel Products & Export Co., New York, $62,090; Receivers for Milliken Bros., New York, $73,300; R. G. Hoffman & Co., Baltimore, Md., $77,827; Cowing Engineering Co., Cleveland, Ohio, $82,086, and Interstate Engineering Co., Bedford, Pa., $85,847. The Penn Bridge Company in addition to being the lowest bidder guarantees the earliest delivery.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

BINGHAM CENTRAL.—Incorporated in Utah with $500,000 capital to build a line about 50 miles from Salt Lake City, Utah, south to Bingham and the tributary smelting and mining districts. The officers are: A. C. Ellis, Jr., President; T. W. Sloan, Vice-President; John Welr, Jr., Second Vice-President; W. T. Gunter, Secretary, and W. F. Adams, Treasurer. R. G. Schulder is a Director, and F. A. Heinze is also interested.

CANADIAN PACIFIC.—Arrangements, it is said, are being made for the construction of the line from Kamloops, B. C., southeast via Yellowhead Pass in the Rockies, [illegible] miles. The proposed line will have a [illegible] existing line. The work will cost about $[illegible] much rock work.

The Guelph & Goderich branch from Guelph, Ont., to Goderich, 80 miles, has been opened for passenger traffic.

CHICAGO, BURLINGTON & QUINCY.—Surveys, it is said, are being made by this company for a connecting line from Fulton, Mo., northwest via Clark to Macon, on the Hannibal & St. Joseph line, 160 miles.

CLEVELAND, CINCINNATI, CHICAGO & ST. LOUIS.—This company, which has work under way straightening its lines, raising the grade and eliminating numerous curves from Indianapolis, Ind., west to Greencastle, 40 miles, expects to have the work finished by November. The work includes two triple arch cement bridges, which have been built over Big and Little White Lick creeks at a cost of $160,000. The line will be practically level. It is double-track and laid with 90-lb. rails.

FAIRMONT & SOUTHERN.—Incorporated in Pennsylvania, with $25,000 capital, to build a line from Bellington, W. Va., on the Baltimore & Ohio, the Coal & Coke and the Western Maryland, north to Pittsburg, Pa., 125 miles. Ralph Overholt, of Pittsburg, and B. F. Overholt, of Scottdale, Pa., are the principal promoters.

GEORGIA & FLORIDA.—This company, which proposes to build a number of connecting links between existing lines to complete a through line from Augusta, Ga., to Madison, Fla., has given a contract to Schofield & Sons, of Philadelphia, for part of the work. (May 17, p. 695.)

GRAND TRUNK.—This company is to start work on the Kingston, Smith's Falls & Ottawa cut-off projected from Rideau, six miles east of Kingston, Ont., north via Smith's Falls to a point a few miles west of Ottawa, on the Canada Atlantic, as soon as the railway department of the government has approved its route map.

GRAND TRUNK PACIFIC.—It is said that this company has bought the Vancouver, Westminster & Yukon's charter to build from Vancouver north to a connection with the Grand Trunk Pacific.

GREAT NORTHERN.—Double tracking of the mountain district is to be begun as soon as the surveys are made, according to a reported statement of Chief Engineer A. H. Hogeland. The work will be on the west slope of the Rockies from Summit northwest to Whitefish, 68 miles. Much of the line will be rebuilt to eliminate curves and to reduce the grade.

This company is reported building under the name of the Crows Nest Southern, from Fernie, B. C., north to Michel, 20 miles, in the Crows Nest coal country.

GREENVILLE & KNOXVILLE.—Contracts, it is said, are to be let about September 15 for extending this line to River Falls, S. C., 27 miles. The line is now in operation from Greenville, S. C., north to Travelers Rest, 10 miles. The northern terminus is to be at Henderson, N. C., 56 miles from Greenville. (May 24, p. 727.)

GUELPH & GODERICH.—See Canadian Pacific.

ILLINOIS TRACTION.—The McKinley Interurban Electric Railway has made arrangements to enter St. Louis as contemplated in its original plans. At Venice the company is to have an independent terminal in connection with its new bridge over the Mississippi river from Venice to the foot of Salisbury street, St. Louis. The company has ground for yards, terminals and stations at Salisbury street in St. Louis, and adjacent to the stock yards at Venice. The land, on both sides of the river, is situated at the approaches of the proposed bridge. The Venice City Council has granted the company right of way over a mile of city streets, also over a mile of private property for the bridge approach. Work is to begin on the bridge piers as soon as possible. (May 10, p. 663.)

JOPLIN & PITTSBURGH (ELECTRIC).—This company, incorporated last spring in Missouri with $5,000,000 capital, is expected soon to take over the properties of the Pittsburgh Railway & Light Company of Pittsburgh, Kan., operating 32 miles of electric roads, and the Joplin & Pittsburgh Street Railway Company, the latter having under construction a line to Joplin, Mo., about 48 miles. The new owners propose to build 26 miles of railroad to connect the Pittsburgh lines with the Joplin lines. (June 28, p. 949.)

JOPLIN & PITTSBURGH STREET RAILWAY.—See Joplin & Pittsburgh.

KINGSTON, SMITH'S FALLS & OTTAWA.—See Grand Trunk.

MEDINA, BATAVIA & ONTARIO (ELECTRIC).—Work has been begun on this proposed electric line. There are to be two divisions, one from Olcott, N. Y., northeast eight miles to Somerset, along the lake shore, through Niagara county, and the other from Olcott southeast to Medina and thence to Batavia 30 miles. The line has been projected for several years.

Mexican Central.—An officer writes that on the Tampico Short Line only about 191 miles remains to be built, 50 miles of which is under contract (from the Panuco river south), and that no bids are being asked for the remainder of the work. The line as located from the City of Mexico to Tampico will be 304 miles long; of this 142 miles, from Tampico to the foot of the plateau, will have a .5 per cent. grade, and on 54 miles the maximum will be 2.5 per cent., with 8 deg. curves. The report that the line is eventually to be extended to the United States border at Matamoras, where a bridge is to be built over the Rio Grande river to Brownsville, Tex., has no official confirmation. (May 3, p. 631.)

Pagosa Springs & Del Norte.—Incorporated in Colorado to build a line from Juanita, in Archuleta county, north to Pagosa Springs, thence northeast via Mineral county to Del Norte, 70 miles. Both of these places are on the Denver & Rio Grande. The incorporators include: Former State Treasurer Whitney Newton, H. N. Hawkins and F. Richardson.

Pittsburg, Binghamton & Eastern.—Announcement is made that the permanent location of this proposed line, under construction from Binghamton, N. Y., to Clearfield, Pa., 225 miles, has been made. From Binghamton the route is west through Owego, Sayre, Pa., thence southwest via Athens, Towanda, Canton, Williamsport, Jersey Shore, Lock Haven and Renovo, following closely the Susquehanna river to Clearfield, where connection is made for Pittsburg with the Buffalo, Rochester & Pittsburg. The grades are very light. (March 15, p. 390.)

Pittsburgh Railway & Light Company.—See Joplin & Pittsburgh.

Southern Pacific.—This company has recently laid track from West Port Arthur in to the city of Port Arthur to the site of its docks and prospective terminal. The company owns 160 acres of land along Taylors bayou, giving over a mile of water front, where a depth of 25 ft. of water is to be had.

On the 85-mile Alexandria branch of Morgan's Louisiana & Texas, 75-lb. rails are being laid to replace the present 60-lb. The work has been finished from Lafayette, Ala., north to Washington, 28 miles.

Sulphur, Colgate & Southeastern.—Surveys are being made by this company, organized to build a line from Sulphur, Ind. T., east through Hickory, Pontotoc and Colgate, thence southeast to Paris, Tex., about 150 miles. The Commercial Club of Hickory guarantees a terminal at that place and residents of Sulphur will pay part of the cost of the survey.

Tidewater Electric.—This company, reported to have secured valuable franchises in Gadsden, Birmingham and Tuscaloosa, Ala., has increased its capital from $100,000 to $150,000. The city of Bessemer ordered work on the line to be commenced September 2, or the franchise was to be forfeited. A time limit to commence work in Birmingham also exists.

Tonopah & Tidewater.—This road was opened for business September 1 to Death Valley Junction, Cal., 121 miles north of Ludlow. Also a branch from Death Valley Junction to Lila C, seven miles. The main line is being extended as rapidly as possible to Gold Center, Beatty and Rhyolite, Nevada.

Vancouver, Westminster & Yukon.—See Grand Trunk Pacific.

Wyoming Roads (Electric).—A franchise has been granted to W. J. Baker, President of the Northern Colorado Power Company, to build an electric line from Cheyenne, Wyo., northwest five miles to Fort Russell. Work to be begun by December.

RAILROAD CORPORATION NEWS.

American Light & Traction Company.—This company is offering to its stockholders for subscription at par $1,500,000 6 per cent. collateral notes payable in two, three or five years and convertible into either common or preferred stock at par.

Boston & Maine.—Results of operation for the year ended June 30, 1907, were as follows:

Gross earnings	$41,125,256	Inc.	$1,911,054
Operating expenses	30,968,397	"	1,615,029
Net earnings	$10,156,859	Inc.	$296,025
Other income	701,359	"	82,274
Gross income	$10,861,218	Inc.	$378,299
Interest, rental and taxes	8,233,237	Dec.	61,177
Net income	$2,627,981	Inc.	$439,776
Sinking fund payments	28,785	Dec.	107,500
Balance available for dividends	$2,599,196	Inc.	$547,276
Dividends of 7 per cent. on common and 6 per cent. on preferred	1,973,332	"	138,686
Additions and betterments charged to income	193,249	"	493,249
Surplus	$432,615	Dec.	$84,659

Central of Georgia.—The following committee has been appointed to protect the interests of the holders of the preference income bonds: C. Altschul, of Lazard Freres; R. Walter Levy, of Maitland, Coppell & Co., and Ernest Groesbeck, of Groesbeck & Co., all of New York; William Scott, of Scott & Stringfellow, Richmond, Va., and J. F. Minis, of Savannah, Ga. The bondholders contend that the company has earned the full 5 per cent. dividends on all three classes of these bonds, although the income account for the year ended June 30, 1907, shows only $33 surplus after paying 5 per cent. on the first incomes and 3.729 per cent. on the second incomes, nothing being paid on the third incomes. It is claimed that the earnings of the Ocean Steamship Co., a subsidiary of the Central of Georgia, should be used to help pay interest on the income bonds; also that about $263,000 should be charged to capital account instead of to income, and that $150,000 is being held to satisfy lumbermen's claims for overcharges in a case pending. This latter sum has been charged against earnings of the past year, although the case has been in the courts for the last three years.

Chicago, Rock Island & Pacific.—A quarterly dividend of 1¾ per cent. on the $74,854,100 capital stock has been declared payable October 1; this makes 5¼ per cent. paid so far this year. The rate in 1906 was 6 per cent., in 1905, 6¼ per cent., and in 1904, 8¼ per cent.

Colorado & Southern.—See Denver & Interurban.

Denver & Interurban.—This company, a subsidiary of the Colorado & Southern, has made a first mortgage to the Guaranty Trust Company, New York, securing an issue of $1,250,000 6 per cent. bonds of 1937. The road is under construction from Denver, Colo., to Louisville Junction, 16 miles, and will include two Colorado & Southern lines from that point to Boulder, each about 28 miles long, which are to be electrified.

Erie.—Results of operation for the year ended June 30, 1907, were as follows:

Miles operated	2,169	Inc.	18
Gross earnings	$53,914,827	"	$3,912,195
Operating expenses and taxes	38,167,039	"	2,294,202
Net earnings	$15,747,788	Inc.	$1,617,991
Other income	475,022	Dec.	62,275
Gross income	$16,222,810	Inc.	$1,555,712
Fixed charges	10,319,152	"	668,697
Net income	$5,903,658	Inc.	$887,015
Additions and improvements	1,642,029	Dec.	284,944
Balance available for dividends	$4,261,629	Inc.	$1,171,959
Dividends:			
4 per cent., 1st preferred	$1,915,696		
4 per cent., 2d preferred.	640,000		
	2,555,696		
Surplus	$1,705,933	Inc.	$1,171,959

Los Angeles Pacific (Electric).—It is understood that a mortgage for $20,000 has been made to the Southern Trust Company, Los Angeles, to secure an issue of that amount of bonds, of which $12,000,000 will be used to retire outstanding bonds and the remainder for improvements. The company owns 107 miles of road from Los Angeles to the Pacific ocean, with branches. The improvements include extensions, new rolling stock and power stations, and rock ballasting and relaying the whole line with 90-lb. ralls.

Michigan Central.—See St. Joseph, South Bend & Southern.

Ohio Electric Railways Company.—The capital stock of this company has been increased from $100,000 to $25,000,000, half of which is preferred. The dividend rate on the preferred stock is to be 2 per cent. in 1908, 3 per cent. in 1909, 4 per cent. in 1910, and 5 per cent. thereafter. The company is to be a merger of the Schoepf properties, including:—the Cincinnati Northern Traction, the Lima & Toledo Traction, the Indiana, Columbus & Eastern Traction, the Columbus, Buckeye Lake & Newark Traction, the Columbus, Newark & Zanesville Electric, the Dayton, Springfield & Urbana Electric, the Urbana, Bellefontaine & Northern, the Columbus, London & Springfield and the Columbus, Grove City and Southwestern. It is said that the new stock has been subscribed to by Cincinnati and New York interests and that the merger will be completed within two months.

St. Joseph, South Bend & Southern.—The regular semi-annual dividends of 2½ per cent. on the $250,000 preferred and 1 per cent. on the $500,000 common stock have been declared, and also an extra dividend of half of 1 per cent. on the common stock. The same extra dividend was declared in 1905, but not in 1906. The road runs from South Bend, Ind., to St. Joseph, Mich., 39 miles, and is operated by the Michigan Central.

Toledo Railway & Terminal.—According to the report of the Special Master, the recent foreclosure sale of this property brought $2,000,000. The principal and interest on the bonds, together with the expenses of the foreclosure proceedings, amounted to $3,865,921.

RAILROAD GAZETTE

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CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.

ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

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CONTENTS

Vol. XLIII., No. 11. Friday, September 13, 1907.

We reprint this week, by permission from the *Quarterly Journal of Economics*, a remarkable paper by Professor Mitchell, of the School of Commerce, Accounts and Finance, of New York University. The author has given a scholarly and thorough history of the Union Pacific and the growth of its financial operations, and has covered his subject far more fully than it has ever been covered before. In this period of rapid corporate expansion the story of the last ten years of Union Pacific development has been partially obscured by the multitude of other interesting events which have forced themselves upon the observer's attention. It is highly important therefore, that the salient facts of this development should be placed upon record, and we congratulate Professor Mitchell upon the manner in which he has performed the task.

The butting collision of electric cars near Charleston, Illinois, August 30, resulting in the death of 14 persons, is charged by a coroner's jury to the negligence of both motormen. As a number of passengers testified that there appeared to have been time for a material reduction of the speed of the passenger car, the motorman of that car may perhaps be justly blamable, for it is said that he, as well as the other motorman, jumped off without so much as turning off the power; but the other car—an express car, not a passenger car—was running on the time of the passenger car, and the real fault lies at the door of the man who was responsible for this irregular use of the track. A motorman may, indeed, be blameworthy for wasting a few seconds in an emergency, when he ought to apply brakes instantly, but as the ability to *save* seconds when one is facing danger is not an art that can be taught by the superintendent or prescribed by a court, it is puerile to talk of punishing by law a man who lacks such ability. The reports indicate that the superintendent or despatcher told the man in charge of the express car to keep out of the way of the passenger car, but failed to add that the passenger car was, on that day, on account of a fair, making round trips every 30 minutes instead of one in 45 minutes, as was customary. These instructions were given over the telephone line and were not written down. This collision will doubtless confirm in their objection to the telephone those railroad officers who hold that it is not a safe means of transmitting train orders; but it seems quite clear that the fault was not with the mode of communication, but with the failure to have orders written out, repeated and approved after repetition. Intrusting an order to one man (the motorman alone), instead of to two, appears also to be a fault of the system practiced on that road. In short, the same bad practices would have been almost or quite as easy with the Morse telegraph. It is not the telephone that has developed the weakness of the despatching system. The only safe system is the block system.*

W. A. Garrett, President of the Seaboard Air Line, acting as arbitrator in the matter of freight car service on the Long Island Railroad has decided that after November 1 the "switching reclaim" by which that short terminal railroad is now partly recompensed for the excessive cost and delay incident to moving freight on its Brooklyn lines shall be abolished; and that in place of it freight rates shall be readjusted so as to give that company $2.35 a car more than it now receives. This amount equals 50 cents a day for 4.7 days, which the records show to be the average time occupied by each loaded car moving in switching service on the Long Island tracks in the Greater New York district. This is an eminently wise decision. It is based on the only rational plan of adjusting the car service rate to the transportation rate. Car service rates must be as nearly uniform as possible in order to keep the clerical machinery of the car-record offices in working order. A sufficient number of exceptions to a uniform rule would cause the whole scheme to break down. And to be uniform the rate must necessarily be arbitrary. To base the car service rate either on the cost of the service or on what the traffic would bear, would result in almost as many rates as there are transactions; that is to say, scores or hundreds of different rates on the same car withiu the same year. The car service rate being arbitrary, the only way to make adjustments where it is burdensome is to increase the price for the work done by the cars. The only practicable and rational relief from the arbitrariness of the interchange car-service rate is for each of the roads participating in a joint service to furnish its fair share of the cars to be used in that service. Such an adjustment is not perfect, but it is the best that has yet been thought of. If a road cannot or does not furnish its share of the cars it is face to face with the problem of increasing its charge to shippers, if necessary, to compensate for the extra cost of doing business with hired cars. Mr. Garrett's decision is dated August 22, and is published in the September issue

*On the application of the two companies Judge Craig, at Mattoon, Ill., Sept. 5, appointed W. P. Avey receiver for the Central Illinois Traction Company and the Mattoon City Railway Company. It was on the Central Illinois line that the collision occurred, but the two companies are controlled by the same men and work together. E. A. Potter, of Mattoon and Chicago, is president of each line, and Judge Peter S. Grosscup, of the United States Circuit Court, is the principal stockholder in the two companies.

of the *Railway Equipment Register*. He was chosen by the Long Island Railroad and the General Managers' Association of New York City. The chairman of this association is Vice-President Besler of the Central of New Jersey, and the secretary is W. F. Allen. Mr. Garrett's decision is short and logical. He first shows that the Long Island Railroad participates in the through rate, and therefore should not be allowed a reclaim on freight cars. Reclaims have been allowed there for five years; but, according to the rule, they are intended only for cars which are switched by roads not participating in the joint freight rate. He then quotes from a statement of Chairman Hale that the reclaim, an arbitrary arrangement, is often unsatisfactory and always unscientific. Mr. Hale believes that "the day will come when all switching reclaims can be wiped out and the transportation rates revised to cover real terminal expenses." The New York, New Haven & Hartford delivers freight at Long Island City and the Long Island Railroad there accepts it and adds its own local rate. Why cannot other roads adopt this plan? But, whether they do or do not, the only way to settle this question and settle it right, is to do whatever is possible to carry out Mr. Hale's prediction; and that is the gist of Mr. Garrett's verdict.

The notice, which was given by the New York, New Haven & Hartford last June that it would withdraw from the Per Diem Rules Agreement October 1, was still in force at last accounts; and all efforts at a compromise on the rate to be charged for interchanged cars having been thus far fruitless, the western connections of the New Haven have given it notice that after the withdrawal becomes effective, freight for its lines will be received, transported and delivered as heretofore, unless declined by the New Haven company; but that on cars thus delivered to the New Haven road "you will be charged such sum per day as is reasonable for the use of each car for the period the same shall remain on your lines; and payment thereof will be insisted on accordingly." The committee appointed on behalf of the American Railway Association to negotiate with the New Haven consisted of Messrs. Atterbury, of the Pennsylvania; Smith, of the New York Central, and Hale of the Baltimore & Ohio. This committee suggested that the questions at issue be arbitrated, but the New Haven declined and made the alternative proposition that it should be allowed two days' reclaim, beginning October 1 and continuing until the road has received 8,500 new cars which it has ordered; after the receipt of these cars the other roads to accept a sufficient number of New Haven cars to equalize the per diem payments, this arrangement to continue for one year. The New Haven has ordered 17,000 cars to be delivered by May 1, next. The committee declined this proposition and proposed instead that the connecting roads agree to begin at once to equalize equipment on a monthly basis, leaving all questions concerning the per diem rate to arbitration. The New Haven road declined this, insisting that, until its new cars could be put in service, it was entitled to some compensation. The committee then suggested to the other roads the form of notice referred to above; and this form has been adopted, we understand, not only by all of the immediate connections of the New Haven but by a number of other roads as well. This notice seems eminently fair. These roads cannot take the responsibility of obstructing the enormous movement of traffic from the West to New England over the New Haven road by requiring the goods to be transferred at New York to New Haven cars, though under the circumstances they would have the technical right to do this. In offering to let cars go through for "a reasonable sum per day" they are giving the New Haven full opportunity to show, if it can, that fifty cents a day is exorbitant. But if the burden should lie on the New Haven (as we suppose it would) to prove any rate named by the car owners unreasonably high, the New Haven would have another aspect of the case to consider; for unless all signs fail cars will be worth at least a dollar a day within the next month or two—and perhaps much more than that

The public service commission of the state of New York has issued an official interpretation of the law relating to the inspection of locomotive boilers that went into effect on July 1. It is well that this should be done, for the wording of the law is such that an overzealous and ill-informed person in authority might easily interpret it in such a way that its execution would be a burden to the railroads, as well as an impossibility. The law says in substance that these boilers shall be thoroughly inspected once every three months. If a thorough inspection were to be understood to be the removal of tubes and an inspection of the inside as well as the outside of the shell, it would probably require at least twice as many engines as are now in use to meet the requirement. As it is, the commission simply requires that the boilers shall be washed out and the staybolts inspected in the time named, and that the thorough inside and outside inspection shall be made at least once in three years. As a matter of fact it will probably appear to most of the mechanical officers of the roads affected, that the regulations for the care and inspection of boilers that have just been issued, have been taken from their own regulations on the subject. There is not a single requirement that can work a hardship in any way and, with the exception of the method of keeping the records, there will be little, if any, change in the present workings. It looks as though these regulations had been compiled from the best of those current on all of the roads. In a few instances men will find that the time of inspection has been shortened. For example, it is required that "safety valves should be tested at least once every month, and no boiler must be used over three months under any circumstances unless the safety valves have been thoroughly tested." It often happens, at present, that safety valves are not inspected and tested between shoppings, but the engineman is required to report those that do not work properly, and this means a constant supervision of the matter. Another regulation is that gage cocks and glasses shall be cleansed whenever the boiler is washed. This is often neglected, and dependence is placed on the fact that they are working and nothing further is done. It is merely an additional precaution and will require but little time to meet. In this interpretation the commission has set the stamp of its approval on the use of the tell-tale hole in staybolts and made it a requirement that cannot be omitted unless the railroad company can show very good evidence that its methods of testing are so thorough as to obviate the necessity for such a precaution. This will probably result in the universal acceptance of the hole, in spite of the fact that some still consider it useless. In the same way the methods of testing staybolts are set forth, and as these are the methods followed in the majority of cases, it will probably lead to uniform practice in this respect also. With the exception of these minor matters, which are already embodied in the practice of some roads, there is nothing in the regulations that need do more than attract a passing notice. It looks very much as though somebody was pushed to it for a law to regulate the railroads, and so one was passed that might have been construed in such a way as to be a hardship, if a wise commission had not taken it in hand and simply set up good current practice, stamped it with the seal of official approval and sent word to the railroads that they were doing well, and that if they continued in the same way there would be no occasion for complaint.

THE NOISE NUISANCE.

With the return of the season of wide-open bedroom windows come renewed complaints of all kinds of noise nuisances, and the newspapers of the past two months have contained the usual editorials and local items on the subject. The railroads come in for at least their regular share of the growling, and in some cases an increased share, this because engines are larger and louder and more numerous and also, apparently, because engine runners are flagrantly careless in the use of whistles and bells. It would seem that in the great expansion of business many superintendents have promoted firemen more rapidly than they have trained them and instances are not wanting where the discipline of the runners of a given division appears to be poorer than it was five or ten years ago.

Complaints of noise reach railroad managers in an irregular stream and usually receive only intermittent attention; so that, like some other reforms which are regarded by everybody as of secondary importance, this reform makes only halting progress. And yet every superintendent is ashamed of his noisy engineers, whenever their slipshod conduct comes under his own personal notice, and if he happens to be out on the road in his private car, or in a sleeper at night, with members of his own family, or their friends, his shame leads to brave resolves to cure the nuisance. Why, therefore, should not there by an improvement? Surely the feelings or wishes of women and invalids residing near a freight yard, and doomed to stay there 24 hours a day, and especially if they be too poor to escape by moving to some other locality, ought to have as much consideration as those of people who are troubled only occasionally. Moreover, anything that is done in this line must be managed as for an all-the-year-round campaign. Sensitive ears suffer in winter as well as in summer. To make enginemen careful

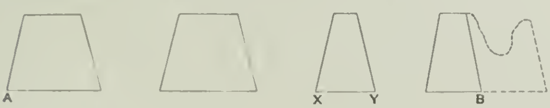
It is necessary to "surprise-check" their management of whistles, bells, air pumps and other noise producers twelve months in the year. A circular issued in the spring is not enough—is, in fact, not worth the cost of printing it, unless it is followed up by personal attention to the matter.

That the noise made by locomotives is as bad now as ever it has been before, seems a pretty safe assumption. Besides the weakness of discipline just mentioned, the increase in the size of engines and of air pumps, and in the number of trains run, helps to swell the total volume of noise. (Air pumps are often allowed to make a great deal of unnecessary noise in train sheds.) The abolition of crossing whistles where grade crossings have been done away with appears to be the only important exception to this statement. But whether the nuisance is larger or smaller it demands abatement to the fullest possible extent.

The noise made by locomotives is often great enough to be a nuisance even after everything possible has been done to lessen it, and this is the real reason why some railroad officers neglect their duty regarding it, but it is not a good reason. Following this line of argument, we should not subdue bells and pop valves around sleeping cars at night. In point of fact the respect shown for the rights of sleeping passengers is the best example we have of rational and restrained use of locomotives and their whistles and bells, and all that a superintendent needs to do, in most cases, is to enforce as good a degree of care at other times and places as he does in this particular.

The problem, therefore, is simple and we have no editorial exhortation to offer. The manager who has many engines, or even a single sleeping car, and who keeps in close touch with his road knows whether or not his passengers and his (the railroad's) neighbors are accorded as considerate treatment as he would like to have accorded to his own family. But we do wish to set forth a few flagrant instances. Some superintendents evidently do not know how great a nuisance some of their enginemen are, or else don't care. In a recent hundred mile trip on a fast train of one of the best trunk lines, the writer rode in a coach next to the engine; and, with the other passengers, was forced to listen to four long ear-piercing shrieks of the whistle at every crossing; and there were somewhere from 20 to 50 crossings. The whistle blasts were not only twice as loud and four times as long as was necessary, but were also of all sorts of lengths. The engine driver was one of those unsensitive, unmusical men who seem to have no delicate idea of time and who therefore make — ——— ——— —— and other combinations for —— —— — — with as cheerful persistency as though they were eliciting applause at every repetition.

Another experience that compelled a poor opinion of the railroad superintendent was that at a summer resort near the main line of an important railroad in Massachusetts. Although a mile from the track, outrageous whistling of the freight locomotives was noticeable day and night, particularly in the early morning and late at night. The needlessly large size of the whistles on the engines and the carelessness of the enginemen, were equally annoying. The excess, both in volume and length of sounds, may be approximately indicated by the accompanying diagrams. In both



diagrams the horizontal measurement represents time and the vertical measurement represents volume of sound. Both diagrams are designed to show two long blasts followed by two short ones, the usual whistle signal for a highway crossing. The smaller one represents the signal as given on an ordinary whistle in about two seconds' time (A B—2 seconds); the larger shows how it was usually made on these engines (A B—9 seconds), by runners who had no thought of the comfort of residents along the line, sick or well, old or young, asleep or awake. Eight or nine seconds was a common length of the crossing signal. Often they would take more time than that. Most of them, like the runner before mentioned, took little care to graduate the length of the blast according to the rule. One runner, apparently wishing to indulge his fancy or to distinguish himself by something that would seem prettily characteristic would put a flourish on at the end [illegible] what is indicated by the dotted line in the larger drawing. [illegible] at night the whistle of a passenger train—[illegible] as the whistles on the freight—was sounded continuously for about 12 or 15 seconds.

The remedy for such slovenly work, as we have [illegible], is obvious. The main question is as to how earnestly the division superintendent desires to apply it. As every energetic superintendent makes an improvement in this matter when complaint is made by his wife's sister, or by some cousin of the president of the road, it would seem to be the part of wisdom for ordinary citizens or boards of aldermen who desire to secure action, to enlist the co-operation of such relatives; or else to try to imitate their method—which is nothing more than direct appeal, persistently repeated as many times as may be necessary. It is quite certain that a city council cannot make much headway by passing ordinances, unless it is prepared to forbid all whistling; for where any at all is to be permitted it is necessary that the enginemen exercise their judgment, and defective judgment can rarely be corrected by ordinance. There is, however, one way in which city authorities can do some good, and that is by publicly recognizing the sufficiency of bells and the non-necessity of whistles, where the circumstances warrant taking such a stand. The laws of some of the states—notably Massachusetts and New York—require as a signal at highway crossings the sounding of either the whistle or the bell, but do not require both. The persistent use of the whistle, everywhere, to-day, after experience has demonstrated in so many situations the sufficiency of the bell alone, is due largely to the feeling among railroad officers that they must do more than the law requires of them. Innumerable law-suits have resulted in awards of damages to persons injured at crossings who failed to heed a reasonably loud warning, and the railroad officer in such cases has naturally determined to clear his own skirts for the future by having all warnings made unreasonably loud. He persists in this until the noise becomes intolerable to himself, unless some state or municipal authority publicly approves of an abatement of his zeal.

The most obvious lack in the remedial measures usually adopted by superintendents is their neglect to clinch their instructions. To actually effect the reasonable limitation of the use of whistles it is necessary not only to issue to enginemen an order—which will be obeyed for a short time by nearly all and thereafter by only a few—but to tell them how to carry it out and then watch and see how well they obey. Proper lengths of blasts can be put in force only by a regular teaching process. On the Fitchburg road a dozen years ago an electric buzzer was used by the instructor and men were taught by example—not by circular—that the highway crossing signal could and should be made in 2½ seconds; and at the same time they were shown that "two-long-and-two-short," meant what it said, and that four blasts of irregular lengths—with occasional two-second intervals between blasts—did not come within a mile of complying with the rule. Unfortunately, that Fitchburg superintendent went "higher up" and his graduates seem to have all died and to have left no successors. That buzzer, with the right kind of a man back of it, is needed to-day in five hundred trainmasters' offices.

Two other simple things might be done. Most locomotive whistles will give an adequate signal for a crossing, or for almost any purpose, if opened only half way. It would be easy to arrange the whistle-pull so that ordinarily it would give only a soft blast, while yet leaving the engineman free, by a more energetic movement, to pull the valve wide open. Or, a single rod or lever could be made to sound a soft and mild whistle and then, by a further stroke, to sound an additional whistle, doubling the volume of sound.

The second point is to give premiums. One of the most satisfactory details of American railroad operation is the payment of prizes in the roadway department, with the emulation and excellence thereby secured; why should not this advantage be secured in other departments? A good record in noiselessness is hard to define, in giving instructions or advice to an engineman; but with a proper incentive he will very readily define it to himself. Premiums are peculiarly adapted to secure excellence in matters which cannot be suitably described in written orders. Where good service depends, not on an improvement of knowledge or skill, but on a more lively motive, a premium is often the best or only means available. As may be noted by observing the movements of engines in any busy train shed after 10 o'clock at night, the maintenance

of a tolerable degree of quiet depends on a number of other things besides the right use of whistles; and a premium covers these other features of the problem as nothing else will. By first giving a premium—or good pay—to others to report careless or noise-loving enginemen, premiums to enginemen for clean records could be made to work an improvement in a very short time. Of course, we are not considering train sheds, or cities, particularly. Many long-suffering country people deserve to have their rights recognized.

NEW PUBLICATIONS.

Allowable Pressures on Deep Foundations. By E. L. Corthell. New York: 1907: John Wiley & Sons. Cloth, 98 pages and tables. Price, $1.25.

This book is a reprint of a paper read before the Institute of Civil Engineers, London, in 1906, which was prepared after the author had made a study of foundation pressures in connection with harbor improvement work at Rozario, Argentine Republic, in 1902-1903. The allowable pressures on the footings of a proposed quay wall resting on the tertiary sand in the bed of the Paraná river were under consideration by the advisory board of engineers of which the writer was chairman, and wide differences of opinion arising, an investigation of recent practice in this detail of design was begun. The data, obtained through circular letters to prominent engineers all over the world and from articles in the technical press, were compiled in the form of brief descriptions of important works and in a long table giving the essential details of practice. This work was done under the direction of Mr. Corthell, by C. R. Wychoff, Jr., of Columbia University. The appendix contains brief descriptions of 54 engineering structures involving deep foundation work. In the table, the data for 178 structures has been collected. The pressures per sq. ft. safely employed in different soils as shown by the tables are as follows: Fine sand, from 2.25 tons to 5.80 tons, average 4.50 tons; coarse sand and gravel, from 2.40 tons to 7.75 tons, average 5.1 tons; sand and clay, from 2.5 tons to 8.5 tons, average 4.9 tons; alluvium and silt, from 1.5 tons to 6.2 tons, average 2.9 tons; hard clay, from 2.0 tons to 8.0 tons, average 5.08 tons; hard pan, from 3.0 tons to 12.0 tons, average 8.7 tons. The average pressures given above are low and safe pressures lie somewhere between the average pressures and the maximum pressure in each case.

The Bond Buyer's Dictionary. Edited by S. A. Nelson; 1907 edition. 174 pages; 5 x 7¼ in.; cloth. Price, $2.00. S. A. Nelson & Co., Inc., 116 Nassau street, New York.

This is a compilation of facts and opinions about bonds of various sorts which Mr. Nelson has been seven years in collecting. It is largely made up of extracts from papers like the *Wall Street Journal* and the *Railroad Gazette*, and from articles by various men who are authorities on financial matters. There is little original work in it except in the editing and combination of these various materials. The book is divided into seven parts, as follows: Government Bonds; Municipal Bonds; Railroad Bonds; Real Estate Mortgage Bonds; Industrial and Public Service Bonds; Underwriting and Distributing Bonds. The most important of these is the section on Railroad Bonds. These are described under a great number of different heads which are generally in no special way related, but each a brief summary of information on one point. The book is well worth reading for any one who does not understand the principles of bond issues and bond investments, and it is a convenient collection and summary of information for all who are interested in bonds.

Self Propelled Vehicles. By James E. Homans. New York: Theo. Audel & Co. Cloth, 644 pages.

The automobile is a complex machine and to the layman difficult to understand in its workings. The multiplicity of details and the difficulty of clearly explaining in language as non-technical as possible the construction and operation of many of them make the writing of a layman's text book no easy task. The author of this book has succeeded well, however. With the aid of more than 500 illustrations and diagrams, the essential details of steam, electric and gasolene automobiles are described in simple language, easily understood. Some of the best known makes of machines are described as a whole, together with the method of operating them. One of the most interesting chapters is on the history of self-propelled vehicles from the time of Cugnot's steam wagon in 1770 down to the practical application of the high-speed gasolene motor about 1885 by Gottlieb Daimler. The book will be found particularly useful to owners of automobiles and prospective purchasers.

On the Art of Cutting Metals, by Frederick W. Taylor, M.E., Sc.D., which was the Presidential address presented at the last annual meeting of The American Society of Mechanical Engineers, has been reprinted and bound in cloth by the society, price $3. This or any other publication of the society may be had by addressing the Secretary, 29 West 39th street, New York. It is not necessary to send orders through members. None of the publications of The American Society of Mechanical Engineers are copyrighted.

CONTRIBUTIONS

A Theory Concerning the Cause of the Quebec Bridge Failure.

Chicago, Sept. 7, 1907.

To the Editor of the Railroad Gazette:

The accounts which have been published of the failure of the Quebec bridge generally refer to the slightly buckled condition of one of the lower chord members of the anchor span in the third panel out from the main post, the impression given being that this condition was the initial cause of the failure. There is no evidence to support this, other than that the member ultimately failed. To be sure this member shows evidence of being crippled by an extraordinary load, and there is no doubt that all of the members in the anchor arm were subjected to the same conditions at the instant of failure, but it so happened that this member had an initial distortion, so that at the instant of failure it absorbed the bulk of the great dynamic energy of the falling cantilever arm. The fact that the structure, as a whole, dropped vertically, points to other causes for failure than the collapse of a single member in one truss.

In all cantilever bridges with curved chords, during the process of erecting the bridge an anomalous condition arises with regard to the web members when the traveler stands out on the end of the cantilever arm. Similar conditions may arise in a finished structure, but in the Quebec bridge, at the time of the failure, this condition was intensified by the presence of two travelers on the end of the cantilever arm, and at the same time a large part of the fixed load in the floor was omitted. In other words, the condition of the loading which produces large pier moments with comparatively small shearing forces, in a cantilever arm with curved chords, develops a very critical condition in the web members near the tower unless these members are qualified to resist either tension or compression.

In the Quebec bridge, beginning at the tower, the first diagonal web member on each side of the tower is a stiff member. The remaining diagonal members to the end of the cantilever arm are purely tension members. What point is the criterion of these members for the condition existing at the time of the failure? To be sure, the designer of this bridge made a stress diagram for the conditions covering the erection of this structure, but were those conditions faithfully carried out? Did he provide for one traveler or two travelers on the bridge at the same time? Did he assume the distribution of the fixed loads correctly? Were the shipping weights of the finished members the same as the calculated weights, within reasonable limits? All these things and many more militate against him, and unless he fully appreciates the gravity of the case he will go astray. Now, what can happen if all this is not provided for? If the stress diagram shows a member near the tower just at the point of turning from tension to compression, or neutral, this member is in a very critical condition when the chords have an extreme curvature. Any departure from the loading assumed, especially at the criterion, works for or against him as the load is increased or diminished at that point. Any slight deviation may mean failure in case the member under consideration is not capable of resisting either tension or compression.

Now, what can happen in case the load on a web member is such that it cannot resist? If the member is an eye-bar and the load is compression, the member will shirk its duty and allow the bottom-chord joint to rise. This will occur simultaneously in both trusses, bringing a bending action on the chord sections, and thereby delaying momentarily the fall until they finally yield and allow the arm to drop. At the same time the tower posts will be pushed in at the bottom and pulled out at the top, dragging the anchor arm with them, so that the top chord eye-bars will be strung out on top of everything else, just as shown in the views published. To be sure, the anchor arm collapsed, but at the same time it was dragged forward, as is clearly shown by the fact that the portal now lies midway between the anchorage and the main pier where the top chord eye-bars begin.

All this argument can be answered by the designer of the bridge, who has all the data at hand, and the writer suggests that he publish a stress diagram giving the stresses in the cantilever arms to correspond as nearly as possible to the conditions existing at the time of the failure of the bridge.

J. W. SCHLAUR,
M. Am. Soc. C. E.

Which Is the Best Electric Railroad System?

New York, Sept. 9, 1907.

To the Editor of the Railroad Gazette:

Electrification is a very actual question for many railroads, and electrical engineers in general are enthusiastic in stating what electricity can do. But they have of late been talking almost too much about the advantages which one particular electric system is supposed to possess as compared with all other systems. And in view of the many widely different statements made in this connection, it is difficult for the average railroad man to form an opinion

concerning the advisability of using electricity as motive power on his road. The following is written as an attempt to assist in understanding the differences, real and imaginary, between the three rival electric railroad systems.

With few exceptions electrical engineers are distinctly given to praising their pet system as being by far the best for every purpose, and all other systems they consider impracticable, or at least uneconomical and otherwise defective. Now, the fact of the matter is, that each system has distinct advantages and disadvantages. It all depends on the viewpoint chosen. Indeed, it is very easy to prepare hypothetical cases in order to show that under certain conditions one particular system is far superior to everything else. But it is a distinct mistake to judge from such a demonstration that the particular system is the best for all railroad purposes. It is, on the contrary, an absolute requirement that each electrification problem be studied on its own merits, and that system should be adopted which best meets the special conditions under consideration. There is no such thing as a universal electric system, but an analysis of the entire electric railroad problem will give some idea as to the greater or lesser fitness of the various systems for certain different classes of service. Let us therefore first look at the foundation of the matter.

It is probably admitted to-day that it is possible to build electric locomotives to handle any traffic now handled by steam locomotives. But where does the use of electricity as motive power begin to be profitable? This seems to be quite distinctly a question of adequate return on first cost of installation.

On steam railroads the motive power equipment is concentrated in the locomotives. On an electric railroad it comprises three distinct parts—the electric power house, the conductors along the line and the locomotives. Take any railroad now operated by steam locomotives and the first cost of an electric equipment suitable for handling the same traffic will be in the great majority of cases in excess of the first cost of the present steam equipment.

Nevertheless, the use of electricity as motive power is justified in all cases where either one or all of the following conditions are fulfilled. First, where governmental action, or the willingness of passengers to pay more for electric traction, make electrification imperative or advisable; second, where the increase in traffic capacity, due to electric locomotives, makes up for the increased fixed charges on the larger investment; third, where the savings effected by electric operation are in excess of the increased fixed charges.

The first condition is exceptional and needs here no special consideration. The second condition is fulfilled on all those roads where the traffic density is nearing the limit of what can economically be handled with steam locomotives. In these cases the greater acceleration and the higher running speeds feasible with electric locomotives will make it possible to handle from 30 to 50 per cent. more traffic without adding new tracks, and the additional investment for electric equipment is generally only a fraction of what new tracks would cost. The third condition is found principally on roads with comparatively heavy grades, or with other features limiting the useful output of the steam locomotives. The greater power of the electric locomotives will make it possible to run trains over grades at the same speeds as on the level, without the use of pushers, and the savings thus effected, together with the savings due to smaller maintenance costs of electric locomotives will frequently much more than counterbalance the new fixed charges due to additional investment.

In many cases, for instance, where grade reductions are contemplated to increase the traffic capacity of any given line, two or more conditions are found together, and in such cases the use of the more powerful electric locomotives will not alone decrease operating expenses materially, but will also save the entire new investment for reducing the grades. The electric equipment will thus pay for itself over and over again.

The general problem of trunk line electrification is therefore quite distinctly the problem of finding the most powerful locomotive. Through increase in tractive power of locomotives it is possible to increase the traffic capacity of the road, or decrease the operating expenses, or both.

Now, let us see how the various electric traction systems meet this condition. There are three distinct systems: First, the well-known continuous current system, introduced into practice by the Grand Master of Electric Traction, Frank J. Sprague, on the historical Richmond road over twenty years ago, and since then successfully used on many thousands of miles of road and more recently for the important electrification work of the New York Central's New York City terminal; second, the single-phase alternating current system, brought out about five years ago by B. G. Lamme, installed during the last few years on a number of interesting interurban railroads and exemplified for the heavier work by the equipment which the New York, New Haven & Hartford has just put in service on a first section of its line between New York City and Stamford, Conn.; third, the three-phase alternating current system, thus far not well enough known in America, but successfully used in Europe for the past fifteen years, among other places for the well-known high-speed tests between Berlin and Zossen and for a recent heavy electrifications, the Simplon Tunnel, the Giovi line near Genoa, and others, the first American installation of this system being the equipment of the Cascade Division of the Great Northern now in course of construction. Each of these three rival systems comprises the three parts of the motive power equipment mentioned above—namely, the electric power house, the conductors along the line and the locomotives. In a comparison of the systems it is feasible to take up one of the parts after the other.

First the power house. With the distances to be covered in trunk line work and the amounts of power involved, it is indispensable that the power house be arranged to produce electricity at high pressures. In the continuous current system it is possible to employ several power houses along the line, each producing continuous currents at pressures up to, say 2,000 volts or somewhat more. But in general this does not prove advantageous, and the usual practice in all three systems is to have a central power house generating three-phase alternating currents at reasonably high pressures, up to, say 50,000 or 60,000 volts, according to the distance to be covered, which high pressure three-phase currents are then transformed for use on the locomotives into low-pressure currents, continuous or single-phase or three-phase, as the case may be. The size of the power house depends, above all, on the amount of energy required at the axles of the locomotives throughout the day; that is, on the weight, number and distribution of trains, on the speed at which they are moved, and on the grades they have to overcome, but furthermore also on the efficiency with which the electric energy is transmitted to the locomotives, and by them transformed into mechanical energy for the purpose of turning the wheels. As regards energy required at the axles, the three systems are pretty nearly on a par, though special conditions, such, for instance, as the use of energy made free on trains descending a grade, may sometimes favor one system over the other. On the question of efficiency of transmission much has been said and written, but not much actual data is thus far at hand. On comparatively short lines, up to, say 20 miles long, the single-phase and the three-phase alternating current systems can feed the locomotives direct from one central power house without the use of sub-stations. In such cases they are almost unquestionably more efficient than the continuous current system, which must of necessity use either sub-stations or else several smaller power houses to cover the same ground. But a very careful investigation into this matter leads me to believe that under ordinary conditions the total efficiency of the three systems is not much different, though the losses occur in each one at different points. Generally speaking the three systems may therefore be assumed to call under similar conditions for power houses of approximately the same size and approximately the same first cost.

Coming to conductors along the line, we find greater differences between the three systems. By conductors we shall understand all that is required to conduct the energy from the power house to the locomotives. To collect, say 2,000 h.p., with 2,000 volts continuous current pressure, means the handling of about 700 amperes. With 5,000 volts single-phase alternating current or 3,000 volts three-phase alternating current it means the handling of about 300 amperes. A pressure of 2,000 volts is pretty close to the upper limit for continuous current operation, while 5,000 volts is not by any means the limit for alternating current operation. The collection of anything above, say 300 amperes from an overhead line at railroad speeds, creates difficulties. It is therefore easy to see that for heavy work the continuous current system will probably be forced to use a third rail, while the single-phase and three-phase alternating current systems can use overhead wires or third rail as may best suit the conditions. For a given current density the pressure of the single-phase system has to be 1.73 times the pressure of the three-phase system. On long roads, or wherever the pressure generated in the power house differs from the pressure used in the locomotives, sub-stations are necessary. The two alternating current systems use stationary transformer sub-stations to change from high pressure to low pressure alternating currents. The continuous current system has to use rotary converter or motor generator sub-stations to convert the high-pressure alternating currents into low-pressure continuous currents. Converter sub-stations are unquestionably more expensive than stationary transformer sub-stations. The costs of first-class third rail and overhead wire installations are taken by the best authorities as being pretty nearly equal, perhaps with a slight advantage in favor of third rail. We find, therefore, that on short roads, where sub-stations are unnecessary, the first cost of the conductors along the line may be taken as being almost the same for the three systems. On longer roads, where sub-stations are required, the cost of the conducting system between power house and locomotive becomes more expensive for the continuous current as compared with the two alternating current systems, and, on account of the higher pressure required, probably also more expensive for the single-phase as compared with the three-phase system.

Coming to the locomotives, we find very material differences between the various systems. Take as examples of each kind, the New York Central continuous current locomotive, the New York,

New Haven & Hartford single-phase alternating current locomotive and the Italian Simplon three-phase alternating current locomotive. Designed and built at pretty nearly the same time and for very similar service, they may well be directly compared with one another. They are similar in that all three weigh about 95 tons and have their axles direct driven by the electric motors without any intermediary gearing. But there the similarity ends. The New York Central locomotive has four continuous current motors of 550 h.p. each, or a total of 2,200 h.p. The New York, New Haven & Hartford locomotive has four single-phase alternating current motors of 250 h.p. each, or a total of 1,000 h.p. The Simplon locomotive has two three-phase alternating current motors of 1,500 h.p. each, or a total of 3,000 h.p. The above ratings of the motors are based on the standard one hour test, accepted by electrical engineers as giving probably the fairest basis of comparison; in other words, the motors are capable of exerting the output mentioned above for one hour continuously without heating any of their parts more than 75 deg. C., which is considered a reasonable temperature for railroad motors. For short periods all of the three locomotives will be able to exert very much larger powers, the maximum output of the continuous current motors being probably about 4,000 h.p., that of the single-phase alternating current motors about 2,000 h.p. and that of the three-phase alternating current motors about 8,000 h.p. The continuous current and the single-phase alternating current motors are of the so-called "Series" type, their speed varying in inverse proportion to the load, being a maximum with light loads and dropping off as the load increases. The three-phase alternating current motors are of the so-called "Synchronous" type, and will run at any desired speed, it being immaterial whether the load increases or decreases. This may be an advantage or a disadvantage according to conditions. Structurally there is this to be said about the three types of motors. For light traffic they are probably equally reliable. For handling very heavy trains, the single-phase alternating current motor is open to objections, because its inherent characteristics make it impossible for the single-phase alternating current motor to exert while standing still a long and steady pull without serious injury to its winding. The single-phase alternating current locomotive is therefore exposed to danger if called upon to hold a heavy train on a grade or to start a train from rest in cold weather, etc. The three-phase alternating current motor is unquestionably the most robust of the three, and the entire absence of any commutators in the three-phase motor will undoubtedly be highly appreciated by all who know what it costs to maintain commutators in railroad service. But, aside from the above-mentioned limitations of the single-phase motors, it may be said that either type of electric locomotive is to-day probably at least as reliable and accident-proof as a steam locomotive. At any rate the companies manufacturing electric locomotives are strong enough to back up any guarantees they may care to give to that effect. The efficiencies of the three types of motors will probably be pretty nearly the same in general service. The continuous current motors will likely show a somewhat better efficiency where trains make frequent stops, as is the case in suburban passenger service. On the other hand, the three-phase alternating current motors will unquestionably be the most efficient for heavy grade work, because they automatically recuperate the energy made free by the trains going down grade. When the weight of locomotives is compared with the output, we find the following: Based on the one hour rating the continuous current locomotive produces 23.2 h.p. for each ton of locomotive weight, the single-phase alternating current locomotive 10.5 h.p. and the three-phase alternating current locomotive 31.5 h.p. The weight efficiency of the three types is therefore very materially different and, inasmuch as the cost is closely proportional to the weight, the same amount of locomotive power will cost most in the single-phase alternating current locomotive, less in the continuous current locomotive, and least in the three-phase alternating current locomotive, more or less in the above proportion of weights per horse power.

Having thus investigated the characteristics of the three parts comprised in any electric system, we are now in a position to judge with greater accuracy what are the chances of the three rival systems for adoption in heavy electric traction work. I repeat, it is dangerous to generalize and each case must of necessity be treated individually and in great detail. Yet it is quite permissible to draw the few general conclusions which follow:

As regards power house there is a slight advantage with the continuous current system for very short lines, and with the single-phase and the three-phase alternating current systems for medium and long lines.

As regards conductors the three systems are fairly equal for the short lines, and there is an advantage with the single-phase and the three-phase alternating current systems for medium and long lines.

As regards locomotives the three systems are equal for light trains and long runs over a fairly level profile. For heavy trains the advantages are with the continuous current and the three-phase alternating curent system. For frequent stops the advantages are with the continuous current system. For grade work the advantages are with the three-phase system.

The comparisons are admittedly crude. But they seem to confirm pretty plainly the general opinion that the particular field of the continuous current system is short distance work, both heavy and light, freight and passenger. The field of the single-phase alternating current system is long distance work of the lighter kind, such as interurban passenger service. The long distance heavy work, or the real trunk line work, is quite plainly the field of the three-phase alternating current system, both from the cost standpoint and because the three-phase system has the most powerful locomotive.

It is, of course, up to the engineer to decide whether any given road may justly be classified in one of these three categories, or whether it belongs to two or more or them at the same time. In the latter event the advantages presented by one system for part of the service may be more than counterbalanced by the advantages presented by some other system for the rest of the service. A careful and detailed investigation, considering all of the points involved, will usually bring out very plainly the system which presents the greatest advantages all around.

In any case it is well to remember that the differences between the three systems are, after all, not fundamental, but rather differences in details, just as an electric power house can be built to generate electricity by the use of a reciprocating engine, a steam turbine or a gas engine, and, aside from the differences in unit costs, the results will be pretty nearly the same in either case. It might be well, therefore, to close these lines with a word of admonition to electrical engineers in general, not to fight too much among themselves on the question of which system is the best, but rather to concentrate their forces on the supplying of general data on the electrification problem as such, so that we may all see the day brought nearer when electricity will be used as motive power on every road where it should be thus employed.

C. L. DE MURALT,
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A Detachable Voucher Draft.

BY FRANK H. CRUMP,
Assistant to the Auditor; San Pedro, Los Angeles & Salt Lake Railroad.

The present voucher draft used in settlement of accounts is objectionable for several reasons. It contains one or more awkward folds. When a large account is stated in detail one or more sheets are added, which makes a cumbersome document to pass through the banks and gives information about quantities and prices which it is sometimes not desirable to make public. The voucher draft, a drawing of which is shown herewith, has been designed in order to overcome these objections. The upper two divisions of this drawing show the statement of account and the detachable draft. The lower part of the drawing shows the bottom of the duplicate sheet which goes to the auditor. The rest of this duplicate sheet, which is concealed by the statement of account and the draft, is similar to the statement of account and is blank in the space covered by the draft. The triplicate sheet is the same as the duplicate sheet.

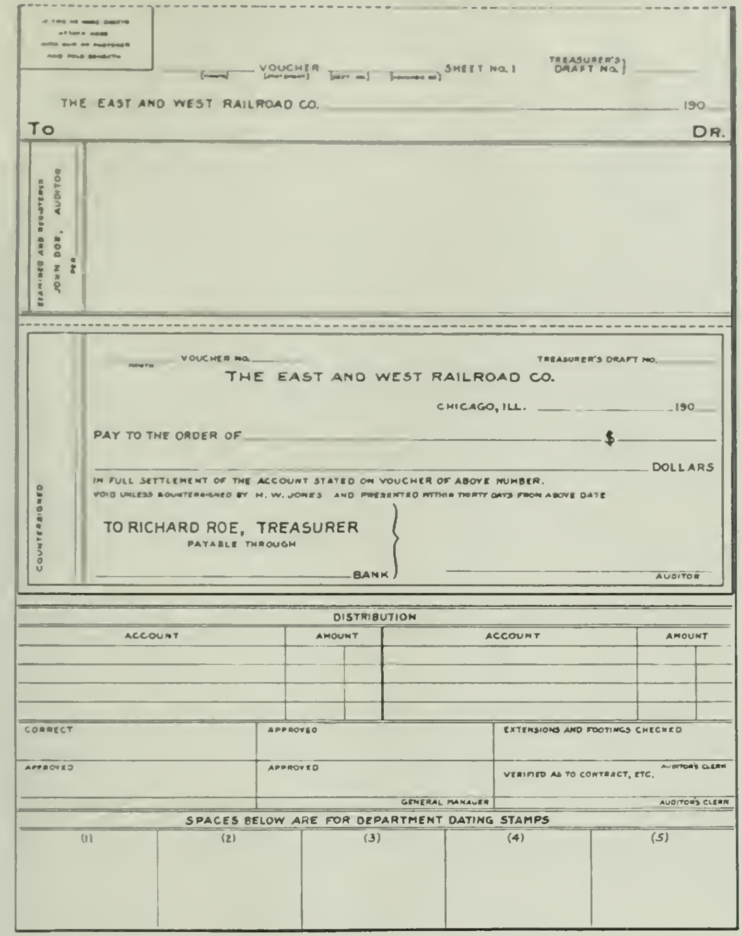
It will be noted that the original is perforated between the draft and the voucher statement, which are to be torn apart by the payor before mailing them both to the payee. On receipt of these documents the payee checks the voucher statement with his records and retains it for future reference. The draft is then deposited for collection. Under this method the banks handle a standard form of draft without any papers attached, and the statement of account, containing one or more sheets, remains with the payee. This idea of making a draft detachable is entirely new.

Many railroad companies have refused to adopt the ordinary form of voucher draft because it is likely to give disinterested persons unnecessary information. As a substitute the ordinary voucher requiring the receipt of the payee is most commonly used. This is sometimes paid by a bank check or where the information shown on the voucher is unimportant, made a sight draft by the use of a rubber stamp, reading as follows:

When properly receipted this voucher
becomes a sight draft, payable through
..... Bank.

In the first case, where payment is made by check, the bank handles the check only, but the payee has to endorse the check and also receipt the voucher. The latter the payee frequently fails to do, until a special request is made by the payor, and in many cases the original voucher is lost and duplicates are prepared and receipted. In some cases the payee cannot be located and the bank check remains as the only receipt in the hands of the payor. When vouchers are made sight drafts by a rubber stamp, it is necessary for the banks to open and examine them very carefully, and for that reason this form of voucher draft is objectionable. The new form of voucher draft can be freely used in payment of all accounts without disclosing information as to price details. Assignments, releases, contracts, deeds, agreements, etc., can be signed in the usual way and reference to them shown on the voucher statement.

As it is impracticable to show full detailed information on every



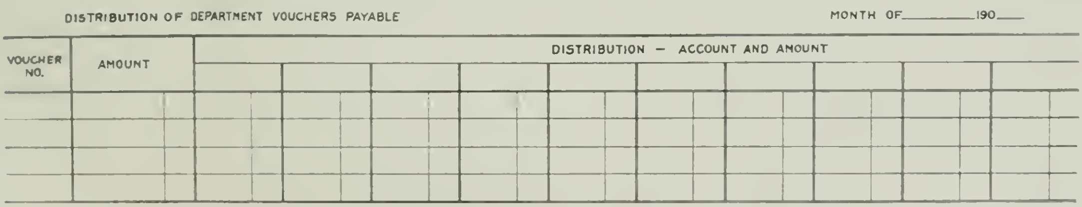
A Detachable Voucher Draft.

Original form and lower part of duplicate form are shown.

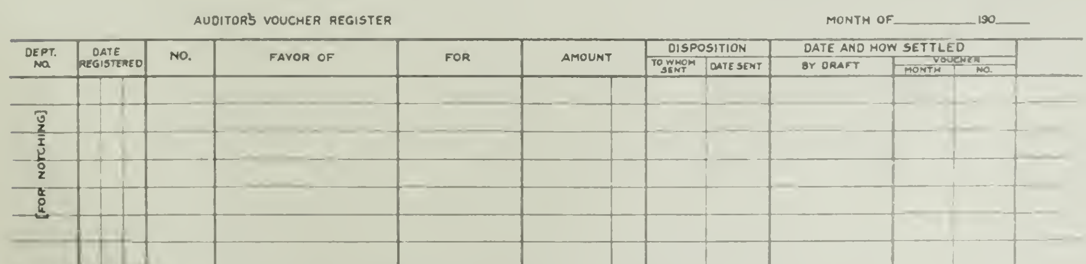
voucher [illegible] the invoice date or n[illegible] identifying the account wh[illegible] pays. The [illegible] voucher statement [illegible] way. The draft refers to the n[illegible] voucher which contain[illegible] account. The draft states explicitly that the money is received "in full settlement of the account stated on voucher of above number," thus connecting the instrument by which payment is made, with the account whose payment it covers. This is the essential feature of the new form.

At first this may seem to be a good deal of a departure from the present practice, but a moment's thought will convince under the present system when there are too many accounts to be listed on a single sheet, two or more voucher sheets are used, the total being carried forward. In such cases the receipt or draft portion on the additional voucher sheets is canceled or cut off. The receipt or draft which is used reads "In full settlement of the account stated above," when, as a matter of fact, the account is only *partially stated above*, the rest of the account being stated on a separate sheet or sheets. In the detachable voucher form the principle of identification by a number has been applied to all accounts. The account is stated on one document and the draft in payment of the account on another document, each referring to the other. The bank endorsements fully protect the payor on all drafts paid through the banks, and proper endorsement is secured on all drafts paid in cash.

In using the detachable voucher draft the department preparing the voucher fills in on a typewriter the voucher number, payee and account on the upper part, and the voucher number, payee and, in figures and in writing, the amount on the lower part. The stenographer, without removing the voucher from the machine, inserts the distribution of the expenditure in the space provided on the duplicate in plain view of all who handle the voucher. The voucher is then press-copied, which sets the ink and prevents alteration of the number, payee and amount on the statement of account and also on the draft. When designed, a triplicate copy may at the same time be made for the department pre-



Auditor's Record of Distribution of Voucher Payments.



Auditor's Register of Vouchers Paid by Detachable Voucher Draft.

paring the voucher, the duplicate being forwarded to the auditor.

The original voucher is folded over the duplicate, to which are attached all supporting papers, making a compact document which may be quickly handled by officials whose signatures of approval appear on the duplicate as the auditor's authority for payment of the account. When vouchers pass through two or more departments, the department dating stamp, which is usually shown on the back of vouchers, is on this form shown on the *face* in department order.

When the voucher reaches the auditor it is verified and registered and the signatures of the clerks who perform these duties shown in space provided. The draft is then signed by the auditor and the original voucher and draft are detached and forwarded to the treasurer.

When the treasurer is ready to pay the account the draft is numbered, dated and the name of the bank on which it is drawn inserted. The draft is then countersigned by the treasurer, cashier, teller or other authorized official. The draft portion should then be detached from the statement of account and *both* mailed to the payee. When the draft is returned through the bank paid, a bank check should be given to cover the drafts presented each day. This method of paying vouchers materially reduces and simplifies the work of the disbursing office.

The forms used for the records kept by the auditor in using detachable voucher drafts are shown herewith. The auditor's register of vouchers payable should be kept by departments, as shown on this form. The sheets should be printed on one side only, bound on the right-hand margin and notched on the left-hand margin for department number.

A separate sheet should be used for each department's vouchers, and all vouchers entered in numerical department number order, which should also be the auditor's number. Each department should keep each month's account separate and begin each month's vouchers with number "1." Each department should be assigned a department number to be used in connection with the voucher number. For example, if the store department has department number 1, all vouchers issued by that department should be numbered 1—1, 1—2, etc.

The auditor's record of the distribution of department vouchers payable is also shown. This is made up by each department which issues vouchers. This method puts each department in close touch with its own expenses and saves the auditor the labor of making a voucher distribution.

The distribution furnished by each department should be verified by the auditor with the distribution shown on each voucher, and balanced with the total vouchers issued by each department, as shown on the register of vouchers payable. As vouchers are paid, the date on which each is paid should be stamped in the column provided and at the close of the month a detailed statement made of vouchers still unpaid, which should agree with the balance "vouchers payable" on the general ledger.

The Traveling Engineers' Association Convention.

The Traveling Engineers' Association held its fifteenth annual convention at the Auditorium Hotel, Chicago, September 3 to 6, inclusive, President W. J. Hurley (N. Y. C.) in the chair. The association was welcomed by E. J. Brundage, Corporation Counsel of Chicago, representing the Mayor. W. A. Gardner, Vice-President of the Chicago & North-Western, delivered an address. The association now has a total membership of 632. The following committee reports and individual papers were presented for discussion:

1. To locate fault of engine not steaming without moving draft appliances.
2. Eliminating the smoke nuisance on soft coal burning engines.
3. Advantage of the hot water system of washing out and filling boilers.
4. Lubrication of cylinders and valves of locomotives using saturated and superheated steam.
5. Waste of energy in railroad operation.
6. Advantages of mechanical stokers as compared with hand firing.
7. What is required of the air-brake to properly control the trains of to-day and what has been done by railroads and manufacturers to meet these requirements?
8. Superheated steam and how to get good results with it in service.

There were morning and afternoon sessions on two of the four days of the meeting, so that plenty of time was allowed for the discussion of each subject. Extracts from two of the more important reports were printed last week and others will be given in a future number.

The officers for the ensuing year are: A. M. Bickel (L. S. & M. S.), President; J. A. Talty (D., L. & W.), First Vice-President; C. F. Richardson (St. L. & S. F.), Second Vice-President; F. C. Thayer (Southern), Third Vice-President; W. O. Thompson (N. Y. C.), Secretary; C. B. Conger (I. C. S.), Treasurer.

The Growth of the Union Pacific and Its Financial Operations.

BY THOMAS WARNER MITCHELL.

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At midnight of January 31, 1898, the Union Pacific Railroad system emerged from one of the most drastic reorganizations hitherto known in railroad finance. Its growth and activities since that date have also been the most remarkable, perhaps, in corporate history. An account of these will be attempted in the following pages.

Since the organization of the present Union Pacific Railroad Company in July, 1897, there have been three fairly well-defined periods in the system's development. During the first period, which extended from the date of organization to, say, December 31, 1900, the company confined its activities in the way of expansion mainly to bringing back under its control those auxiliary systems and branch lines which had been parts of the old Union Pacific, but which during the receivership period of 1893 to 1897, inclusive, had been torn out and reorganized separately. The second period began early in 1901 with the Union Pacific's attempt to gain control of Northern Pacific, and thereby a one-half interest in the Chicago, Burlington & Quincy. Growing out of this attempt, and belonging to this period, were the formation of the Northern Securities Company, the subsequent decision by the United States Supreme Court that this company was a combination in restraint of trade and illegal, and the redistribution to its stockholders of the Great Northern and Northern Pacific stock which it held. The gradual sale by the Oregon Short Line of its portion of these shares, and its subsequent large purchases of Alton, Atchison, Baltimore & Ohio, Illinois Central, New York Central, North-Western, and Chicago, Milwaukee & St. Paul stocks are the important events of the third period. Running through all three periods are the extensive activities of the Union Pacific in the betterment and equipment of the lines of its system.

I.

ORGANIZATION AND RECONSTRUCTION, 1897-1900.

A brief description of the Union Pacific system as it existed in 1893, just before the receivership, and of its subsequent dismemberment, will assist to an understanding of the events of the first period.

The old Union Pacific Railway Company was organized in 1880 as a consolidation of the still older Union Pacific Railroad Company, whose main line extended from Council Bluffs, Iowa, to Ogden, Utah, a distance of 1,043 miles; of the Kansas Pacific Railway Company, whose main line, lying about 100 miles to the southward, connected Kansas City with Denver, Colo., a distance of 643 miles; of the Denver Pacific Railway & Telegraph Company, whose 104 miles, extending almost north and south, connected the Kansas Pacific at Denver with the Union Pacific at Cheyenne, Wyo.; and of a small branch line. These lines, aggregating 1,821.86 miles, were owned in fee simple by the Union Pacific Railway Company.

Through the ownership of $15,116,703 out of $26,244,853 of the capital stock of the Oregon Short Line & Utah Northern, and through the ownership by this company in turn of $14,508,200 out of $24,000,000 of the capital stock of the Oregon Railway & Navigation Company, the Union Pacific exercised control of the 1,425 miles of the one and 1,059 miles of the other, and gained an outlet to Portland, Ore., and the Pacific ocean. Also through the ownership of $13,251,882 out of the $32,634,482 of the capital stock of the Union Pacific, Denver & Gulf Railway, the Union Pacific exercised actual control of that company's 1,463 miles of railroad, extending the Denver Pacific from Denver southeasterly to Fort Worth, Texas.

In addition to these extensions the Union Pacific owned a majority interest in, and in many cases all of the stock of, about 25 branch lines and systems of various lengths. The largest of these were the Omaha & Republican Valley Railway, 482 miles; the Denver, Leadville & Gunnison Railway, 325 miles; the St. Joseph & Grand Island Railroad, 251 miles; the Central Branch Union Pacific, which with its leased lines aggregated 388 miles; and the Union Pacific, Lincoln & Colorado Railway, 225 miles.

Altogether the Union Pacific Railway Company controlled or owned 7,681.72 miles of railroad. In the case of the branch lines it owned not only most of their capital stocks, but in many cases a large part or even all of their bonded debt. By 1893, however, all these shares and bonds had been pledged as security for one or the other of the Union Pacific's numerous mortgage bond or note issues.

Unable to meet its obligations during the depression which then set in, the company's properties were placed in the hands of receivers in 1893. In the subsequent negotiations between its creditors great difficulty was experienced in arriving at a satisfactory adjustment of the United States government's second lien against the main lines. This difficulty delayed reorganization for several years, and in the meantime the creditors of the branch systems, for their own protection, had proceeded with independent reorganizations of their properties. The great subsidiaries—namely, the Oregon Short Line & Utah Northern, the Oregon Railway & Navigation Company, and the Union Pacific, Denver & Gulf—were each reorganized separately, together taking 4,307 miles of railroad out

of the Union Pacific system. Most of the branch lines were also either reorganized independently or given separate receivers pending reorganization. So that when on January 31, 1898, the new Union Pacific Railroad Company took possession of the properties which had been bought in for it at foreclosure sale, it found itself in possession only of the main lines which its predecessor had owned in fee simple and one or two small branches—in all (June 30, 1898) 1,849.29 miles of railroad.

Thus the Union Pacific had lost 5,832.43 miles of railroad, or by far the larger part of its system. It had also lost its connection with the Pacific ocean. Finally, it was devoid of the branch lines which are the necessary source of traffic of every prosperous railroad system. Thus arose the first great problem which confronted the new management, namely, to bring back into its system on a satisfactory basis all the important branches and feeders which had been cut off during this receivership, and to restore the company's connection with the Pacific. This task was not completed until the latter part of 1900. In fact, one of the former subsidiaries, the St. Joseph & Grand Island, was recaptured only within the last year.

The Union Pacific Railroad Company began its business in February, 1898, with an authorized capital stock of $136,000,000, consisting of $75,000,000 of non-cumulative preferred and $61,000,000 of common stock. It also had an authorized bonded indebtedness of $100,000,000, consisting of 4 per cent. 50-year first mortgage bonds. Its first balance sheet, as of June 30, 1898, was as follows:

Assets.	
Cost of railroads, equipment and appurtenances	$221,264,210
Stocks and bonds owned	2,252,962
Trust funds	199,400
Cash	6,071,810
Other current assets	1,526,295
Materials and supplies	961,485
	$232,276,102
Liabilities.	
Common stock	$61,000,000
Preferred stock	75,000,000
Funded debt	90,011,000
Interest accrued or unpaid	1,800,275
Vouchers and pay rolls	1,585,367
Reserve for improvements and equipment	1,082,774
Surplus available for dividends	1,796,686
	$232,276,102

The 1,849 miles of railroad, nearly all main line, with which the company commenced operations, constitute by far the greater portion of the first item among the assets. The valuation (namely, $221,264,210) has no special significance, merely representing approximately the par value of the new shares and bonds which were issued in exchange for the old and for other reorganization purposes. The cash cost of these lines and equipment to the Reorganization Committee has been estimated at about $81,500,000; namely, $40,255,605 paid to the United States government to extinguish its second lien, $13,645,250 paid for the securities in the sinking fund of this second lien, and $27,637,435 bid at the foreclosure sale under the old first mortgage. But these requirements were met by the issuance of mortgage bonds and preferred stock which were not accepted at par. Most of the old high-interest bonds received (in lieu of cash) 100 per cent. of their par value in new 4 per cent. bonds and a bonus of 50 per cent. in new preferred stock. The bankers received corresponding amounts of bonds and preferred stock for the cash which they were called upon to furnish to take up the government lien and for other purposes. Finally, the old shareholders, or their successors, who responded to a cash assessment of $15 a share, were given about $9,000,000 of new preferred stock for this cash, and the $61,000,000 of new common stock for their old shares. "Cost of railroads and equipment" was charged to the extent of the par value of all these securities except the $9,000,000 of preferred stock issued as a result of the cash assessment, and even this was thus charged in so far as a part of the cash was paid out for reorganization expenses as distinguished from being held as working capital. This situation will show the meaning or rather the lack of meaning, of the cost of properties as stated in a railroad balance sheet.

The Union Pacific's first great step toward regaining its lost mileage was its acquisition early in 1899 of nearly all of the stock of the newly reorganized Oregon Short Line Railroad Company, whose lines connected with its own near Ogden, and extended northwesterly to a junction with those of the Oregon Railroad & Navigation Company. All the securities which had been owned by the old Union Pacific had been pledged by it as security for one or other of its numerous collateral trust bond or note issues. The trustees of these mortgages and indentures had sold portions of this collateral from time to time during the receivership, Kuhn, Loeb & Co., representing the Reorganization Committee, being the principal purchaser. In this way, as early as December, 1897, the committee had obtained possession of $8,460,000 out of the $24,778,600 of capital stock of the reorganized Oregon Short Line Railroad company. This stock was not turned over at once to the new company, but held for its benefit by the syndicate.

In January, 1899, by which time it was seen that the company was going to be strong in earning power (it had already paid one dividend of 1½ per cent. on its preferred stock), the [illegible] ratified a proposal to increase its common stock by $27,4[illegible], and to offer the new shares in exchange for a like amount of Oregon Short Line stock. This offer was accepted by the Short Line shareholders, who paid in cash $3 with each share exchanged. These [illegible] the Union Pacific take over the stock purchased on its behalf by the Reorganization Committee and enough more to bring the total up to $26,505,300 par value. Since that time all but $10,[illegible] of the remaining Short Line stock has been acquired, so that for all practical purposes the Union Pacific and the Oregon Short Line Companies are one.

In October of the same year the Union Pacific shareholders were called upon to authorize another stock increase, namely, $25,000,000 preferred and $7,718,600 common. The purpose of this was as follows. The old Oregon Short Line & Utah Northern had held, subject to a collateral trust mortgage, $13,827,200 of the $24,000,000 of capital stock of the old Oregon Railway & Navigation Company. In the latter's reorganization this old stock was replaced by an equal amount of common stock of the new Oregon Railroad & Navigation Company, the trustees of the Short Line collateral trust bonds receiving their share. The collateral trust bonds were replaced in the new Oregon Short Line Railroad Company by an equal amount of "Income B and Collateral Trust" bonds. The latter had as security the same Navigation Company shares, together with 24,542 additional shares which were obtained in direct exchange for some of the "Income B" bonds. Thus the Union Pacific, which, as before stated, eventually acquired control of the Short Line, came into virtual possession of these Navigation Company shares.

The Oregon Railroad & Navigation Company was governed at this time by a voting trust representing the Northern Pacific, Great Northern and Union Pacific,* which, as holders of that company's preferred stock, elected two-thirds of the board of directors. By this means it was planned that the Navigation Company should be kept independent of any one system and be made to subserve the interests of all three. Why the arrangement failed to be continued is not understood. But in October, 1899, the Union Pacific offered its $25,000,000 of new preferred stock in exchange for the Navigation Company's preferred stock ($11,000,000 par value), and for the outstanding "Income B" bonds of the Oregon Short Line. These offers were accepted. In fact, it was reported that the Northern Pacific had already sold its holdings of the Navigation Company's stock to the Union Pacific. The purchase of the "Income B" bonds of course gave the Union Pacific a firmer grip upon the $16,281,400 of the Oregon Railroad & Navigation Company's common stock which served as their collateral. The $7,718,600 of new Union Pacific common shares were offered in exchange for an equal quantity (namely, the remainder) of the Navigation Company's common stock. Practically all of the latter's shares of both classes was thus acquired. This restored the Union Pacific's outlet to the Pacific northwest. Henceforth, except for certain legal purposes, the Union Pacific and its two great auxiliaries, the Oregon Short Line and the Oregon Railroad & Navigation Company, may be considered and are virtually one.

In the meantime the Union Pacific had not been idle in the work of regaining its former branch systems. As before stated, all of the old Union Pacific Railway Company's holdings in the shares and bonds of its subsidiaries had been hypothecated under one or more of its collateral trust issues. Much of this collateral, both bonds and shares, was bought in at low prices from time to time by the Harriman syndicate. When the properties of these companies were offered at foreclosure sale, the syndicate bought them in, again at low prices, and turned them over to the Union Pacific. In the latter part of 1898 the company acquired in this way the properties of the Omaha & Republican Valley, the Union Pacific, Lincoln & Colorado, the Kearney & Black Hills, and the Junction City & Fort Kearney. It also purchased, in accordance with the terms of an agreement with the reorganization committee of the Union Pacific, Denver & Gulf, the so-called Julesburg branch of that system. That company itself remained independent. In a similar manner the Union Pacific purchased, in January, 1900, the lines of the Carbon Cut-off Railway and the Echo & Park City Railway. In the latter part of the same year the lines of the Solomon Railroad and the Salina & South-western Railway were acquired. This, with the exception of the recent acquisition of the St. Joseph & Grand Island, completed the Union Pacific's task of regaining the branches of the old system which had been lost to it.

These acquisitions, together with trackage rights over 74.94 miles of other railroad, brought the total mileage operated as of June 30, 1900, by the Union Pacific Railroad Company proper up to 3,033.22 miles. All of these acquisitions were owned in fee simple by the company, and were without any lien encumbrances, having been paid for out of the cash funds in the company's treasury.

*The Great Northern and Northern Pacific had purchased a large quantity of the Navigation Company's stock in Europe. It was stated that the Union Pacific was to acquire an interest in this purchase. Whether it did or not the writer has been unable to ascertain. The financial manuals all represent the Union Pacific as being represented in the voting trust, however.

This statement may seem remarkable. The new company was fortunate from the beginning in several ways. In the first place it had a strong earning power. Its surplus income at the end of the first five months was $1,796,685. In 1899, after the payment of dividends on the preferred stock, which were commenced in September, 1898, the surplus for the year was $2,883,367, and in 1900, after paying dividends on both preferred and common stock, it was $834,183. The surplus earnings of the two auxiliary systems, which by this time were integral parts of the Union Pacific, brought this up to $7,536,737. The Reorganization Committee had started the company with a good cash working capital. In November, 1899, the old Union Pacific Railway Company, which had been kept alive pending the realization on some of its assets and the liquidation of its unsecured liabilities, declared a cash dividend upon those claims. The new Union Pacific, as the holder of some of those obligations which it had bought in at nominal prices, received $5,249,090 in this way. The $3 per share received from the holders of 265,053 shares of Oregon Short Line stock at the time of the exchange described above should not be forgotten.

The Union Pacific's expansion had been financed thus far either by the issuance of stock or out of its cash funds obtained from earnings and other income. The mileage in its system had grown from 1,849.29 miles in 1898 to 5,628.42 miles on June 30, 1901. At the same time the system's management had entered upon a policy of extensive improvements to the railroad and equipment. During the fiscal year 1900-01, according to the report, $8,516,971 was expended for betterment of the lines of the three large companies in the system and $3,571,759 for new equipment. Of the former amount, $4,498,094 represented the cost of making changes in the lines, while the remainder was spent in rectifying grades, widening embankments, laying better ballast, enlarging tunnels, building second and side track, and the like. Of the $12,000,000 used in these two ways in one year, $1,500,000 was appropriated from the surplus earnings of the year. Yet, after deducting this and paying 4 per cent., or approximately $8,000,000 in dividends on the two classes of stock, the formal surplus was still $3,678,175; $2,061,012 represented the appropriation of a "Reserve for Improvement," leaving $8,521,718 to be added to the "Cost of Railways and Equipment." In a similar manner, during the preceding year, $8,977,405 had been expended for betterments and equipment, $2,000,000 of which was charged directly against surplus income, but still leaving the latter at the figure, $7,536,737, given above.

During all this time, as intimated, the Union Pacific had been paying dividends on both its preferred and common stock. Payment of dividends on the preferred stock was commenced in September, 1898, six months after the new company had begun operations, with the distribution of $1.50 per share. The financial operations up to June 30, 1898, were as follows:

Gross earnings, Union Pacific main line	$7,670,579
Miscellaneous income	606,442
Total	$8,277,021
Operating expenses and taxes	4,534,418
Available income	$3,742,603
Fixed charges	1,945,918
Surplus exclusive of branches	$1,796,685

To this surplus was to be added $446,659 as the net results of the operations of the branch lines. Of the total free income of $2,243,344, the preferred dividend took $1,025,000, leaving $1,118,344, or more than 50 per cent., for other purposes. The percentage is respectable enough, but the absolute amount left in the surplus account represented a rather small margin, when we consider that it was the undivided profits of a large railroad system whose financial success was not yet assured.

At the directors' meeting at which the second semi-annual dividend on the preferred stock was declared, a resolution was passed which, in substance, was as follows:

> Whereas the company has been in possession of all of its main lines barely a year, and of its branch lines a less time, and is therefore without a basis of experience for determining any fair average of results for unequal years, and it is not deemed advisable to add to the bonded debt, but to continue a liberal application of surplus income to permanent improvements and additions and to such uses as will secure economy of operation and increased earning power, and thereby establish stable and permanent values for its securities and a reasonably safe minimum basis of regular dividends to its stock, be it
>
> Resolved, That we distribute $1.50 per share on the preferred stock.

The preamble contains a great deal of financial wisdom, especially for a company which had yet to work out its salvation. But it is difficult to see any logical connection between it and the conclusion, unless the directors were trying to justify themselves in paying *only* 1½ per cent. instead of 2 per cent.

In October, 1899, the semi-annual dividend on the preferred stock was increased to its maximum (namely, 2 per cent.), and in February, 1900, the company commenced paying 1½ per cent. semi-annually on the common shares. By this time the surplus earnings were so large that before deducting the appropriations therefrom for betterments and equipment they were more than double the requirements to pay the 3 per cent. per annum to the common shareholders. Accordingly, on July 31, 1900, the semi-annual dividend on this stock was increased to 2 per cent. Yet, in spite of this and in spite of deductions for improvements and equipment, the formal surplus for the year ended June 30, 1901, was $3,678,175. It will readily be appreciated that by this time the Union Pacific was in good financial condition, and possessed of a strong credit wherewith to carry on its activities of the second period of its history.

II.

THE SOUTHERN PACIFIC AND THE NORTHERN SECURITIES COMBINATION.

We may now begin an account of the Union Pacific's activities during this second period. In it the company commenced reaching out and acquiring control of railroad mileage which had not been a part of the former Union Pacific system. The two great events were the purchase of a substantially controlling interest in the stock of the Southern Pacific Company and the fight with the Hill-Morgan interests for control of Northern Pacific. It is true that Mr. Harriman and his associates had about completed their now famous Chicago & Alton deal; but, although this promoted friendly relations between the Alton and the Union Pacific, there was no formal connection between the two until a much more recent date.

In January, 1901, Kuhn, Loeb & Co., acting on behalf of the Union Pacific, purchased $75,000,000 par value of the Southern Pacific Company's stock. The total outstanding share capital of this company was $197,832,148. This purchase did not, therefore, give absolute control of that company; it represented a substantial control, however. A year later another $15,000,000 of the stock was acquired. The major portion of the original purchase was obtained by the Harriman Syndicate from Speyer & Co., of New York city. It consisted of the so-called Speyer and Huntington interests. The former was estimated by current financial writers at about $20,000,000 par value. It was accumulated a year earlier from the estates of Charles Croker and Leland Stanford, two of C. P. Huntington's former associates. The original Huntington interest consisted of 600,000 out of the 2,000,000 shares of the Southern Pacific Company. Of these 400,000 shares were left to the widow of C. P. Huntington, and 200,000 to his nephew, H. E. Huntington. Of the total Huntington interest, that portion held by Speyer & Co. at the time of this purchase was variously estimated at from 300,000 to 430,000 shares. These two blocks of stock would not account, therefore, for the entire 750,000 shares included in the purchase.

Opinion was expressed at the time to the effect that a considerable portion of this stock must have been acquired in the open market. Certain it is that Southern Pacific stock was very active just a few days previous to the announcement of the purchase. On January 29, 1901, 187,760 shares changed hands at prices ranging from $45.50 to $47 per share. During the next two days the total sales amounted to 326,000 shares at prices ranging from $46.62½ to $48.25 per share. In two days more shares changed hands than were traded in during a week before this time, and the company's stock had been one of the most active of the entire list during a period of at least two months previous to the consummation of this purchase. This does not mean that Kuhn, Loeb & Co. bought all of these extra shares. But to obtain at a fair price what was finally taken probably required a great deal of stock market manipulation on the part of their generals, involving the sale and repurchase of a large additional number of shares.*

An important question is, How was this purchase financed? Within a few days after the purchases had been consummated (they were announced on February 1, 1901), the Union Pacific advertised a new bond issue of $100,000,000. These bonds bore 4 per cent. interest, matured at the end of 10 years, and were convertible, dollar for dollar, into common stock of the company at any time before May 1, 1906. To provide for this conversion, the authorized common stock was also increased $100,000,000, but, of course, the new stock was not issued except as the new bonds were presented for conversion. The security of these bonds consisted of a first lien upon about 859 miles of the branch lines which had been acquired as described above, and the following railroad stocks and bonds:

Southern Pacific Co. capital stock	$75,000,000
Oregon Short Line, capital stock	27,334,700
Oregon R. R. & Navigation Co. common stock	7,633,500
Oregon R.R. & Navigation Co. preferred stock	9,876,200
Union Pacific Coal Co., 1st mortgage bonds	4,706,000
Leavenworth, Kansas & Western Ry., capital stock	1,000,000

The Short Line and Navigation Companies' stocks had been acquired by the Union Pacific in exchange for its own shares, as described above, and were, therefore, "free assets." All this collateral was pledged at a valuation of $87,080,400, the Southern Pacific stock having been placed at 50 per cent. of par, a little more than its market value at the time. The railroad lines were valued at $20,485,400. Altogether, security of an estimated value of $107,565,800 was pledged under this $100,000,000 bond issue. The pro-

*The financial paragraphs of that time state that the large transactions in this stock indicated a "liberal application of Wall Street laundry methods," i. e., "wash," or bogus sales. Whether this manipulation was connected with Kuhn, Loeb & Co.'s purchase of the stock or was independent cannot, of course, be known. It can only be inferred.

[illegible] of the bond sales were to be used for lawful corporate purposes."

It is noteworthy that little more than 73½ per cent of the value of the above security consisted of the Southern Pacific stock purchased. There are two partial explanations of this. In the first place that stock was not paying dividends so that the bonds would have no income behind them in case the Union Pacific should tire of the interest burden. Further, it did not represent absolute control of the Southern Pacific Company so that the bondholders could not force dividend payments even if they seized the collateral. Additional security would be needed, therefore, to render the bonds marketable on favorable terms. In the second place only $40,000,000 of these bonds were to be used to finance the Southern Pacific purchase, the other $60,000,000 being reserved for other "lawful corporate purposes." The entire bond issue was eventually subscribed by the shareholders, the subscription being underwritten by Kuhn, Loeb & Co.

The importance of this deal will readily be appreciated. It gave the Union Pacific substantial control over 9,500 miles of railroad, stretching from New Orleans to San Francisco, from San Francisco to Ogden, Utah, and gridironing the states of Texas and California. On 7,545 miles of this total the gross earnings in 1900 were $64,400,000. On only one railroad system (namely, that of the Pennsylvania Railroad Company) did the gross earnings then exceed this figure. The feeling current in financial circles of that day was that the control would result in less friction between the Union Pacific and Southern Pacific systems. The Union Pacific management, however, were careful to give out that their purpose was to insure "harmonious relations" in the interchange of traffic between their system and the Central Pacific, which, joining with the former near Ogden, connected it with San Francisco, but whose stock was owned by the Southern Pacific Company. The Union Pacific and Central Pacific had been conceived and built as one continuous line from the Missouri river to the Golden Gate, and should logically have been owned by one company. Under the separate companies, however, their relationships had at times been anything but harmonious. The Southern Pacific purchase did away with this friction. It also conferred another important benefit upon the Union Pacific; namely, steamship connection with the Orient through the Pacific Mail Steamship Company, control of which had recently been acquired by the Southern Pacific Company.

Of Southern Pacific finances we have little to do in this story. We may, therefore, seize this opportunity for disposing of them. The Union Pacific inaugurated, or, rather, continued, a very extensive betterment policy for its southern auxiliary, causing it to use all of its surplus income for a number of years thereafter for improvements and the purchase of equipment. In an analysis of that system's accounts made by White & Kemble in 1902 it was estimated that in addition to past expenditures another $40,000,000 would be needed to completely modernize the property. During the four years from 1902 to 1905, inclusive, the Southern Pacific Company expended from its earnings, in improving and better equipping its properties, the enormous sum of $33,409,611, an average of $8,352,403 a year. For the fiscal year ended June 30, 1906, after providing for dividends on its stock, the company's stated surplus was $11,118,838. Of this it acknowledges the expenditure of $6,381,775 for betterment and equipment purposes. There was a further $2,354,218 appropriated for betterments, which was charged directly to the operating expenses of the year, bringing the total appropriation and expenditure for betterments and equipment up to $8,735,993.

During these six years not only has the Southern Pacific Company appropriated its stated surplus income for these betterment purposes, but it has apparently improved its existing equipment at the expense of its operating account. This is indicated by the following facts. The average stated cost per mile run of maintaining locomotives during this period has been 9.17 cents; that of the Union Pacific was 9.82 cents. But the similar expenditures on a number of other systems somewhat similarly situated range between 6 and 7 cents per mile run. This may be interpreted in part as meaning that both the Union Pacific and Southern Pacific are pursuing the very liberal practice of sending old locomotives to the scrap heap, replacing them with more modern and expensive locomotives, and charging the entire cost of the latter to operating expenses. Again, the average stated cost per mile run of maintaining passenger cars on the Southern Pacific line has been 1.028 cents, which is well above the average of 9.1 mills on other systems. Finally, the cost of maintaining freight cars has averaged 6.99 mills per mile run as compared with a maximum of 6 mills on about 12 other systems. We may infer, then, that the Southern Pacific Company has been improving the character of its equipment, charging the difference in cost between the old and the new directly to "operating expenses" instead of to "cost of railroads and equipment." What an opportunity some financier of the future will have for capitalizing these expenditures, issuing bonds to represent them, and from the proceeds of the sale thereof declaring a 30 per cent. dividend!

Not only has the Southern Pacific Company bettered its system by the use of funds obtained in this way, but it has been [illegible] capital expenditures from funds obtained [illegible]. During the years 1903 and 1904 it borrowed from the treasury of the Union Pacific system a total sum of $2[illegible]. But [illegible] in the latter part of 1904 it was decided by the Harriman management to capitalize some of these expenditures and to obtain [illegible] from the outside with which to continue these betterment [illegible]. Accordingly the stockholders voted to create an issue of 7 per cent non-cumulative preferred stock amounting to $10[illegible], of which $40,000,000 was offered to the old shareholders for pro rata subscription at par. A part of the proceeds was used to reimburse the Union Pacific treasury. The Oregon Short Line took $18,000,000 of the new stock.

Under the policy inaugurated by the Harriman management the Southern Pacific system's net earnings increased from $2[illegible] to $37,500,000. Owing to the liberal maintenance policy, however, the operating ratio (i.e., the ratio of operating expenses to gross earnings) has not decreased, but, on the contrary, has increased somewhat. The operating ratio is taken as an indication of the economy of management, but the high ratio of the past should be followed by a lower ratio in the future if the betterment expenditures realize their purpose. The following table will show to best advantage the growth of the system's traffic and earnings

Southern Pacific System

	1901.	1902.	1903	1904.	1905.	1906.
Density of passenger traffic	108,047	124,110	124,986	140,686	141,661	152,[illegible]
Density of freight traffic	561,838	566,089	569,187	591,450	600,71[illegible]	678,513
Gross earnings per mile	$8,503	$9,012	$9,371	$9,631	$9,784	$10,78[illegible]
Operating expenses, per mile	5,324	5,824	6,305	6,459	6,406	6,827
Operating ratio, per cent	62.6	64.6	67.3	67.1	65.5	[illegible]
Net earnings per mile	$3,179	$3,188	$3,066	$3,172	$3,378	$3,956
Fixed charges per mile	2,390	2,322	2,264	2,441	2,269	2,208

By "density of passenger traffic" is meant, in technical language, the average number of passengers carried one mile per mile of road operated. Thus the figure for 1901 indicates that for each mile of road operated the company did the work equivalent to carrying 108,047 passengers one mile. A similar definition applies to the term "density of freight traffic." The enormous growth of the Southern Pacific traffic is indicated by the increase in these averages year by year. The gross earnings and operating expenses per mile have also increased, the one correspondingly, the other more than correspondingly. The management's liberal maintenance policy is indicated in the high operating ratios of 1902, 1903 and 1904. Since the last date this ratio has rapidly fallen off, possibly showing that the liberal maintenance and betterment policies have begun to have their desired effect of increasing the economy of operation. The result has been a rapid growth in the average net earnings per mile since 1903. The declaration in October, 1906, of dividends on the Southern Pacific Company's common stock will be discussed in its proper connection in the story of Union Pacific finances which will now be resumed.

The other great event of the year 1901 was the contest between the Harriman Syndicate, representing Union Pacific interests on the one side and the Hill-Morgan interests on the other, over the control of the Northern Pacific Railway. It is evident that the Great Northern and Northern Pacific wished to secure a permanent connection of the terminus of their lines at St. Paul with Chicago. Early in 1901 there arose persistent rumors that these two companies were negotiating for a lease of the line of the Chicago, Milwaukee & St. Paul. These rumors were officially denied. Yet one individual, said to be high in Great Northern councils, gave out that they were founded in fact, and that the only point to be settled was the amount of the dividend to be guaranteed on St. Paul stock. Nevertheless, the deal was never consummated. At the same time Dame Rumor had it that the Union Pacific was trying to obtain control of the Chicago, Burlington & Quincy. This, if acquired, would give the Union Pacific direct access to Chicago. It would also drain a large volume of westbound traffic through the Union Pacific outlet.

There seems to have been a substantial foundation in truth for these rumors. As explained afterwards by President James J. Hill, of the Great Northern, the success of the Union Pacific in this attempt would have shut the Great Northern and Northern Pacific out of most of the territories of Nebraska, Kansas, Missouri, South Dakota, Iowa, Illinois and Wisconsin. To prevent this, the two companies entered into negotiations with the directors of the Burlington, making proposals for the purchase of their entire property. These were successful, practically the entire $109,321,000 of the stock of the Chicago, Burlington & Quincy Railroad Company being purchased by the two companies at $200 per hundred-dollar share. The Union Pacific asked to be admitted as a participant in this purchase, but the Morgan-Hill interests refused to accede to the request, because to do so would have defeated the purpose of their move.

Mr Harriman decided to fight. Under the terms of the purchase, the Northern Pacific was to have a half interest in the control of the Burlington. If the Union Pacific could gain control of Northern Pacific, all would yet be well with its own interests. Accordingly, his bankers purchased over $60,000,000 of Northern Pacific stock in Europe and the United States. Mr Hill and his friends

found that they held about $26,000,000 of the common stock of that company. Mr. Morgan succeeded in obtaining in London and New York about $16,000,000 more. The bidding of the rival factions, together with that of the speculators who found themselves "short" of the stock, forced the price up to $1,000 a share, and precipitated the stock market panic of May 9, 1901. The result was that, after the contending parties had taken account of their holdings, the Morgan-Hill interests owned $42,000,000 out of the $80,000,000 of Northern Pacific common stock and probably $34,000,000 of the preferred stock, while the Harriman Syndicate held $37,000,000 of the one and $41,000,000 of the other.

The Union Pacific people claimed absolute control of the Northern Pacific Railway Company and through it a one-half interest in the control of the Burlington. In his stock purchases, however, Mr. Harriman overlooked one vital fact. According to the charter of the Northern Pacific Railway Company its common stockholders had the right to call in all the preferred stock for redemption in cash at par. This move was decided upon by Mr. Hill and his friends. To finance this redemption, the Northern Pacific offered its common shareholders for pro rata subscription at par $75,000,000 of 4 per cent. debentures, which were convertible, dollar for dollar, into common stock. The Harriman Syndicate received its share of these debentures, about $34,700,000, and of course would convert them into common stock. This would necessitate a similar conversion of their debentures by the Morgan-Hill faction if they were to retain their control. In the end, however, the Union Pacific party would hold only about $61,700,000 out of the new $155,000,000 of stock of the Northern Pacific.

Control of Northern Pacific was lost to Mr. Harriman and his associates, but he would still hold enough stock to make him dangerous. Consequently, a compromise was effected. This involved in the first place the formation of the Northern Securities Company to acquire as much as possible of the share capital of the Great Northern and Northern Pacific, Mr. Harriman agreeing to exchange his holdings in the latter for stock of the new company; secondly, the formation of a new Chicago, Burlington & Quincy *Railway* Company to take a 99-year lease of the existing Chicago, Burlington & Quincy *Railroad* Company's lines. The Union Pacific interests were to share with the two northern companies in the management of this new corporation, thereby being assured good treatment. At the same time the new company guaranteed the payment of 7 per cent. dividends on the old Burlington's stock, most of which had been pledged as security for the Great Northern and Northern Pacific C., B. & Q. collateral joint 4 per cent. bonds. One object of the formation of the Northern Securities Company was probably to enable the Morgan-Hill faction to resell a part of their stock without losing control of the Northern Pacific; for after the exchange the Union Pacific would hold only $82,491,000 out of over $394,000,000 of Northern Securities stock, or about 23 per cent. This would leave a wide margin for sale by the other faction.

We have finally to inquire how the Union Pacific financed these extensive stock purchases and subscriptions. The prices paid for Northern Pacific preferred and common shares are not known, but Mr. Mahl, controller of the Union Pacific system, testified at the recent investigation that the Northern Securities stock cost $79,459,691.36. Presumably, this was the sum paid for the original 781,980 shares of Northern Pacific stock which were exchanged. This is assumed to be true. Sixty millions of this were provided out of the proceeds of the sale of the convertible bond issue mentioned above in connection with the Southern Pacific purchase. The remaining funds were evidently borrowed from the banks, as is evidenced by the fact that the Union Pacific system's net floating debt on June 30, 1901, was $30,249,459 larger than it was a year before, and that for several years thereafter the company had outstanding large amounts ($28,750,000 in 1902) of "Loans and Bills Payable."

Later the Union Pacific received $41,085,000 in cash for that amount of Northern Pacific preferred shares which it held. Out of this it paid about $34,700,000 for its subscription to that company's convertible debentures, leaving about $6,300,000 of cash in the treasury. But, of course, this was not available for the financial purposes with which we are dealing. This is important, however, in that it left the net cost of the $82,491,000 of Northern Securities stock which the company eventually received at about $73,160,000, freeing the remaining $6,300,000 of the original investment for other corporate purposes.

The title to the Northern Pacific shares, and later to the Northern Securities shares received in exchange, was vested in the Oregon Short Line Railroad Company. That company issued to the Union Pacific Railroad Company in payment therefor its purchase money certificates of indebtedness amounting to $61,000,000. This transaction was merely between these two companies, and had nothing to do with the work of financing the purchase of the stock. It was probably a method of technically avoiding the laws against the combination of parallel railroad lines.

During the year 1901-02 the Union Pacific advanced $4,393,887 to future subsidiaries to aid them in constructing their lines. In June and July, 1902, it purchased an additional $15,000,000 par value of the Southern Pacific Company's stock, bringing its total holdings up to $90,000,000. These shares cost about $7,500,000. During 1903 and 1904, as we have seen, it advanced an aggregate of $20,460,927 to that company to aid it in carrying out its betterment policy. The Union Pacific also advanced to the Pacific Mail Steamship Company during the two years the sum of $5,055,311. This was to aid that company in the construction of two large steamers for the trade with the Orient.

These activities in 1903 were financed partly out of cash funds already in the treasury, partly out of current earnings, but mainly by the issuance of $36,000,000 of Oregon Short Line 4 per cent. and participating (collateral trust) bonds. That company pledged all of the $82,491,000 par value of Northern Securities stock, which it received under the terms of the compromise with the Morgan-Hill interests, as security for an equal amount of these "Participating Fours." The latter it was caused to give to the Union Pacific Railroad Company at 10 per cent. discount to take up the $61,000,000 of purchase money certificates mentioned above and for other debts which it owed to the parent organization. Thirty-one millions of these bonds were at once offered to the Union Pacific shareholders for pro rata subscription at 90 and interest, and another five millions were sold later. The proceeds were used partly for the purposes mentioned above and partly to pay off $14,500,000 of the loans contracted at the time of the Northern Pacific purchase. Thus was this purchase eventually financed in part by means of the Oregon Short Line "Participating Fours." The remainder of these bonds was never sold to the public.

In 1904 the Union Pacific embarked upon a new enterprise. This was the purchase of a one-half interest in the San Pedro, Los Angeles & Salt Lake Railway Company. This company was originated by Senator Clark, of Montana, to build a line of railroad from San Pedro on the California coast, near Los Angeles, through that city northeasterly through southern Nevada and western central Utah to Salt Lake City. Its construction and acquisition would give the Union Pacific a direct line to the fruit-growing section of southern California. In 1904 the Oregon Short Line purchased from Senator Clark a one-half interest in this line, paying therefor and for its share of advances to it for construction purposes up to June 30, 1904, the sum of $14,960,000. During the next year additional payments of $5,440,000 were made. At the same time the Oregon Short Line sold to its newly acquired subsidiary about 340 miles of its own line which stood on its books at a valuation of $7,043,994. The acquisition by the San Pedro of these lines, which extend from Salt Lake City southerly to Calientes, Nevada, relieved it from the necessity of building so much railroad. A portion of the funds required for these and the other advances of the year was obtained by the sale of $10,000,000 of Union Pacific collateral trust notes.

On March 14, 1904, the United States Supreme Court handed down a decision, affirming that of the lower court, to the effect that the Northern Securities Company was a combination in restraint of trade and illegal. It enjoined that company from collecting dividends on the Great Northern and Northern Pacific stock, and entailed the redistribution of this stock to its shareholders. This resulted in other financial measures on the part of the Union Pacific and Oregon Short Line. But another matter must be discussed before that tale is related.

It will be recalled that in 1901 the Union Pacific shareholders subscribed to a huge bond issue aggregating one hundred millions of dollars. The purpose of this issue, as before stated, was to finance the Southern Pacific purchase and to finance in part the acquisition of Northern Pacific stock. These bonds bore 4 per cent. interest, and were convertible at any time before May 1, 1906, into common stock at par. This common stock was paying at that time only 4 per cent. dividends, so that for the time being the conversion clause was not very attractive. Only $12,743,000 of the bonds were converted up to June 30, 1904. But during this time the Union Pacific's net earnings increased very rapidly, so that, despite large appropriations therefrom every year for betterments and equipment and despite the increases in dividends, large sums were left to be carried to the formal surplus account. It became evident that Union Pacific common stock was a good investment and was going to improve, especially since it possessed the entire equity in the net income after 4 per cent. had been distributed to the preferred shareholders. During the fiscal year ended June 30, 1905, there was converted a total of $56,071,000 of these bonds, and after the increase of the common stock dividend to a 5 per cent. basis in October, 1905, and to a 6 per cent. basis in April, 1906, another $32,687,000 of these bonds was exchanged. In August, 1906, only $500,000 of the original hundred millions were outstanding, and these were called for redemption.

According to the terms of the trust agreement securing these bonds, as they were converted, a proportionate amount of their underlying collateral could be released. In this way during the years 1901 to 1904, inclusive, the Union Pacific came into free possession of a considerable amount of Oregon Railroad & Navigation Company and other stock which had originally been pledged under

this mortgage. These shares could be used, if desirable, as collateral for other loans.

Again, as stated above, in 1904 the Southern Pacific Company was caused to create an issue of $100,000,000 of 7 per cent non-cumulative preferred stock, 40 millions of which was offered to its old shareholders at par. The Oregon Short Line, as the holder of $90,000,000 of its old stock, took $18,000,000 of these new preferred shares. Out of the proceeds of this stock sale, also, the Union Pacific system's treasuries were repaid the $20,460,960 which had previously been loaned to the Southern Pacific Company. As a net result, the Union Pacific system, after paying its subscription, gained $2,460,960 in cash and $18,000,000 par value in securities.

Considerable importance must be attached to the above-described activities. The possession of this Southern Pacific preferred stock as a free asset, and the freeing of the Navigation Company's common and preferred stock, gave the Union Pacific system securities which it could use as collateral for further loans, or could substitute for and thereby release securities which might be more valuable for certain purposes. The significance of this will be seen presently.

Let us return now to the main thread of our story. The method decided upon by the Northern Securities Company of distributing to its shareholders the Northern Pacific and Great Northern stock in its treasury was to give $30.17 par value of Great Northern and $39.27 of Northern Pacific* stock and $1 in Northern Securities "Stubs" for each hundred-dollar share of its own stock surrendered. If carried out, this would give the Oregon Short Line in exchange for its $24,910 shares of Northern Securities stock the following amounts of securities: Great Northern shares, $24,887,534.70; Northern Pacific shares, $32,391,215.70; Northern Securities stubs, $824,910.† These securities would come in time into the hands of the trustees of the Oregon Short Line "Participating Fours."

And thereby hangs a tale. Pending this distribution the Northern Securities Company could not collect the dividends declared upon the Great Northern and Northern Pacific stock. That being true, it could not pay dividends on its own shares. Since this was true, again, there was no income accruing to the Oregon Short Line upon the collateral, consisting, it will be remembered, of Northern Securities stock, underlying its "Participating Fours." Hence that company had to pay the 4 per cent. interest drawn by those bonds with funds derived from other sources. Those uncollectible dividends, however, were accumulating in the Northern Pacific and Great Northern treasuries and, after the completion of the above stock distribution, its share of them would be received by the Oregon Short Line. Now an important privilege accruing to the holders of the "Participating Fours" was that of sharing each year in the income received upon their collateral to the extent that this income exceeded during that year the 4 per cent. interest drawn by their bonds. There was grave danger that, when these back dividends were finally received, the holders of the bonds would insist upon being given the entire amount, notwithstanding the fact that in reality a part of them was to be set over against the interest already paid on those bonds during the legal deadlock. To avoid this, it was decided to call in these "Participating Fours" for redemption at 102½, as was permitted under the terms of the trust indenture securing those bonds.

To retire these bonds and for "other corporate purposes," the Oregon Short Line created an issue of "Four Per Cent. Refunding Twenty-five Year Gold Bonds" amounting to $100,000,000. A portion of this new issue, amounting to $42,250,000, was sold at 96 and interest, or given to the holders of the "Participating Fours" for the principal and accrued interest of their bonds at a corresponding rate. The remaining $57,750,000 was retained in the treasury of the Union Pacific Railroad Company.

According to the advertisement, the security of this new issue was to have consisted of whatever the company received in exchange for its Northern Securities holdings and of any other shares or bonds at not exceeding 80 per cent. of their appraised value. For months all holders of these bonds imagined that their security consisted of Northern Pacific and Great Northern stock and Northern Securities stubs, as described in a foregoing paragraph. When the mortgage finally appeared,‡ the investors were much surprised to find that the actual collateral consisted of the following:

Northern Securities stubs	$5,000,000
Southern Pacific Company preferred stock	18,000,000
Southern Pacific Company common stock	90,000,000
Oregon R. R. & Navigation Co. preferred stock	10,000,000
Oregon R. R. & Navigation Co. common stock	20,000,000

*A return of 1 per cent. of the Northern Securities stock surrendered because of other of the company's assets not realized upon.

†Mr. Harriman asked that he be returned the original 781,080 shares of Northern Pacific stock which he had turned over to the Northern Securities Company on the ground that, the combination being illegal, the receipt by that company of those shares was illegal, a good title to them could not pass, and, therefore, that the title to them remained in the Oregon Short Line Railroad Co. This would have given the Oregon Short Line the control of the Northern Pacific Railway Company. But his position was not sustained by the courts.

‡The Union Pacific has a peculiar faculty for issuing and selling bonds and not exhibiting the mortgage instrument until weeks or even months afterward.

No Northern Pacific or Great Northern stock was included.

The significance of the Union Pacific's bond conversions described above will now be seen. By the time the Oregon Short Line's new refunding mortgage was given out, which was not in 1905, enough of the former company's bonds had been converted into stock to release not only the underlying shares of the Navigation Company but those of the Southern Pacific Company as well. These securities were substituted under the new mortgage thereby freeing the Northern Pacific and Great Northern stock for other purposes of the system. What was done with these securities we shall now see.

III.

INVESTMENTS IN OTHER RAILROADS.

We reach now the third and most recent stage in the history of the system or in the expansion of its interests—the investments made within the last year or two in sundry other railroads not closely connected with the system itself. These investments are closely connected with the financial operations arising out of the Northern Securities combination.

It might be maintained that the funds with which the Union Pacific Railroad Company and its auxiliary have carried on their vast operations of the past few months were those obtained by means of the bond issue of 1901, but which the subsequent conversion of those bonds freed for the general uses of the company. The fact that they were embodied for a time in Great Northern and Northern Pacific stock was merely an incident, an incident, however, which had important results.

The Oregon Short Line made the following disposition of its original Northern Securities stock.† Of the $82,491,871 of these shares originally acquired, $10,000,000 was sold for $16,880,019 cash, $72,491,871 was exchanged for $21,652,089 par value of Great Northern stock, $28,182,882 of Northern Pacific stock, and $724,919 of Northern Securities stubs. These shares might have been held as an investment. The 7 per cent. dividend paid by each of the two railroad companies would yield about $3,488,448 annually. The market prices of these two stocks became very high, however. The average market price of Northern Pacific stock during 1905 was about $199 a share; for January and February, 1906, during which time over one million shares changed hands, it was about $216 a share; for the first six months of 1906 it was about $205. The average price of the Great Northern stock during 1905 was about $290 a share; during the first half of 1906 it was about $306, and the quotations were as high as $348 per share at one time. At these prices the Union Pacific holdings in these two stocks together were yielding in dividends less 3 per cent. of their market value. There were other good railroad stocks which could be obtained at prices which would yield a much larger income. Manifestly, it would be merely a plain business proposition, if there were no other reason, to sell the Great Northern and Northern Pacific shares and reinvest the proceeds in other securities. This was done.

Other motives no doubt entered. The Great Northern and Northern Pacific lines paralleled those of the Union Pacific system, and to retain their shares might entail other legal complications. Then there were the old dreams of a continuous transcontinental railroad line from the Atlantic coast to the Pacific.

According to Mr. Mahl's testimony, of the original $28,182,882 of Northern Pacific stock acquired in the exchange, $24,030,082 par value was sold for $50,166,357.95, an average of $208.76 per share; $4,152,800 had been unsold at the date of the investigation (February, 1907). Of Great Northern stock, $21,652,089 par value was obtained in the exchange for Northern Securities stock, and $3,744,400 was acquired subsequently through a subscription to new stock at par. Of this, $16,360,089 par value was sold for $49,801,576.47, an average of $304.41 per share; $9,036,400 remained unsold at the date of the investigation. The Union Pacific also received on account of its holdings in Great Northern stock 90,364 shares of that company's ore certificates, which were quoted at from $70 to $85 per share.

From these sales, it will be seen, the Union Pacific realized in cash about $116,848,000. At the same time it retained securities which, at the same prices, were of the aggregate value in round numbers of about $43,000,000. According to Mr. Mahl's statement, the original Northern Securities stock cost $79,459,691.36. Presumably, this was the cost of the 781,080 shares of Northern Pacific preferred and common stock which were purchased in the first instance. As shown above, in the subsequent redemption of the preferred shares about $6,300,000 of this investment came back to the Oregon Short Line in cash. This would reduce the final cost of Northern Securities stock to about $73,159,700. Add to this the $3,744,400 of cash subsequently paid on the subscription for that amount of new Great Northern stock, and the total investment in these securities was about $76,904,100. To represent this the Union Pacific holds in securities or has realized in cash, as shown at the

†William Mahl, controller of the Union Pacific System, at the Interstate Commerce Commission's recent investigation.

beginning of the paragraph, about $159,848,000. This represents a profit in hand and on paper of about $82,943,900, or 113 per cent.

Some wonderment has been expressed concerning the source of the funds with which the Union Pacific made its vast stock purchases of the past few months. It has been stated that this company is the most potent factor in the investment market. The above account will show the source of at least the major portion of these funds. But what has been done with them?

It was reported that in September, 1904, Kuhn, Loeb & Co. had purchased several hundred thousand shares (variously estimated at from 300,000 to 480,000) of the capital stock of the Atchison, Topeka & Santa Fé Railway Company for the purpose of obtaining for the "Union Pacific interests" a minority holding sufficient to maintain "harmonious relations" between the two systems. Later President Ripley, of the Atchison, stated that Messrs. John D. Rockefeller and James Stillman had acquired $25,000,000 of his company's stock. These shares must have been held privately, however, since the Union Pacific's report as of June 30, 1905, which contains a detailed table of all securities owned by the company, shows that no Atchison stock was included in its holdings.

During that fiscal year, however, the Union Pacific acquired $10,343,100 out of the $19,544,000 of preferred stock of the Chicago & Alton Railway Company. In December, 1903, Kuhn, Loeb & Co. issued a circular asking for the deposit, with certain designated trustees, of the Chicago & Alton preferred stock for the purpose of selling it for cash or for the notes of any one or more dividend-paying railroad companies. If notes were taken, they were to bear not less than 5 per cent. interest per annum, mature in not more than five years, and be secured by this preferred stock itself. Large deposits under this agreement were reported. On October 1, 1904, Kuhn, Loeb & Co. announced the sale of this stock at $84 per share. The purchaser was not mentioned, but presumably it was the Union Pacific, since E. H. Harriman and two of his associates in Alton finances constituted the administrative committee under the agreement. In that case the Chicago & Alton shares cost the Union Pacific about $8,688,204. During the same year the Rock Island had also acquired $18,790,000 of Alton stock, and the two companies entered into an agreement for joint alternating control of this property.*

The Union Pacific's table of stocks and bonds owned (contained in its report as of June 30, 1906) does not show extensive investments up to that time in the share capital of independent railroad corporations. The company is shown to own still $15,436,400 par value of Great Northern stock and $13,352,800 of Northern Pacific. The Alton shares represented the only additional purchases up to that time. Yet there had been extensive sales of the former two stocks, enough to decrease the book value of the company's "Stocks and Bonds Owned" to the extent of $62,493,520. This is an enormous sum to lie idle, but it was not all idle. To represent the proceeds, the company had increased its cash on hand $13,913,318, bringing the total up to $21,258,883, its advances to other companies for construction purposes by $16,841,646, and held "Demand Loans" to the extent of $34,710,000, besides other smaller items. The last item is remarkable. As we have seen, during two former years the Union Pacific had lent the Southern Pacific Company over $20,000,000; but these were not carried as demand loans. The reader will wonder who the borrowers of this enormous amount of funds were. Were they other companies, officers of the Union Pacific, or were these funds put out on call loans in Wall street? He will be left wondering, for the company's report throws no light upon the subject.

After June 30, 1906, the Union Pacific made up for the time it had lost in the work of reinvesting its funds. According to the testimony of Mr. Mahl, the company purchased, between that date and the Interstate Commerce Commission's investigation, a mass of securities of an aggregate cost of $131,970,018.46. Summarized these consist of the following:

Acquired by the Union Pacific Railroad Company.

	Par value.	Cost.	Cost, per share.
Illinois Central R.R. Co.	$18,623,100	$32,618,883.53	$175.15
Railroad Securities Co.:			
Common stock	3,115,400	6,905,156.42	202.18
Preferred stock	1,898,400	1,917,988.42	101.03
St. Joseph & Grand Island:			
First preferred	932,000		
Second preferred	1,250,000	2,022,540.00	39.79
Common	2,900,000		
Fresno City Railway	495,650	106,110.98	21.47
Pacific Fruit Express*	1,200,000	1,200,000.00	100.00
Total	$30,712,550	$44,770,979.35	$145.77

*1% per cent. subscription to $12,000,000.

*The purchase of the greater portion of the capital stock of the old Chicago & Alton Railroad Company, made in 1899 by Mr. Harriman and three of his associates, that company's subsequent sale of a thirty two million dollar bond issue at $650 per 1,000-dollar bond out of the proceeds of which a 30 per cent. dividend was distributed to its stockholders, the recapitalization of this system through the organization of the Chicago & Alton Railway Company, the subsequent loans made to the latter company by Mr. Harriman in order to enable it to pay its preferred dividends, and the more recent consolidation of these two corporations into one—all this would make an interesting story. But to tell it would unduly extend this narrative; and, since the transactions were the private activities of Mr. Harriman and his associates rather than of the Union Pacific, a description of them has been omitted.

Acquired by the Oregon Short Line Railroad Company.

	Par value.	Cost.	Cost, per share.
Atch., Topeka & S. Fe preferred stock.	$10,000,000	$10,395,000.00	$103.95
Baltimore & Ohio: Common	32,334,200	38,801,040.00	120.00
Preferred stock	7,206,400	6,665,920.00	92.50
C., M. & St. Paul Ry. common	3,690,000	6,274,500.24	170.04
Chicago & Northwestern common	2,572,000	5,303,673.94	204.21
New York Central	14,285,745	19,634,324.93	137.44
Northern Pacific Ry.†	124,580	124,580.00	100.00
Total	$70,212,925	$87,199,039.11	$124.19
Total, both companies	100,925,475	131,970,018.46	130.76

†5 per cent. subscription to $2,491,600.

In computing the average cost, a par value of $100 a share is assumed in every case. Of the total, $45,466,960 was the cost of Baltimore & Ohio stock. Of this, it was stated by Mr. Harriman in the investigation, $36,393,432 was unpaid as yet, leaving $94,576,586 to represent the reinvestment of the proceeds of the sales of Great Northern and Northern Pacific stock. To this is to be added, possibly, the $8,688,204 paid for the Chicago & Alton shares in 1904. We have accounted in this way for $103,264,790 out of the $116,848,000 estimated above as constituting those proceeds. The Union Pacific's advances to other companies will account for the remainder.

At present rates of dividend, the annual income on all of these shares aggregates $4,693,703, which is nearly 4.55 per cent. on their cost. This is to be compared with the barely 3 per cent. which the Great Northern and Northern Pacific stocks yielded on their market value at the time of their sale. This annual income itself exceeds the total income received in dividends on those two stocks by $1,205,255. There is yet to be counted the income on the unsold Great Northern and Northern Pacific stock which would bring this excess up to $2,128,500. As before stated, the Union Pacific's sales and reinvestments were a good stroke of business.

Concerning the purchase of the Illinois Central's stock Mr. Harriman stated on the stand that control of this system was not one of the Union Pacific's motives, since control had not been acquired. This illustrates Mr. Harriman's acuteness in taking advantage of a technicality. Technically, the Union Pacific does not have control of the Illinois Central, since it owns only $18,623,100 out of the total amount issued of that company's stock—namely, $95,042,600; control of the Railroad Securities Company gives it voting power over possibly another ten millions owned by that company. But these holdings certainly give the Union Pacific a strong influence in the direction of the Illinois Central's affairs, and constitute a large nucleus about which to build up actual control of that company.

Further, Mr. Harriman's own words, as recorded in the minutes of the Union Pacific's board of directors, show that he did contemplate control of the Illinois Central when he advised the purchase of its stock. Summarized, Mr. Harriman's argument for the purchase was as follows: (1) The Union Pacific served a large grain-producing country, but had no line to the Gulf or to Chicago and the southeast; (2) the value of a system having low grades and extending from the territory north of the Missouri river to the Gulf will be enhanced by the Panama Canal; the importance of such a connection to the Union Pacific is very great; (3) the strategic value of the Illinois Central is little understood and appreciated, and its stock is bound to become much more valuable.

In the last argument Mr. Harriman might be interpreted as advising the purchase of the Illinois Central's stock for investment or speculative purposes. But there is certainly running through the entire argument the idea that the control of the Illinois Central would greatly benefit the Union Pacific on account of the latter's grain traffic. One proposition in which far-seeing railroad managers are coming to believe thoroughly is that eventually the foreign-bound grain from the Mississippi basin, and especially from the states west of that river, will move by way of the Gulf instead of the Atlantic ports. Because of this idea certain systems, notably the Rock Island and the Missouri Pacific, have been throwing lines into the Gulf ports. When this time comes, the Illinois Central will probably be the most strategically located railroad system for handling this grain traffic. The importance of that system to the Union Pacific in such an event can easily be seen. In the meantime its possession would give the latter an important connection with Chicago.

It was these ideas just as much as that of finding a good investment for the Union Pacific's funds which impelled Mr. Harriman to advise his company to pay $175 a share for Illinois Central stock and to buy Railroad Securities stock on the same basis. The fact that a large portion of both of these stocks was purchased from Mr. Harriman himself, and that he had acquired them at a much lower cost in years long previous, might be made the basis of criticism by his enemies. Fair consideration, however, will deprive it of any significance.

The above described stock purchases, we have intimated, might be considered to be the reinvestment of funds liberated, or rather borrowing capacity created, by the conversion into common stock of the Union Pacific's bond issue of 1901. The conversion of those bonds also made another financial measure possible. It reduced the fixed charges to the extent of $4,000,000 a year, through the conversion of an interest into a dividend claim. This, together

with the rapidly increasing earning power of the system placed the Union Pacific in a position where it could finance a part of its further capital requirements by means of the sale of preferred stock instead of bonds. The truth of this statement will be evident if one considers that although the interest charge which disappeared in the bond conversion was replaced by a much larger claim upon earnings for the payment of dividends, yet these dividends were upon common stock. Any new preferred stock which might be sold would present a claim for dividends which would be superior to that of the common stock. Such preferred stock ought to sell well, because after the conversion of those bonds a much larger portion of the net earnings would be left for dividend purposes.

It was this consideration which actuated the Union Pacific in its authorization, in April, 1905, of an increase to the extent of $100,000,000 in its preferred stock. The issuance of such stock at this time, had the capital requirements of the company necessitated the creation of some new security, would have been in accordance with a conservative and wise financial policy, for it would have economized the credit of the company. It would have left unimpaired the company's ability to issue bonds at a later date, should its need for capital funds again become pressing. However, although authorized for some unnamed "lawful corporate purposes," none of this preferred stock has been issued.

During all this time the Union Pacific had not been idle in its traffic department and in its work of building up its system internally. The growth of traffic earnings, income from investments and other sources, net income available for dividend payments, dividends, surplus income, and the appropriations therefrom for betterments and equipment are represented in the following table:

Union Pacific Operations.
(000 omitted.)

	1900.	1901.	1902.	1903.	1904.	1905.	1906.
Gross earnings	$39,148	$44,538	$47,500	$51,075	$55,279	$59,325	$67,282
Net earnings	18,952	20,201	23,311	23,735	26,253	28,954	32,020
Income from investmts. etc.	2,744	3,221	4,581	4,648	5,520	6,497	10,330
Gross income	21,695	23,122	27,891	28,383	31,772	35,451	42,350
Fixed charges	9,108	9,525	13,388	13,107	13,922	12,665	10,586
Net income	12,588	13,598	14,503	15,277	17,850	22,786	31,765
Dividends	7,744	8,420	8,197	8,333	8,333	10,087	19,532
Betterms & equipmts.	2,000	1,500	2,000	2,000	3,500	4,479	4,200
Other adjustments*	- 2,403	.....	- 220	- 5,173	+ 110	+ 385	- 125
Net surplus	5,247	3,678	4,526	—229†	6,127	8,605	8,158

*Net increase to income, +; net decrease, —
†Net deficit

The enormous increase between 1900 and 1906 of $28,134,000 in gross earnings is seen at a glance. This is nearly 42 per cent. Not less striking, the net earnings have increased $13,068,000, or 69 per cent. This shows economy in the operating department. This economy has not been secured by under-maintaining the property or equipment, however, for the Union Pacific, like the Southern Pacific, makes maintenance expenditures which are well above the average of those on other systems.

Probably the most remarkable line in the table is that representing the income from investments, loans, etc., showing an increase in this income from $2,744,000 to $10,330,000. The amount for 1906 was more than sufficient to pay half of the dividends of that year, and exceeded the entire amount of the dividends distributed in 1905. The increase in this income has been most marked within the last year included in the table, and is due in part to the commencement of dividends on Southern Pacific common stock, in part probably to the interest on the $34,710,000 of "Demand Loans" spoken of above. Owing to these increases in income and to a reduction in fixed charges in recent years, due to the conversion of the 4 per cent. bonds of 1905, the net income available for the payment of dividends has increased at an even greater rate, namely, $19,177,000, or 152 per cent.

The dividend payments have grown rapidly since 1904. This is due to two causes; namely, an increase in the rate to common stockholders and the aforesaid conversion of bonds into that stock. In September, 1905, the common stock was placed on a 5 per cent. basis. In April, 1906, it was advanced to 6 per cent. Finally, for October, 1906, it was placed at 10 per cent., the semi-annual dividend of 5 per cent. being payable 3 per cent. from earnings and 2 per cent. from the income from investments.

The manner in which this last dividend was announced has brought upon Mr. Harriman and his associates probably more deserved criticism than any other act. The boards of directors of the Southern Pacific Company and of the Union Pacific Railroad Company met in the same room at practically the same time. The former transacted its business first. The enormous growth in that company's net earnings, its directors thought, justified them in commencing the payment of dividends to the common stockholders, and accordingly that stock was placed on a 5 per cent. basis. The Union Pacific board then transacted its business, declaring the customary 2 per cent. semi-annual dividend on its preferred stock and the common stock dividend, as described above. So far all is well. But a report concerning these actions was not given out until two days afterwards. When this report should finally be given forth, both the Union Pacific and Southern Pacific stocks would rise many points, as they did rise afterwards, on the market. Here was an excellent opportunity for those with [illegible] of profits by buying these stocks at the existing prices and selling them on the advance. Whether this was actually done, no one knows but those who had this knowledge ramely, the directors of the two companies. Mr. Harriman explained the fact that two of the Union Pacific's directors were not present at the first meeting and he thought it advisable to inform them of the action before making a public announcement. This may be so, and those who were in possession of the confidential knowledge may not have used their knowledge to gain a single dollar for themselves. Yet it does not seem that the importance of giving the other two directors advance information was great enough to warrant the giving of such an *opportunity* for amassing illegotten gains.

But, after paying dividends amounting to 10 or 20 millions of dollars, the company has had vast sums left for betterments and other purposes. For instance, in 1905, $4,479,000 was spent upon or appropriated for betterments and equipment, and charged against the surplus account, yet $8,605,000 remained of the year's earnings to increase the formal surplus. In 1906, after paying $19,532,000 in dividends and after charging another $4,200,000 against the surplus account for similar purposes, it again had $8,158,000 to carry to its surplus account. This surplus, too, it must be remembered, is not kept in the form of idle cash, but is also expended upon betterments, in the purchase of additional new equipment, or by way of advances to other companies (notably the San Pedro, Los Angeles and Salt Lake) to aid them in the construction of their properties. Its use differs from the previously mentioned appropriations only in that the cost of these things is added to the "cost of railroads and equipment" account or carried as "advances for construction," *i.e.*, is treated as a capital expenditure instead of being technically classed as an expense, and deducted from "surplus income."

The financial strength, and, yes, we may even say the financial conservatism, of the Union Pacific Railroad Company are brought out in the above description. A brief restatement of certain facts will throw the policy of the Union Pacific management more strongly into relief. Mr. Harriman has enforced for this company the highest standard of maintenance for roadway and equipment of any railroad system west of the Mississippi river. The expenditure for maintenance of freight equipment until 1904 was, perhaps, somewhat below the standard set by other systems, being about 4½ mills per mile run (for freight cars) as compared with 5 to 6 mills on other lines; but the Union Pacific's expenditure on this branch of the equipment rose to 6.13 mills in 1905 and 6.87 mills in 1906—figures which are as much above the standard as the earlier amounts were below it. The expenditure for the maintenance of the passenger equipment during the last five years has averaged 1.25 cents per mile run of those cars, or more than 25 per cent. more than is expended by other western companies. To maintain the locomotive equipment, the company has allowed an average of about 9.82 cents per mile run, or 50 per cent. more than comparative statistics would indicate as necessary to keep this branch of the equipment in good operating condition. The alkaline character of the water used in the boilers over a considerable portion of the system will account for a part of the excessive allowance for locomotive maintenance, but not for all of it. These expenditures mean that, as the company's equipment wears out, it is replaced with more capacious and better equipment, the entire cost of which is charged as an expense; they mean, also, that the old equipment is sent to the scrap heap earlier in its life than is similar equipment on other systems.

In a similar manner the Union Pacific has allowed an average, during the last five years, of $1,256 per mile per annum to maintain its roadway, while other western companies have been expending only $800 and $900 per mile on their lines. These expenditures result in giving the Union Pacific an excellent roadbed and track over which to roll its traffic and an adequate equipment with which to handle it economically.*

All of these liberal maintenance allowances the Union Pacific charges as a part of the expense of operation. They are taken into account before net earnings are ascertained. Yet, in spite of their great magnitude, the company has the large net earnings indicated in the table exhibited above—earnings which are large enough to pay fixed charges of nearly $10,600,000 and the huge dividends of over $19,500,000 distributed in 1906, and still leave a surplus reserve of nearly $2,000,000 for other purposes. But to these earnings the company adds a vast sum—it was more than $10,300,000 in 1906, and will approximate $14,000,000 in 1907—received as income from investments in the stocks of other railroad systems. In fact, the Union Pacific could completely abandon the operation of its railroad lines and still receive, as tribute from the Alton, the Atchison, the Baltimore & Ohio, the North-Western, the St Paul, the Illinois Central, and the other great railroad systems whose stocks it owns, enough income to pay its fixed charges and the customary 4 per cent. dividends on its preferred stock.

*For a striking comparison between the [illegible] management policies of the Union Pacific and its great rival, the Great Northern, see the *Wall Street Journal* for June 26 1907.

Live Rail Accidents in England.

It is clear that the North Eastern does not desire to conceal its satisfaction with electric traction working. It has found it just the help that was required in meeting the electric trolley car competition which sucked away its traffic in the district about Newcastle in its pre-electric days. At the last half-yearly meeting it was shown that though the cost of electrical working had shown a slight increase caused by the running of a larger number of trains and car miles, the receipts have made a more than corresponding increase, with the result that the takings for these sections have now got back to practically what they were when the tramways began running. The length of route of running lines is 29.5 miles electrical operated on a 600-volt, direct-current system, with multiple unit control.

It will be remembered that three to three and a half years ago, when the converted lines were opened, there was some disquiet occasioned by the number of accidents that occurred through trespassers and some employees coming into contact with the third rail. The same experience was also recorded in the case of the Lancashire & Yorkshire Liverpool-Southport section. As time has worn on it has been shown that these disasters were largely due to unacquaintance with the conditions attending live rail traction. The railroad authorities took special precautions for preventing trespassers from finding their way on to the track and for the guarding of the third rail at exposed places. Additional bridges were erected in the neighborhood of certain of the crossings, and these various measures together with a better knowledge of the danger on the part of the public and railroad employees, have led to a very gratifying falling off in the fatalities.

English electrical experts are quiet again just now, but the danger of the live rail between tracks was one of their strong arguments in favor of the single-phase alternating current system. The statistics that have been officially compiled of the live rail fatalities during 1906 will not help them in that argument, whatever may be the relative merits of the two systems on other grounds. The only shock fatality—apart from those of trespassers—was to a railroad employee. The only other deaths were those of three trespassers. Of these four, one occurred on the Lancashire & Yorkshire, one on the Metropolitan District and two on the North Eastern. There were 21 persons injured, and of these 10 were railroad employees and eight were trespassers.

These four deaths and 21 injury cases in 1906 on eight electric systems may be compared with eight deaths and 20 injuries in 1904, when only three of the railroads were electrified, and it is at once clear that the better guarding of the rail, the publishing of placard warnings, better fencing, and a closer knowledge of potential danger on the part of employees and the public, have been in a great measure effectual.

Experience in England in all departments of electrical application is showing how necessary it is that the worker in the vicinity of live apparatus or conductors should be fully warned concerning the possible dangers attending his employment. An examination of recent returns shows that carelessness, recklessness and foolhardiness are responsible for far too many fatalities. It has been the custom in power stations of all kinds, and latterly on electric railroads, to circulate illustrated wall sheets and pocket pamphlets describing the most effective methods of handling a man under shock, and this is an instructive warning. The Government Department (Home Office) dealing with such matters is about to order the use of such wall sheets in all factories where electricity is used at above 130 volts continuous and 65 volts alternating.

The Connecticut Avenue Concrete Bridge at Washington, D. C.

The concrete arch bridge carrying Connecticut avenue over Rock creek gorge in the outskirts of Washington, D. C., is now nearly completed. It consists of five main arches, full centered and of 150-ft. span, and one small flanking arch of 82-ft. span at each end. With the abutments it has a total length of 1,341 ft., and the roadway is 125 ft. above the level of Rock creek. It carries a 35-ft. roadway and two 8-ft. sidewalks and is 52 ft. wide over the faces of the arch rings. The roadway is carried over the haunches of the main arches by seven spandrel arches of 14-ft. span supported on piers 3 ft. thick, the middle arch being blanked by a face wall carried up from the piers. The main arch piers are 20 ft. thick and rest on rock foundations; the abutment piers next to the flanking arches are 31 ft. thick. The arch rings are monolithic concrete without reinforcement and are 5 ft. thick at the crown. All the quoins, ring stones, mouldings, etc., are molded concrete faced with mortar and bush hammered to give the same finish as the granite balustrades and coping. In all, nearly 60,000 yds. of concrete have been used in the superstructure and 50,000 yds. of earth filling.

The Connecticut Avenue Bridge; View from the South End.

The Connecticut Avenue Bridge over Rock Creek, Washington, D. C.

The District Construction Co., of Washington, D. C., was the contractor for the superstructure. The bridge cost nearly $1,000,000, and was designed and built under the direction of W. J. Douglas, Engineer of Bridges for the District of Columbia.

Locomotive Boiler Inspections in New York State.

The Legislature of New York last spring amended the requirements for locomotive boiler inspection to read substantially as follows:

Inspection of Locomotive Boilers.—It shall be the duty of every railroad corporation operated by steam power, within this state, and of the directors, managers, or superintendent of such railroad, to cause thorough inspections to be made of the boilers and their appurtenances of all the steam locomotives which shall be used on said railroads. Inspections shall be made, at least every three months under the direction of said corporation by persons able to perform the services required of inspectors of boilers, and who from their knowledge of the construction and use of boilers and the appurtenances therewith connected, are able to form a reliable opinion of the strength, form, workmanship and suitableness of boilers, to be employed without hazard of life, from imperfections in material, workmanship or arrangement of any part. All boilers shall comply with the following requirements: The boilers must be made of good and suitable materials, the openings for the passage of water and steam respectively, and all pipes and tubes exposed to heat shall be of proper dimensions; the safety valves, fusible plugs, low water glass indicator, gage cocks and steam gages, shall be of such construction, condition and arrangement that they may be safely employed without peril to life; and each inspector shall satisfy himself by thorough examination that said requirements have been fully complied with. No boiler, nor any connection therewith shall be approved which is unsafe in its form, or dangerous from defects, workmanship or other cause. The inspector if he approve of the boiler and appurtenances throughout, shall make a certificate which shall contain the number of each boiler inspected, the date of its inspection, the condition of the boiler inspected, and such details as may be prescribed by the railroad commissioners. Every certificate shall be verified by oath and shall be filed in the office of the railroad commissioners, within ten days after each inspection, and also a copy thereof with the chief operating officer or employee of such railroad having charge of the operation of such locomotive boiler; a copy shall also be placed in a conspicuous place in the cab connected with the locomotive boiler inspected, and there kept framed under glass. The railroad commissioners shall have power to formulate rules and regulations for the inspection and testing of boilers. If it shall be ascertained by such inspection and test or otherwise, that any locomotive boiler is unsafe for use, the same shall not again be used until it shall be repaired, and made safe. Every corporation, director, manager or superintendent operating such railroad and violating any of the provisions of this section shall be liable to a penalty of $100 for each offense, and the further penalty of $100 for each day they shall neglect to comply with said provision, and the making or filing of a false certificate shall be a misdemeanor, and every inspector who wilfully certifies falsely touching any steam boiler, or appurtenance, or any matter contained in any certificate, signed and sworn to by him, shall be guilty of a misdemeanor. Any person, upon application to the secretary of the board of railroad commissioners, and on the payment of a reasonable fee shall be furnished with a copy of any such certificate.

Care of Steam Locomotives; Steam and Water Cocks; Penalty.—It shall be the duty of every corporation operating a steam railroad within this state, and of its directors, managers or superintendents, to cause the boiler of every locomotive used on such railroad to be washed out as often as once every 30 days, and to equip each boiler with, and maintain thereon at all times, a water glass, showing the height of water in the boiler, having two valves or shut off cocks, one at each end of such glass, which valves or shut-off cocks shall be so constructed that they can be easily opened and closed by hand; also to cause such valves or shut-off cocks and all gage cocks or try cocks attached to the boiler to be removed and cleaned whenever the boiler is washed out, also to keep all steam valves, cocks and joints, studs, bolts and seams in such repair that they will not at any time emit steam in front of the engineer, so as to obscure his vision. No locomotive shall hereafter be driven in this state unless the same is equipped and cared for in conformity with the provisions of this section; but nothing here contained shall be construed to excuse the observance of any other requirement imposed by this chapter upon railroad corporations, their directors, officers, managers and superintendents. Every corporation, person, or persons operating a steam railroad and violating any of the provisions of this section, shall be liable to a penalty of $100 for each offense, and the further penalty of $10 for each day that such violation shall continue. The board of railroad commissioners shall enforce the provisions of this act.

The law went into effect September 1, and on August 20 the Public Service Commission, Second district, which assumed all of the duties of the State Railroad Commission mentioned in the Act, issued complete instructions and regulations for inspecting, testing and washing locomotive boilers together with forms for making reports. The regulations are as follows:

GENERAL CONSTRUCTION AND SAFE WORKING PRESSURE.

The chief mechanical officer of each railroad company will be held responsible for the general design, construction and inspection of the locomotive boilers under his control. The safe working pressure for each locomotive boiler shall be fixed by the chief mechanical officer of the company or by a competent mechanical engineer under his supervision. The safe working pressure must be determined in accordance with calculations of the various parts after full consideration has been given to the general design, workmanship and condition of the boiler.

INSPECTION OF INTERIOR OF BOILER.

(a) *Time of Inspection.*—The interior of every boiler shall be thoroughly inspected before the boiler is put into service, and also whenever a sufficient number of flues are removed to allow examination.

(b) *Flues to be Removed.*—All flues shall be removed at least once every three years and a thorough examination made of the entire interior of the boiler. After the flues are taken out, the inside of the boiler must have the scale removed and be thoroughly cleaned.

(c) *Method of Inspection.*—The entire interior of the boiler must then be examined for cracks, pitting and grooving. The edges of plates, all laps, seams and points where cracks and defects are likely to develop, or which an exterior examination may have indicated, must be given an especially minute examination. It must be seen that braces and stays are taut, that pins are properly secured in place, and that each is in condition to support its proportion of the stress.

(d) *Repairs.*—Any boiler developing cracks in the shell shall be taken out of service at once and thoroughly repaired before it is reported to be in satisfactory condition.

(e) *Lap Joint Seams.*—Every boiler having lap joint longitudinal seams without reinforcing plates shall be examined with special care to detect grooving or cracks at the edges of the seams.

INSPECTION OF EXTERIOR OF BOILER.

The jacket and lagging shall be removed at least once every three years, and also whenever the inspector considers it desirable or necessary in order to thoroughly inspect the boiler.

TESTING BOILERS.

(a) *Time of Testing.*—Every boiler before being put into service, and at least once every 12 months thereafter, shall be subjected to hydrostatic pressure 25 per cent. above the working steam pressure.

(b) *Removal of Dome Cap.*—Preceding the hydrostatic test the dome cap and throttle pipe must be removed and the interior surface and connections of the boiler examined as thoroughly as the conditions permit.

(c) *Foreman to Witness Tests.*—When boilers are being tested by hydrostatic pressure the foreman of the shop having under his charge the repairs of boilers, or an authorized competent boilermaker, shall personally attend and assist the inspector in his examination.

(d) *Repairs and Steam Test.*—When all necessary repairs have been completed, the boiler shall be fired up and the steam pressure raised to not less than the allowed working pressure.

STAY BOLT TESTING.

(a) *Time of Testing Rigid Bolts.*—All stay bolts should be tested at least once every month, and no boiler must be used over three months under any circumstances unless thorough stay bolt inspection has been made. Stay bolts shall also be tested immediately after every hydrostatic test.

(b) *Method of Testing Rigid Bolts.*—The inspector must tap each bolt from the firebox side and judge from the sound or the vibration of the sheet which of them are broken. If stay bolt tests are made when the boiler is filled with water there must be not less than 50 lbs. pressure on the boiler. This will produce sufficient strain upon the stay bolts to cause the separation of the parts of the broken ones. Should the boiler not be under pressure the test may be made after draining all the water from the boiler, in which case the vibration of the sheet will indicate any unsoundness. The latter test is preferable.

(c) *Method of Testing Flexible Stay Bolts.*—All flexible stay bolts having caps over the outer ends shall have the caps removed at least once every year, and also whenever the inspector considers the removal desirable in order to thoroughly inspect the stay bolts. The firebox sheets should be examined carefully at least once a month to detect any bulging or indications of broken stay bolts.

(d) *Broken Stay Bolts.*—No boiler must be allowed to remain in service when there are two adjacent stay bolts broken in any part of the firebox or combustion chamber, nor when three or more are broken in a circle 4 ft. in diameter.

(e) *Tell Tale Holes.*—All stay bolts shorter than 8 in. applied after September 1, 1907, except flexible bolts, shall have tell tale holes $^{3}/_{16}$ in. diameter by 1¼ in. deep or more in the outer end. These holes must be kept open at all times, and must not in any case be plugged. All stay bolts shorter than 8 in., except flexible bolts, shall be drilled when the locomotive is in the shop for heavy repairs or at other suitable opportunity, and this work must be completed prior to January 1, 1909.*

STEAM GAGES.

(a) *Location of Gage.*—Every boiler shall have at least one steam gage which will correctly indicate the working pressure. Care must be taken to locate the gage so that it will be kept reasonably cool, particularly in case of gages located on the back head of boilers.

(b) *Siphon.*—Every gage shall have a siphon of ample capacity to prevent steam entering the gage. The pipe connection shall enter the boiler shell direct, and shall be maintained steam tight between siphon and gage.

(c) *Time of Testing.*—Steam gages should be tested at least once every month, and no boiler must be used over three months under any circumstances unless a thorough test has been made of the steam gage.

*Applications from companies desiring to omit the use of tell tale holes will be considered when it can be shown to the satisfaction of the commission that unusual care is used in stay bolt testing, both as to the frequency of tests and the selection of inspectors.

SAFETY VALVES.

(a) *Number and Capacity.*—Every boiler shall be equipped with at least two safety valves, the capacity of which shall be sufficient to prevent, under any conditions of service, an accumulation of pressure of more than 5 per cent. above the allowed steam pressure.

(b) *Setting of Valves.*—Safety valves shall be set by the gage employed upon the boiler, to pop at pressures not exceeding 5 lbs. above the allowed steam pressure, the gage in all cases to be tested before the safety valves are set or any change made in the setting. When setting safety valves the water level in the boiler must not be above the highest gage cock.

(c) *Time of Testing.*—Safety valves should be tested under steam at least once in every month, and no boiler must be used over three months under any circumstances unless the safety valves have been thoroughly tested.

WATER GLASS AND GAGE COCKS.

(a) *Number and Location.*—Every boiler shall be equipped with at least one water glass and three gage cocks. The lowest gage cock and the lowest reading of the water glass shall not be less than 3 in. above the highest part of the crown sheet.

(b) *Water Glass Valves.*—All water glasses shall be supplied with two valves or shut-off cocks, one at the upper and one at the lower connection to the boiler, and also a drain cock, so constructed and located that they can be easily opened and closed by hand.

(c) *Time of Cleaning.*—All gage cocks and water glass cocks shall be removed and cleaned of scale and sediment whenever the boiler is washed.

PLUGS IN FIRE TUBES.

(a) *Plugs Prohibited.*—No boiler shall remain in service which has one or more fire tubes plugged at both ends of the tube unless the plugs are securely tied together by means of a rod not less than ⅝ in. diameter.

WASHING BOILERS.

(a) *Time of Washing.*—All boilers shall be thoroughly washed not less frequently than once in 30 days.

(b) *Plugs to be Removed.*—When boilers are washed all washout, arch and water bar plugs must be removed.

(c) *Water Tubes.*—Special attention must be given the arch and water bar tubes to see that they are free from scale and sediment.

(d) *Office Record.*—An accurate record of all locomotive boiler washouts shall be kept in the office of the railroad company. The following information must be entered on the day that the boiler is washed:

(1) Number of locomotive;
(2) Date of washout;
(3) Statement that boiler was washed;
(4) Signature of the boiler washer or the boiler inspector;
(5) Statement that gage cocks and water glass cocks were removed and cleaned;
(6) Signature of the boiler inspector or the employee who removed and cleaned the cocks.

STEAM LEAKS.

(a) *Leaks Under Lagging.*—If a serious leak develops under the lagging an examination must be made and the leak located. If the leak is found to be due to a crack in the shell or to any other defect which may reduce safety, the boiler must be taken out of service at once and thoroughly repaired before it is reported to be in satisfactory condition.

(b) *Leaks in Front of Engineer.*—All steam valves, cocks and joints, studs, bolts and seams shall be kept in such repair that they will not at any time emit steam in front of the engineer, so as to obscure his vision.

FILING OF REPORTS.

(a) *Specification Card.*—A specification card containing the results of the calculations made in determining the working pressure and other necessary data shall be filed in the office of the Public Service Commission, Second district, for each locomotive boiler. A copy shall also be filed in the office of the chief mechanical officer having charge of the locomotive. Every specification card shall be verified by the oath of the engineer making the calculations, and shall be approved by the chief mechanical officer. These specification cards shall be filed as promptly as thorough examination and accurate calculation will permit. Where accurate drawings of boilers are available, the data for specification card may be taken from the drawings, and such specification cards must be completed and forwarded prior to March 1, 1908. Where accurate drawings are not available, the required data must be obtained at the first opportunity when general repairs are made, or when flues are removed. Specification cards must be forwarded within one month after examination has been made, and all examinations must be completed and specification cards filed prior to January 1, 1909, flues being removed if necessary, to enable the examination to be made before this date.

(b) *Certificate of Inspection.* Not less than once in three months and within 10 days after each inspection, a certificate of inspection shall be filed with the Public Service Commission, Second district, for each locomotive boiler used by a railroad company, and a copy shall be filed in the office of the chief officer having charge of the locomotive. A copy shall also be placed under glass in a conspicuous place in the cab of the locomotive before the boiler inspected is put into service. Each certificate shall give the number and the condition of the boiler inspected, the date of the inspection and other required details, and each certificate shall be verified by the oath of the inspector.

(c) *Reporting Washouts.*—The inspector shall examine the record of boiler washouts on file in the company's office not less frequently that once every three months, and if he is satisfied of its accuracy he shall enter the dates of every washout made during the preceding three months on the certificate of inspection. In case the record is not satisfactory the inspector shall make notation thereof on the certificate.

COPIES OF REGULATIONS.

The chief mechanical officer of each railroad company shall keep each inspector of locomotive boilers under his supervision supplied with a copy of these regulations. Copies can be obtained upon application to the Secretary of the Public Service Commission, Second district, Albany, N. Y.

Track Work Involved in the New York Central's Reversal of the Direction of Traffic.

In the *Railroad Gazette* for August 30, page 227, was given some account of the signal work made necessary by the change from left-hand running to right-hand running, on August 25, of trains on the Harlem Division within the Electric Zone. In addition to this, the track work involved was considerable and interesting, because only a part of the construction could be entirely completed beforehand, and all connecting up and putting in service was concluded in about twelve hours.

The entrances to the tail-end yards were previously revised so as to make a trailing switch entrance from the new direction of traffic. This caused a substantial rebuilding of the yards with the installation of new switches, the building of roadways, and in two cases the previous moving of the freight houses to locations where they could be used both before and after the change. It involved also much work in taking care of the industries affected and the making of new leases and negotiations for private sidings. The crossovers in main tracks were reversed, and in some cases the locations were revised. The new crossovers were installed beforehand and spiked ready for service where it was possible to do this. Wherever the old crossovers prevented this anticipation of a change as much work as possible was done beforehand. The rails were cut and material was at hand for a quick completion of the work. The inner guard rails were pointed for the new direction of traffic. Bridge ticklers were erected to warn trainmen on top of cars that they were approaching an overhead obstruction. There were forty-two bridges for which tell-tales were required.

In the main tracks rigid crossing frogs were replaced by movable point frogs and the electric circuit was designed to prevent the switches being thrown under a train. This did away with the unprotected portion of the rigid crossing formerly in use and substituted a continuous rail for traffic which should outlast the old arrangement and make an easier riding track.

At the Harlem river draw bridge the lift rails have mitered ends fitting those which they meet on the draw. These mitered ends must have their chisel edges pointed away from the direction of traffic, and, due to the reversal, this whole construction needed to be taken out and changed so as to make the points trailing. This meant removing 1,150 ft. of rail in the four tracks, substituting new insulators and insulated tie-rods and clips. As the track is on a steel structure, this was precise work. The new track had to be drilled for the negative return current from operation, and this single item, drilling and bonding cost $475 during the 15 hours in which the change was made.

The point of departure of the New Haven track from the Harlem track was shifted to a place one-quarter mile south from the old junction. From the Grand Central Station to this point the double-equipped New Haven electric motors are fed with direct current from the under contact third rail. Here they change to the overhead contact with alternating current. This point, therefore, becomes a new third rail terminal. The new construction involved a change of colors in about 1,200 lights in switch lamps and repainting the switch targets to conform to the new color indications. The change in color indications involved an additional complication both in construction and in practice in drilling the men. Green instead of white now means proceed and yellow means caution. The changes necessitated the quick use of many barrels of paint and many thousand carefully chosen words used in lectures to the men. There was also a change in nomenclature in which the men had to be drilled. The numbers by which the main tracks were known were reversed in order, the westerly main track became No. 1 and the other tracks numbered consecutively eastward, so that the easterly track became No. 4. At the same date a new time table went into effect, so that nearly every one on the line was kept busy in learning new things.

At Mott Haven Junction the electro-pneumatic controlled manual signals were kept in operation, but were rebuilt and modernized during the period of change. During this period the trackmen threw the switches by hand, flagged trains and set up routes through this busy junction under the direction of the towermen. The trackmen were also used as watchmen and inspectors of the condition of tracks at every spot where changes were made.

The adaptation of northbound tracks to southbound running involved a revision of the superelevation of track on many curves. The grades and reversal of approaches and departures at stations made material changes in possible speed and in operating limitations to speed. New calculations were made and the heights of the outer rail were readjusted.

The pneumatic interlocking plants have been heretofore arranged for a switch throw of 4 in. The new interlocking plants are arranged for a throw of 5 in. The track work involved in this change was considerable. All switch rods in these plants were insulated and were redrilled for the wider throw. This was work of precision and accuracy, and to secure it all available draftsmen and instrumentmen were detailed to measure and inspect the progress of the work.

The changing of the position of signs and the making of new signs on the track and at stations was also a considerable undertaking. Almost everything of this character had to be moved to new places. Slow order signs, resume speed signs, yard limit signs, all and many others were changed. Notices to the public in the stations were changed so as to guide all except absent-minded persons to the proper departure place of trains, and new notices, conspicuously placed, were put up to assist in this. This included the signs adjacent to the tracks in the waiting-rooms and on the stations. There was a change in the lighting of the signs in Park avenue tunnel and also a making, painting and placing of signs on the new towers, designating those towers as described in the train orders. Involved, too, in this same department of the work was the moving of the benches on the platforms. These are required principally near those tracks used by outgoing passengers, and a change in the direction of traffic meant a change in the bench location at all places where the platforms are separated into two groups.

At 125th street station it was necessary to extend the platform south, so that the baggage cars could stop near the baggage elevator and still allow landing platform room for passengers.

At Claremont Park the new southerly entrance to the freight yard went through the passenger platform. An overhead bridge has been designed from the overhead station to the platform to allow for this, but has not yet been received. To allow for the change it was necessary to shift the canopy back, make temporary stairs and platform for passengers to walk across this entering track.

At the Harlem river drawbridge the new location of the tower and the new signal interlocking made necessary new rules for communication between the bridge foreman and the towerman controlling the opening of the draw.

The changes in third rail were such as were needed to allow for track changes, and an adaptation of third rail to the new direction of operation. The two-bolt angle plates connecting the third rails were bolted tightly on the receiving end of the third rail, but loosely on its leaving end. The idea of this was to allow more room for expansion, as the bolts are covered by the sheathing and cannot be readily loosened and tightened in changing temperature. The location of the third rail appeared all right, except when forced upward by the shoe of a passing train, at which time a slight lip or jog was caused between the ends of the adjacent rails. To tighten these bolts meant taking off the sheathing at all joints throughout the Electric Division. All end inclines were carefully gaged in the new direction of traffic and test trains were run against traffic to see if any further trouble developed.

To make the change there were employed: General Railway Signal Company men who were responsible for the completion of their contract to erect the new signals; inspectors from the signal engineer who were responsible for the proper inspection and correct working of the new installation; maintainers from the engineer of signals who were responsible for the maintenance and care of the new system.

To co-ordinate the different departments involved in the change, it was decided to have one boss, a director representing the four departments. Mr. H. S. Balliet, Engineer of Signals, was so appointed. All instructions affecting the work were issued through him, so that there would be no chance of confusion or lack of understanding. During the work progress reports were telephoned or telegraphed to Mr. Balliet from each point, and any one wishing to get information about his own work or somebody else's work could find out the condition from Mr. Balliet. To assist in this communication, lists of all public telephones adjacent and available for use, were given to each foreman.

The territory was divided into sections, each one being under the jurisdiction of a signal inspector, who was responsible for the proper carrying out of changes affecting the operating of the signal. As the operation of the signal guided the operation of trains that meant the whole change. With him was a signal company representative, a signal maintainer and a trackman, each with the necessary forces to complete such work as was assigned to him. The time for unspiking the new switches and spiking up the old switches was arranged for in advance, each territory having a program for each portion of the work issued as a bulletin over the signatures of the four officials in general charge of the work. However, the actual placing in service of these tracks was only done on orders from the director in order to guard against any trouble.

The determining point in the change seemed to be the Harlem river drawbridge. At 7 p.m., August 24, tracks Nos. 2 and 3 were put out of operation, the current on the third rail killed and the work of taking out the old lift rails and installing, bonding and connecting up the new was begun. This was completed together with the signal work about 4 o'clock in the morning, at which time tracks Nos. 2 and 3 went into service for right-hand operation, tracks Nos. 1 and 4 put out of service, and the work of equipping these latter tracks for right-hand running began. This was completed about noon Sunday.

At daylight Sunday morning the work of changing notices to the public and signs affecting movement of trains was begun, and was completed by the time the out-of-town movement for the day began.

Philippine Railroad Building with Filipino Builders.

When the concession for building, equipping and operating the new system of railroads in the Philippine Islands, Panay, Negros and Cebu, was let by the Government in January, 1906, to a syndicate, including Wm. Salomon & Co., Cornelius Vanderbilt, International Banking Corporation, J. G. White & Company and others, under the name of the Philippine Railway Company, the first problem which had to be met was the selection of the chief construction and operating officials. The second problem was that of

Map of the Philippine Railways in Visayan Islands.

labor, and the third, in part still in process of solution, was the development of standards of construction and equipment best adapted to the conditions. These three primary considerations have been stated in what is estimated to be the order of their importance.

After a careful investigation of the records of several well known railroad construction engineers, whose services were available, the contracting company chose as Chief Engineer for construction Edward J. Beard, Principal Assistant Engineer of the Chicago, Rock Island & Pacific Ry. In organizing the operating staff of the Philippine Railway Company, William B. Poland, formerly on the Baltimore & Ohio Southwestern, was made Vice-President and chief operating officer.

Not until these officers had gone to the Islands and completed close personal studies of the labor conditions in the archipelago generally, and in the Visayan group in particular, was it felt safe to map out the labor policy, the second important problem. This

involved primarily the question whether Filipinos should be employed or whether the Government should be asked to let down the bars temporarily and admit Chinese coolies for the work, under deportation bond. There was a strong feeling current among business men experienced in the affairs of the islands that because of the many previous expensive trials of native labor on road making and like work that the Filipinos were not up to this greater job and that Chinese labor would have to be depended on to complete the project. Because of this general trend of opinion it might have been possible to get governmental permission to import Chinamen but no attempt in that direction was ever made. The counsel of Mr. Beard, coupled with the previous successful experience of the contractors, J. G. White & Co., in using natives on the Manila Street Railway and power plant and upon various harbor works, caused the decision to be made in favor of Filipino labor, at the beginning of operations in the summer of 1906. Doubts as to the wisdom of this decision were quite freely expressed by many of those interested in the enterprise, but the decision proved right.

Before describing how the details of policy were formulated and how the whole programme has worked out in practice, it is well to outline the successive steps in the organization of the Philippine Railway Co. up to the point of breaking ground. This is the largest railroad project and probably the largest engineering development of any kind ever advanced by Americans over seas without any cooperation or help from foreigners, in addition to being far larger than any single industrial development of any kind previously carried out in the Philippines. Under its franchise, there is conceded to the Philippine Railway Company by the Philippine Commission through special act of Congress, the privilege of building and operating perpetually between 300 and 400 miles of road, almost equally divided between the Visayan islands of Panay, Negros and Cebu, and the 4 per cent. interest on the 30-year gold bonds of the company is guaranteed by the Government. The route and terminals

Terminal Yards at Cebu and Construction Tracks.

tentatively planned by the Government are shown on the accompanying map. Only after the most exhaustive study of the resources and topography of these islands, through the United States Government records and through reconnaissance surveys by special representatives,* did the associated bankers decide to bid for the work and organize a syndicate to carry it out. These studies indicated potential wealth in the Visayas awaiting for development only the completion of adequate and economical transportation, and these resources quite overshadowed difficulties of construction. Another source of information that should be mentioned was the statistical records of the Spanish priests in the Philippines, about the most valuable documentary heritage of the United States from Spain.

Throughout these Visayan islands the soil is very fertile. The population varies from 130 per square mile on Negros to more than 300 on Cebu, which is the most thickly populated island of the whole Philippine archipelago. The great staple product is sugar, although in the lowlands considerable rice is cultivated. In the year 1905 Negros, which is the best sugar producer, exported not more than 80,000 tons of sugar, but in the face of a transportation cost of from $20 to $30 per ton in the dry season and an entire lack of transportation in the wet season because of impassable roads. This sugar goes largely to China, the Chinese merchants buying it up in the native markets. This island contains in the uplands also vast untouched forests of the

*See articles by L. E. Bennett, *Railroad Gazette*, Jan. 5, 1906, and Feb. 23, 1906.

Construction Foremen's Quarters at Lopus Lopus.

best native hard and soft woods. Other products of the higher country throughout the Visayan group are coffee, cocoa, hemp, copra and other valuable vegetable fibers. Easily as these products are grown, they are produced only in small quantities mostly for local consumption, there being no means of getting them out of the country in bulk. As far as at present discovered, the most valuable mineral resource is coal, a fine grade of high carbon lignite, plentiful on Cebu, which the locomotives on the construction of the railroads are burning, they having been designed for the purpose. These facts of population and resources account for the readiness of the syndicate to offer to build these roads, after determining how the routes lay across tracts of rolling plains and low-lying hills, presenting no great problems of construction other than were likely to be induced by the uncertainty of the labor factor.

The first active step after the selection of the Chief Engineer was the organization of the pioneer corps of locating engineers. This was done in New York by Mr. Beard through his personal knowledge of railroad men and with the aid of the employment records of J. G. White & Company. Successful experience in railroad locating in the tropics was the first consideration in selecting men, and three of the five chiefs of party chosen were so qualified, two of them, H. F. Howe and C. H. Farnham, having been with the Canton-Hankow Railroad in China, where they were respectively Principal Assistant Engineer and Division Engineer, and the third, J. M. Robinson, coming from the Guayaquil-Quito Railroad in Ecuador, where he was Division Engineer. The other chiefs of party chosen were R. F. Ricker, from the Virginia & Carolina Coast, and F. D. Nash from the C., B. & Q., both well known to the Chief Engineer. The engineering corps was recruited up to a complement of 50 men, and they all reported at Kansas City and made the trip to the coast in special cars over the Northern Pacific. On April 26, 1906, they sailed from Seattle on the "Minnesota." This was the first big step toward the fulfillment of the plan of the United States Government to relieve the greatest economic need of the Philippine Islands.

The five locating parties, two for Panay and one each for Negros and Cebu, were made up on the voyage out, and the Cebu party was first in the field, beginning work on June 14, undaunted by the prospect of the tropical rainy season before them. After arriving

A Long Tangent near Cebu.

Grading a Fill from Borrow Pits.

mer months the rapid rate of construction established in the spring was somewhat by unfavorable weather. Forty miles of the advanced construction is on Cebu, half north of Cebu, the chief town, to Danao, the northern terminus of the Cebu lines, and half south of Cebu to Sangat. The other 20-mile section is on Panay Island from Iloilo, the metropolis of the southern Philippines, and the southern terminus of the Panay Railroad to Pototan in the interior north.

Construction has been pushed on Cebu in advance of the other islands because the dense population makes the demand for transportation most acute there. A construction force of about 4,000 natives was organized and the stability and efficiency of this force was so rapidly established that within three months a monthly average rate of 90,000 cu. yds. of earth and about 35,000 cu. yds. of rock was moved, at a cost of only 12½c. per cubic yard. Nothing but hand tools and wheelbarrows and baskets are used, as abundant labor and the heavy shipping expense which would have to be reckoned both ways, render the use of heavy railroad construction equipment impracticable in the Philippines in the present state of development.

The great majority of the natives engaged were quite unaccustomed to the use of the white man's pick and shovel and wheelbarrow and rock drills, coming as they did from plantations where their own primitive tools were still largely in vogue. It is a native trait to use the hands and feet for working earth and some patience was required to overcome the tendency to drop the new tools and resort to nature's implements whenever the foreman's back was turned. There was also a disposition to try to carry the wheelbarrows after loading on the back. These little idiosyncracies were gradually eliminated, so that in a very few weeks the men were able to use their implements effectively, throwing up embankments four feet high all through a nine hour-shift without serious fatigue.

The experiences encountered on Panay Island, where about 2,000 natives have been at work were practically a repetition of those on Cebu, though the island is not so densely populated and some fears were at first entertained as to whether the labor supply would be adequate. Negros is also less densely populated than Cebu, but there now appears good reason to suppose that a sufficient force can be mustered without difficulty among the natives there, though it was at one time thought that labor might have to be imported to some extent from the other islands. Altogether the use of Filipino labor is proving an unqualified success, and the experience thus far is summed up in the opinion of the Chief Engineer, recently stated, that his men were doing work not only better than could ever be achieved by white laborers in the tropics but comparing favorably with the average rate of workmen on railroad work in temperate climates.

Naturally the secret of this achievement lies largely in the administration which has attempted to develop the best qualities in the native character as well as to attract and hold the better element among the laboring populace. First there is the question of wages. Common labor is paid 50 centavos, or about

in their respective territories the other parties lost no time in getting to work and it became a race among the five to see which could make the best showing. Little will ever be known of the fortitude displayed by these little bands of surveyors working in an utterly strange country, toiling through miles of tropical undergrowth and not infrequently cut off entirely from their base of supplies. At times bad trails made packing with animals quite impossible and cargadores or native carriers were the only reliance of the field parties for supplies and transportation. Men accustomed to endure this kind of hardship are generally the last to talk about it, but occasional despatches briefly informing the New York office of the progress of the work, by their very terseness told the tale. So and so pulled out for a bit of a rest; supplies sent in ahead and cached to prevent running short again; and once in a long while the bare statement of a resignation, doubtless of some weaker brother unable to endure the strain. The actual test was bound to develop here and there weaknesses that even the searching examination at appointment failed to detect.

As a whole the locating engineers were admirably well qualified for the work, and all the parties succeeded in demonstrating markedly better routes than were supposed to exist. For example, on Panay between Passi and Dao, a distance of about 20 miles, it was supposed from reconnaissance that a 2 per cent. line would be necessary. After a comparatively long silence when the Chief Engineer had begun to wonder just what they were up to, the party assigned to that section emerged with the news that they had located a 1 per cent. line requiring actually less work than had been expected for the 2 per cent. grade. This is one instance of the character of the work done.

The First Locomotive Shops of the Philippine Railways.

Rapid progress was made considering this careful location, so that by November, 1906, less than five months from the time of landing, nearly all of the main surveys were completed and ground was broken on Cebu. Governor-General Smith turned the first shovel of soil on the fourth of that month. Construction on Panay Island was begun soon after, but small surveying parties continued in the field on all three islands some months longer, making tentative locations for possible extensions and branches of the main system.

To date there has been completed nearly 60 miles of grading composing three sections. Track is laid and ballasted on one section, which will probably be placed in operation this month. Track laying is almost completed on a second section. During the sum-

Grading for a "Wye" at Cebu.

25 cents gold per day of 10 hours, with subsistence, while the capitaces receive one peso, or 50 cents. A scientifically proportioned diet of the most nourishing food is provided, costing the company about 25 centavos per day per man. This total cost of 75 centavos per day for common labor is high for the Philippines and was fixed only after much study of the experiences of the Government and others with Filipino labor. There were two vital considerations. The first was to fix a figure that would be considered fair by the Government and the Filipinos, thus enabling it to be maintained without disagreement throughout the period of construction. The second point was to determine the lowest figure that would attract the best working element among the natives in sufficient numbers to keep the large supervising organization fully occupied at all times.

Wages for common labor were found to vary widely in the archipelago, according to the supply and to the inclinations of employers. At the Marivales quarries in Luzon the rate was 90 centavos and subsistence. On the Toledo road construction in Cebu only 30 centavos with subsistence was paid for nine hours work. These were the extremes. In the former case the work was more arduous than that in prospect on the railroads, while in the latter it was much less so and was performed largely by boys and old men who would not do for railroad construction. From this it will be seen that the fixing of the wage scale was a delicate question, seriously involving the success of the enterprise. Then came the question of subsistence. Verified instances of men trying to live with too little nourishment in the effort to save money when paid entirely in cash with other considerations of organization determined the Chief Engineer to provide subsistence. The chief surgeon of the Philippine Railway Company, after due experiment, settled upon the proportions three-fifths rice, one-fifth beef, one-tenth fish, one-tenth vegetables and the remainder condiments, as the most nourishing composition for the daily diet of the native doing hard physical labor, and this standard was adopted. It may be noted that this ration, served in ample quantities, by a Chinese contract commissary, is much better calculated to forestall fatigue than anything to which the average of the men had hitherto been accustomed.

The fortunate outcome of this liberal policy measured by general results has been seen. A specific comparison of unit costs on the railroad up to date and on road making previously carried out in the Visayan Islands, shows that the railroad company is getting from 50 to 60 per cent. more work for its money than has been returned before by native labor. An unprecedented stability of native labor forces has been attained. The working force does not vary from day to day, as has nearly always been the case heretofore, but the same men are to be found constantly on the work day in and day out, month by month, so that there is growing up for the first time in the Philippines that personal touch between the foremen and their men, which is so essential for efficient construction.

Fill No. 109, Island of Cebu; Philippine Railways.

In connection with wages, the problem of the method of payment was met by an interesting solution. The expense of maintaining a properly bonded staff of paymasters to pay men at short regular intervals would be heavy and besides there would be some physical difficulty connected with transporting by pack animals or cargadores, and handling large quantities of money, weighing something like 150 lbs. for every thousand dollars in the necessary small cash. Therefore the men are paid daily in time checks which are negotiable with certain leading merchants by special arrangement and with Ah Gong, the commissary. The plan works to the complete satisfaction of all but the disreputable characters who were accustomed to hover about the camps and mulct the laborers of their wages often as soon as they were paid. This undesirable condition has been almost entirely eliminated.

The benefits to the Philippine Islands of this use of native labor solely, as compared with the probable results if imported Chinese labor had been used, are many. Chinese labor would have assured the same first class railroad system at a total cost of possibly 5 per cent. less, but the economic gain to the country would probably have ended there. Cer-

A Side Hill Cut and Fill; Philippine Railways.

Grading at Mile 24, Island of Panay.

Clearing a Nipa Thicket; Philippine Railways.

tainly most of the money paid out as wages would have found its way to the Celestial Kingdom, while now it will be put in circulation in the islands to increase the money supply there. Furthermore, an industrial army of 20,000 men will have been trained in the principles of modern industry, and these men will naturally be absorbed except those who will be needed in operation, to very good advantage in the new industrial activity made possible by the railroads which they will have built.

It has now been shown how two of the three most vital considerations in the building of this railroad system have been met and substantially solved. To facilitate the working out of the standardization of equipment and rolling stock, there has been organized a so-called Technical Board, consisting of certain officers of J. G. White & Co. as the contractors, the Philippine Railway Company, two consulting engineers and the engineering executives in the field. This Technical Board co-operates with the Philippine Commission, for all decisions and purchases are subject to the approval of the latter body.

Nearly all the orders for the rolling stock, rails and materials thus far placed have been described from time to time in the *Railroad Gazette*. Some motive power in the shape of an early order of 50-ton mogul locomotives has been in use on construction for several months. Besides the regular [illegible] have been in use on construction a [illegible] number of flat cars which [illegible] part of the ultimate operating equipment. A [illegible] number of box cars have been shipped and a small initial order of [illegible] rolling stock, 24 cars in all, has been placed.

The design of these passenger [illegible] not yet fully decided on and is one of the principal questions now before the Technical Board. Lacking a basis of actual experience under the exact conditions obtaining in the country where the cars will be operated studies are being made of the passenger rolling stock, new and old, on several leading railroads in the tropics, notably the Sudan Government Military Railways, the Great Indian Peninsular Railway and Le Chemin de Fer du Congo. The design of the Philippine railroad passenger cars will be evolved from these studies modified by the judgment of the board as to the probable effect of conditions of operation in the Philippines which have no parallel elsewhere.

In the matter of materials a serious problem was to secure an adequate supply of timber suitable for ties, piles, etc. An order was

Finishing a Cut and Fill to Standard Width of 15 Feet.

placed for 150,000 ties of Jarrah, an Australian hard wood. It was feared that this supply would not be received rapidly enough to keep pace with the shipments of rails, and that the construction might be delayed. As was well-known to the Chief Engineer, some of the Philippine hard woods are eminently well adapted for the above purposes, but heretofore there has appeared to be no way to get the timber out. A special representative was sent down into the Island of Mindanao, remote from the scene of the railroads, to take up the question with the friendly Moro chiefs. Negotiations were successfully completed and hundreds of Moro tribesmen are at work in their own forests with their native knives and the saws supplied them, hewing trees and getting railroad ties out in finished shape. Indications are that this plan will naturally aid in solving the problem of timber supply.

Outlying Buildings of a Construction Camp.

A railroad is being planned to run from Hilo, on the eastern coast of Hawaii, northwesterly 45 miles. It will serve a number of sugar plantations in Hilo and Hamakua districts; at present the sugar is carried to the nearest point on the coast and loaded on

coastwise steamers instead of being shipped everland to a main port. The road will cost about $1,800,000. It is expected that it will eventually be built all the way around the island, going near the lower levels of Mauna Loa, which is an active volcano in the center of the island.

Pennsylvania Two-Cent Law Unconstitutional.

Judges Willson and Audenried, in Common Pleas Court, at Philadelphia last Tuesday, declared unconstitutional the two-cent fare law passed by the last Pennsylvania legislature. The case upon which the decision was made will be taken to the State Supreme Court at once, in the hope of getting a decision before October 1, when the law was to have gone into effect.

The Pennsylvania was the first to attack the law, bringing a suit in the Philadelphia courts to restrain the county of Philadelphia from collecting the fine for violating the provisions of the act, and it is on this suit that the decision is now given. Other railroads have brought similar proceedings in various counties of the state, but no decisions have been rendered, as it is generally understood that the Pennsylvania's suit will be made the test case in the higher court.

The decision of the court takes up 110 typewritten pages. After reviewing its limitations in the present case and declaring the "Pennsylvania Railroad Company is not vested with any immunity from the exercise of the power of the legislature to regulate rates," the court takes up the contention of the company that the two-cent rate is unreasonable, sustains the contention and grants the injunction asked for.

Continuing, the court says:

There remains now to be disposed of the question whether the act is to be denied enforcement on the ground that by reason of the generality of its language it extends to interstate commerce, and thus infringes on the province of the federal law. The question must be answered in the negative. A legislative intent to exceed constitutional rights and to violate fundamental law is never to be presumed if the language of the statute can be satisfied by a contrary construction. The act with which we are concerned is to be regarded as intended to apply only to that part of the passenger business of the railroads over which the legislative power of regulation extends, and since that business is not so confused with interstate passenger traffic as to be insusceptible of separate regulation we hold that the act is not invalid for the reason last suggested.

Upon the whole case we are of opinion, and therefore find, that, although with respect to its title and other matters of form no valid objection to the law exists, its operation, so far as it relates to the Pennsylvania Railroad Company, is objectionable on constitutional grounds for the following reasons:

As a regulation by the legislature of the rates of fares for passengers on the lines constructed by the plaintiff under the act of April 13, 1846, between Harrisburg and Pittsburg and Pittsburg and Erie, the act violates an existing contract between the plaintiff and the Commonwealth, and so contravenes Article I, Section 10, of the Constitution of the United States.

As a regulation of the plaintiff's intrastate passenger business in its entirety, the act under existing circumstances is unreasonable and confiscatory, and by depriving the plaintiff of its property without due process of law, violates Amendment 14 of the Constitution of the United States. * * *

Viewed as an alteration or revocation of the plaintiff's franchise, to establish * * * such rates as, within the maxima fixed by the second proviso of Section 21, of the act of April 13, 1846, its president and directors may deem reasonable, the act under consideration violates Article XVI, Section 10, of the constitution of Pennsylvania * * * by establishing so low a maximum rate of fare as to render that branch of the plaintiff's business unremunerative, but providing no compensation for the loss thereby occasioned.

We accordingly adjudge that the act of April 5, 1907, cannot be enforced so far as concerns the Pennsylvania Railroad Company, and that the county of Philadelphia should be restrained from demanding fines and attempting by action to collect them, if the maximum which that act attempts to establish be disregarded by the plaintiff.

Under the head of "plaintiffs' requests for findings of fact," the court affirms that:

The method used in ascertaining the expenses of handling the complainant's intrastate passenger business is the correct one.

That the percentage realized under existing rates of fare, upon the cost of the property, is not unfair or unreasonable, and that the percentage under the new law would not be fair or properly compensatory.

That cost of conducting railroad business for several years has been greatly and constantly increasing.

That a reduction in intrastate rates will most probably compel a corresponding reduction in interstate rates.

That the average rate per mile for carrying intrastate passengers does not now exceed two cents a mile.

That reduction of rates would not be likely to lead to increase of business.

That a uniform rate of two cents could not, in all probability, be obtained from all passengers, and is neither advantageous to the public nor just to the company.

That there is no evidence that the legislature investigated the matter before enacting the law.

In the defendant's requests for finding the court refuses the following:

In determining whether the maximum rate, as specified in the act, is improper, all the traffic and receipts of the plaintiff within the state, and subjected to the control of the legislature, must be taken into consideration. The passenger traffic cannot be segregated and considered without reference to receipts from the express and freight traffic and all other sources of corporate earnings.

The opinion of the court goes exhaustively into the many and intricate questions of law involved in the case. It is shown that, with the exception of the Philadelphia & Trenton Railroad and the Allegheny Valley Railroad, the leased lines of the Pennsylvania Railroad were vested with the same rights as to rates of toll and transportation charges as those conferred on the plaintiff company. While the Pennsylvania is operated under a charter granted under the old state constitution, nevertheless the company accepted the constitution of 1873, so that, as above stated, the company is not vested with any immunity from the exercise of the power of the legislature to regulate rates by virtue of grants thereof by the commonwealth to any of the corporations whose railroads it has leased or acquired.

The court states a large number of legal principles involved in the case, and cites decision affecting unreasonableness, confiscation, contract abrogation and the like, and declares that public service corporations in Pennsylvania are entitled to look for a rate of return, if their property will earn it, of not less than the legal rate of interest.

As to immunity from rate regulation on the line between Harrisburg and Pittsburg and any branch line to Erie constructed under the authority of the act of 1846, the court says that—

"The act of incorporation by which this immunity was conferred, being accepted by the plaintiff when it constructed its road on the faith thereof, constituted a contract between it and the commonwealth, whose obligation the latter could not impair. Neither the act of May 3, 1855, nor the constitutional amendment of 1857, nor the constitution of 1873 could have any such effect. * * * When the legislature alters or revokes a corporate franchise under Article 16, Section 10, of the constitution of 1873, it is necessarily implied that such franchise was, in its opinion, injurious to the citizens of the commonwealth. When the legislature, without providing for compensation, endeavors by general law to annul the charter right of a railroad company to establish its rates in accordance with a certain schedule and attempts an unreasonable regulation of its rates, this is a violation of the constitutional provision that no injustice shall be done to its corporators.

The court also considers the failure of the legislature properly to investigate passenger earnings and their proportion to freight business. This is discussed for the reason that the court was called upon to determine whether or not a two-cent maximum rate was a reasonable regulation so far as concerns the Pennsylvania Railroad. After analyzing the figures submitted during the trial of the suit, the court reaches the opinion that upon an actual investment of $32,548,802 of its own money, the Pennsylvania's probable earnings for 1907 for the passenger business within the state would yield a return of 5.1 per cent. on the basis of the rates charged at present. This would be less than legal interest.

"It is improbable that the doing away with commutation tickets and the exaction of a two cents per mile fare from those who have been using such tickets would serve to increase the net profits of the plaintiff, since, in all likelihood, such a change would so reduce the number of suburban riders and the amount of the higher rate business that such passengers incidentally bring to the company as to practically offset the increase of receipts due to the increase in fare."

The court does not agree with the county's contention that the freight business will not be affected by an increase in commutation rates, or that the passenger business is so combined with freight business as to be indistinguishable in the joint result. On the contrary, the opinion declares that experienced railroad men say that the business is readily distinguishable and further that "the legislature itself, in the very act now under discussion has, for the purposes of regulation, attempted to segregate the passenger traffic of the railways and to deal with it as if it existed as a thing apart from all else."

"If pushed to its logical result," says the opinion, "the argument advanced would justify a law requiring that the railroad companies of the state should carry all intrastate passengers without charge and look to their freight business for reimbursement of expenses and for a return on their investment in the business, which, of course, is the reductio ad absurdum."

GENERAL NEWS SECTION

NOTES.

The Missouri Pacific has made increases averaging 10 per cent in the wages of 2,000 clerical employees.

The Texas State Railroad Commission has ordered the railroads to report train accidents promptly to the commission by telegraph.

In the Federal Court at Jamestown, N. Y., September 6, the Grand Jury returned indictments for illegal freight rates against the Standard Oil Co. and the New York Central and the Pennsylvania railroads.

The Mexican government has just released two Americans, railroad conductors, who have been in prison more than a year on the charge of murder, but who now are released unconditionally with no charges against them.

Officers of Mexican railroads are complaining that the Southern Pacific is devoting its freight cars to the needs of sugar cane traffic and other heavy business in Louisiana and Texas to the neglect of shipments destined for Mexico.

In the United States Court at Lincoln, Neb., September 10, the Burlington, the Northwestern and the Union Pacific obtained a temporary injunction to prevent the Nebraska State Railroad Commission from reducing freight rates on grain.

Commercial travelers of Chicago and west of there complain that the railroads in the West and Southwest have increased their extra baggage rates from 12½ per cent. of the passenger fare to 18 per cent.—an increase which evidently was made to offset the reductions which the state legislatures ordered in passenger fares.

The Southern Pacific has ordered the discontinuance of the sale of liquors on the trains of the company within the territory of Arizona, a law having been passed in that territory requiring the payment of a tax of $300 a year for each train in each county; and the Southern Pacific runs six trains a day through five counties.

Near Murdock, Neb., on the morning of September 6, the passengers in the chair car of an express train of the Rock Island road were robbed by three masked men with pistols who, until a moment before the robbery, had been riding peacefully in the car as passengers. The conductor endeavored to repulse the robbers, but their four "guns" were more than a match for his one.

The Pennsylvania Railroad has reported to the Department of Internal Affairs of the state of Pennsylvania that the line of its road from Philadelphia to Pittsburg is 348.9 miles long, or about five miles less than the distance hitherto shown in the company's timetables. The reporters are now figuring out how much the company has cheated the public annually in consequence of the use of this erroneous figure in computing passenger fares.

Between Milwaukee and Cedarburg, Wis., recently a length of 25,000 ft. of copper trolley wire was stolen from the line of the Milwaukee & Northern Electric Railway, all in a single night. The wire, weighing 500 lbs. per 1,000 ft., was all in place over the tracks, and the thieves must have had a "giraffe" wagon to enable them to commit the theft so quickly. The loss to the railroad company is about $3,000, and at last accounts there was no clew to the thieves.

According to the newspapers the use of Barclay's automatic printing telegraph on the lines of the Western Union Telegraph Company has been much extended since the strike. This apparatus which, at the receiving station, prints telegrams on the regular blank, like any other typewriter, is in use on lines between New York and Boston, New York and Philadelphia, New York and Pittsburg, New York and Boston and New York and St. Louis. It was described in the *Railroad Gazette* of June 9, 1905.

The Secretary of State of Missouri has been enjoined by Judge Pollock, of the United States Court, at St. Joseph from annulling the Chicago, Rock Island & Pacific Railway's charter for its refusal to stop its through trains at Lathrop, a junction with the Atchison, Topeka & Santa Fe, for which the Rock Island was fined in the state courts and appealed to the Federal court, thus ignoring the statute prohibiting corporations doing business in Missouri from appealing from state to Federal courts. The hearing will be held next Monday.

President A. B. Stickney, of the Chicago Great Western Railroad, in an affidavit filed in the Federal court at St. Paul last Monday, says that if the commodity and the 2-cent passenger rates, now in controversy in Minnesota become effective his road will be financially ruined. It will suffer a reduction of 22 per cent. on fine grains, 28 per cent. on corn, more than 42 per cent. on hard coal and nearly 26 per cent. on soft coal. The company accepted the freight tariff promulgated by the State Railroad Commission in 1906, though by so doing it sustained a loss in revenue of 22 per cent. It was hoped to make up this loss in increased traffic, but this hope was not fully realized.

At Milwaukee it is reported that the principal railroads of Wisconsin are considering the complete abolition of commutation tickets. Under the law of that state, which now forbids discrimination with minute particularity, every town to or from which desired commutation tickets are not sold is expected to complain of the discrimination practiced by the railroads in favor of other towns at which commutation privileges are granted. It is also reported in Milwaukee that the sale of local single-trip tickets has increased on many of the roads to a marked degree since the reduction of all fares to 2 cents a mile. This increase of traffic has been particularly noticeable on Sundays, and numerous bits of circumstantial evidence are cited to support the statement made.

Controlled Manual on the Burlington.

The Chicago, Burlington & Quincy is preparing to install on its line from Aurora to Savannah, Ill., the manual block system arranged for the use of the single-track control apparatus which is made by the General Railway Signal Company, of the type which has been in use for the last few years on several hundred miles of the single-track lines of the Illinois Central. The officers of the Burlington expect to rapidly extend the use of controlled manual signals over about 2,000 miles of their single-track lines.

Cautiousness Extraordinary.

The Standard Oil Company shies when a railroad company tenders money to its officers! When the western lines made interstate fares 2 cents a mile the mileage credential was no longer necessary, and notice was given that such credentials would be redeemed by the Western Passenger Association at their face value. The Standard Oil Company returned 187 which had been in use by its representatives. In due time the Association sent the company a check for $1,776.50, but the check was returned. The legal department wrote to the General Passenger agents of the various lines asking for copies of the circular announcing the redemption, and if such circular had been regularly filed with the commission, and if the action had official cognizance. In the meantime, the mileage bureau is holding the check.—*Exchange.*

Disastrous Derailment at Norris, Iowa.

Twelve persons were killed and about the same number injured at Norris, Iowa, on September 6, when a northbound passenger train of the Chicago, Rock Island & Pacific was derailed at or near the station while running at full speed. The derailment occurred just at the moment that the engine of the passenger train passed the engine of a freight which was standing on the side track, and the engine and first three cars of the passenger train were thrown with great violence against the freight engine. All of the passengers killed or injured were in the smoking car, which appears to have been the third from the engine.

Six Passengers Killed at Caledon, Ont.

In the derailment of a special passenger train, heavily loaded, on the Canadian Pacific near Caledon, Ont., about 40 miles west of Toronto April 3, six passengers were killed and a large number were injured. The train was traveling on a steep descending grade around a sharp curve and appears to have been thrown off the track by excessive speed. The engineman is 23 years old and he had made but two trips before this in charge of a passenger train. The speed at which the train was traveling as it approached the curve was so high that an experienced track foreman, who was at work on the track, warned his gang of men to leap over the fence to safeguard their lives, the foreman feeling sure that the speed, which was about 35 miles an hour, was too high for the curve.

Chicago Railways Company Not in Possession.

The order recently entered by Judge Grosscup in the United States Circuit Court directing the receivers of the Union Traction Company, which operates the street car system on the north and west sides of Chicago, to turn these properties over to a new corporation called the Chicago Railways Company for 20 years, has been reversed by the United States Court of Appeals. The decision of the higher court remands the case to the United States Circuit Court and leaves the situation where it was before the formation of the Chicago Railways Company.

The Court of Appeals said that Judge Grosscup had no power to give possession to the Chicago Railways Company without the

consent of the bondholders and stockholders of the underlying companies, and that the only manner in which the railways company could obtain possession of the traction properties was through negotiations with the stockholders and the bondholders.

The action of the Court of Appeals hinged entirely on the question of jurisdiction. The power of Judge Grosscup to issue the order in favor of the Chicago Railways Company was the only thing assailed. The opinion, by Judge Brewer, of the United States Supreme Court, praised the wisdom of the order, but declared that legally it was wrong.

The Noise Nuisance on Street Cars.

Blowing of whistles by conductors of South Side street railway cars as signals for stopping and starting must stop. The ear-splitting communication between the conductor and motorman was dispensed with yesterday by order of the President. In days past the conductor took delight in blowing his whistle as close as possible to the passenger's ear, the more inoffensive the passenger the louder the signal. President Mitten says that "the car whistle is a relic of barbarism and of the cable epoch now consigned to students of geology. In the future conductors will rely on the bell cord, which does not interfere with the comfort of passengers." The conductor's blasts have been mistaken for the notifications of the policemen at crossings, and now even the use of the whistle to warn teamsters out of the track is forbidden.—*Chicago Record-Herald.*

The American Locomotive Company.

In the last fiscal year the American Locomotive Company did the largest amount of business since its organization six years ago. It built new shop buildings and power plants and installed machinery and equipment at its different works, particularly at Schenectady, Dunkirk, Richmond and Montreal; these improvements cost $1,692,859, and were paid for out of the extraordinary additions and betterment fund of $2,000,000 created last year. An equal amount has been set aside to carry on similar work next year. During the past year, $5,000,000 5 per cent. notes, maturing in five equal annual instalments from October 1, 1907, to October 1, 1911, were issued to provide working capital. Last spring the structural steel department at Montreal was sold to the Structural Steel Company, Ltd., and the Locomotive & Machine Company of Montreal will hereafter build only locomotives, steam shovels and rotary snow plows. In the following statement of earnings, income from investments, etc., is included in gross earnings.

	1907.		Changes.
Gross earnings	$49,515,486	Inc.	$6,967,610
Expenses	42,744,381	"	6,659,011
Net earnings	$6,771,105	Inc.	$308,599
Fixed chrgs., bills payable, &c.	412,898	"	131,086
Available for dividends	$6,358,207	Inc.	$177,513
Div. on preferred, 7 per cent.	1,750,000		.....
Div. on common, 5 per cent.	1,250,000	Inc.	937,500
Surplus after dividends	$3,358,207	Dec.	759,987
Extra. additns and betrmt fund	2,000,000		.....
Surplus	$1,358,207	Inc.	$241,378

Progress on Panama Canal.

The excavation of the Panama canal is now one-tenth completed. The work done in August, despite the heavy rainfall of 11.89 in., amounted to 215,625 cu. yds. more than was done in July, and surpassed all previous records.

The total amount of material to be excavated was estimated in June, 1904, to be 111,280,000 cu. yds. Since then and up to August 31, an aggregate of 10,863,681 yds. had been excavated. There are now sixty-three steam shovels at work and 34 will soon be received. The present force in constant employment on the Isthmus consists of 30,500 men. Reports from the Isthmus show that the health records are better than in most of the larger cities of the United States.

President Johnson on Restrictive Legislation.

From the advance sheets of the Norfolk & Western annual report we take the following comment by President Johnson on the legislative situation.

The rapidly progressing development of the coal areas tributary to your lines makes it increasingly evident that the demands upon your management for transportation cannot be properly met without the complete double tracking of the line from Concord to Columbus. This work, while important to the interest of the stockholders, is equally important to the welfare of the commonwealths traversed by your lines and to the property of their citizens who are striving to develop the natural wealth of their states and to broaden the market for their mineral and other products.

It therefore goes without saying that any policy which hampers the development of railroads, or by depleting their revenues lowers their credit and thus repels investors who would otherwise purchase their securities at fair prices, cannot but be fraught with disaster both to the states and to the railroads. It is not believed that such a policy will commend itself to the dispassionate judgment of the communities served by your lines, or that in the effort to correct abuses that may exist unjust treatment will be accorded to corporations that are honestly endeavoring to fulfil the purposes for which they were chartered.

It is only 11 years since your railroad passed through a receivership and foreclosure and a drastic reorganization, and it certainly cannot be seriously claimed that the small dividends since paid to the shareholders have yielded even a just return upon its capital. The owners of your property are entitled to the same good faith which is properly exacted from them, and no temporary prejudices or misunderstandings can excuse or justify action which would deprive a railroad shareholder of the rights and remedies which are guaranteed to all classes of the community.

Fire Protection in Altoona Yards.

The Pennsylvania Railroad is to put fire extinguishing apparatus on all of the 26 locomotives used in the freight yards at Altoona, Pa., and most of these engines are already equipped. This action is a result of the determination on the part of the company to provide, without reference to the city fire department, for a complete fire-fighting system in its yards. The Altoona yard is divided into five fire districts, each with an alarm whistle.

In the Pittsburg yards the fire organization, which is also to be adopted at Altoona, is as follows: The conductor of the crew is the "foreman," and is the man to direct the work of a crew when called to answer a fire alarm. The flagman is designated as the "hoseman," it being his duty to see that the hose is removed from the reel and coupled to the water attachment as promptly as possible. The two brakemen of the crew are designated as "nozzlemen." Weekly tests are made to promote efficiency.

Foundry Cooling.

A letter from the Bellevue Pipe & Foundry Co. to the American Blower Co., Detroit, Mich., says that in order to keep the foundry cool enough to work in during the hot summer days the steam coils of the hot-blast heating system were filled with cold water and the fan run as for heating. The experiment was a success and as a result not a day was lost in the moulding room. The American Blower Co. has given special attention to the matter of proper heating and ventilation of foundries by a system which makes it possible to cool and ventilate with equal satisfaction in the summer time, and thus save much lost time as well as maintain the efficiency of the plant while in operation.

Railroad Y. M. C. A. at Baltimore.

The Baltimore & Ohio Railroad Company has awarded a contract for the erection of a new Y. M. C. A. building at Riverside, Baltimore, to J. J. Walsh & Sons, of that city. The building will cost about $33,000 and it is to be ready for use March 1. It will be of brick, 36 ft. x 100 ft., two stories high, with attic and basement. On the first floor will be a reception hall, game room and reading room, and on the second the assembly room, one class room, four bedrooms, ladies' retiring room, buffet, kitchen and two toilet rooms. The attic will be taken up by one large dormitory. New association buildings have been built at Brunswick, Cumberland, South Chicago, Newark, Holloway and several other places, and it is contemplated to still build others.

The Dramatis Personae.

A prominent railroad man, in close touch with the southern roads, gives the following partial explanation of recent occurrences:

The zone of the Southern states in which the antagonism between the state and the railroads has become most acute has been in North Carolina, Georgia and Alabama. These three states are represented, respectively, by Gov. Robert B. Glenn, Gov. Hoke Smith and Gov. Comer. Gov. Glenn was formerly a Southern Railway attorney, Gov. Smith made his money chiefly by prosecution of damage suits against railroads, and Gov. Comer is a farmer. Gov. Glenn is opposed in North Carolina by a United States Circuit Judge, Peter C. Pritchard. Gov. Comer is opposed in Alabama by United States Judge Thomas G. Jones. Gov. Smith is "layin' low and sayin' nuthin'."

Gov. Smith says that he has a scheme that will outscheme the Governors of North Carolina and Alabama in their bids for the Democratic nomination for the Presidency, though he has given no intimation as yet as to the details of his plan. Hoke Smith's father was born in Vermont, and he has no war record; Gov. Glenn's father was killed in the Confederate Army; Judge Thomas G. Jones was wounded several times in defence of Alabama as a Confederate soldier; the father of Judge Pritchard was killed on account of his Union predilections, together with other East Tennesseans in the beginning of the civil war; Gov. Comer took no part in the war.

The Southern Railway, both in Alabama and North Carolina, capitulated to the state authorities, but the Louisville & Nashville has not done so. The L. & N. is managed by one of the most dominating and commanding railroad spirits in the United States, Milton H. Smith, who defies and hates Comer and will take advantage of every right that he has under the Federal law.—*New York Times.*

"Courteous" and Absolutely Equal Treatment."

General Manager E. A. Handy, of the Lake Shore & Michigan Southern and its controlled lines, has issued to employees of the operating department a circular in which he says:

The following outlines in a general way the relations which the management desires to see established between its employees and the public. They are presented for your individual guidance and observance.

The public judges a railroad corporation very largely by the treatment it is accorded by the agent representing the company, in whatever capacity he may be employed.

A reputation for fair dealing, with courteous and absolutely equal treatment of all customers, is as essential to the success of the railroad as it is to the success of any other business.

The interest of the farmer, the manufacturer, the mine owner, the merchant and the railroad is mutual, and efficient transportation facilities are necessary to the success of all.

The good will and friendship of the communities served by our companies is the most valuable asset they can have; and the strongest recommendation for promotion an employee in any department can possibly have is the fact that by uniform courtesy and kindly accommodation of patrons he has secured for himself and for the road the good will and friendship of the community in which he is located.

We earnestly ask our employees to be governed by the above, in spirit as well as in letter.

MANUFACTURING AND BUSINESS.

The Atlantic, Quebec & Western will soon be in the market for ties to be used on its line now building from Port Daniel, Que., to Gaspe Basin, 80 miles.

V. I. Smart, Signal Engineer of the Chicago & Eastern Illinois, has been appointed Assistant Professor of Transportation at McGill University, Montreal, Can.

K. W. Blackwell has resigned as Managing Director of the Montreal Steel Works, Montreal, Can., but remains President. W. F. Angus, Secretary, has been appointed General Manager.

A. L. Whipple, who has been Eastern Representative of the Curtain Supply Co., Chicago, since the formation of that company, has been appointed Eastern Manager, with headquarters at the New York office, Park Row building, New York city.

The contracting office of the Virginia Bridge & Iron Company, Roanoke, Va., heretofore at Little Rock, Ark., has been transferred to New Orleans, La. The office will be in charge of F. E. Golian, C. E., of the Atlanta office, who has been with the company for some time.

Lewis O. Cameron, of Atlanta, Ga., Manager of Sales in the Southern district of the Pressed Steel Car Company, New York, was married on September 4 at Calvary Episcopal Church, New York, to Miss Louise Wann, of that city. The bride is the daughter of Mr. and Mrs. Charles Wann, of New York, and niece of F. A. Wann, General Traffic Manager of the San Pedro, Los Angeles & Salt Lake.

Iron and Steel.

The Kanawha & Michigan has ordered 3,000 tons of rails.

The Toledo & Ohio Central has ordered 4,000 tons of rails.

The Hocking Valley has given an order for 5,000 tons of rails.

The Erie will shortly give a contract for 1,100 tons of bridge steel.

The American Steel & Wire Company has announced an advance of $1 a ton on its wire products.

The New York Central is receiving bids for an additional 2,000 tons of steel to be used on its New York terminal.

The Atlantic, Quebec & Western will soon be in the market for rails, to be used on 80 miles of line now under construction.

The McClintic-Marshall Construction Company has received an order for 3,000 tons of structural steel for the new open hearth works of the Pittsburgh Steel Company.

OBITUARY NOTICES.

A memorial of Samuel Spencer, late President of the Southern, has been published. It consists of a minute adopted by the Voting Trustees and the Board of Directors of the company in joint meeting shortly after Mr. Spencer [illegible] rehearses his work in connection with the growth of the railroad company of which he was the first President.

*Courteous: Showing well-bred consideration; affable.—*Dictionary.*

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Apalachicola Northern.—E. A. Fauntleroy, of [illegible], Mo., has been appointed Receiver.

Chicago Junction.—H. E. Porter, Pittsburgh, has been elected also Secretary. R. B. Thomas, Assistant Treasurer, has been elected Treasurer.

Colorado Southern, New Orleans & Pacific.—I. H. Evans, General Superintendent of the Third district of the St. Louis & San Francisco, has been elected Vice-President and General Manager of the Colorado Southern, New Orleans & Pacific, with office at Beaumont, Tex.

Mexican Central.—E. W. Cartlidge, Assistant to the Vice-President at Boston, Mass., has been appointed Assistant to the Vice-President at Mexico City, Mex.

Missouri & Louisiana.—Charles S. Keith, Vice-President and General Manager, has been elected President. John A. Sargent, Traffic Manager and General Superintendent, succeeds Mr. Keith.

Raritan River.—G. C. Chittick has been appointed Auditor with office at South Amboy, N. J.

St. Joseph & Grand Island.—W. N. Purvis has been elected Secretary, with office at St. Joseph, Mo., succeeding F. W. Russell. W. M. Mooney has been appointed Acting Auditor, with office at St. Joseph, succeeding to the duties of F. C. Uhlman, who went to the Virginian Railway.

Tehuantepec National.—H. W. Morris, Assistant to the Vice-President, has been assigned to other duties and his former position has been abolished.

Tonopah & Tidewater.—B. W. Fernald has been appointed Auditor, with office at Los Angeles, Cal.

Operating Officers.

Baltimore & Ohio Southwestern.—James Donahue, Trainmaster of the Springfield division, has been appointed Trainmaster of the Indiana division, with headquarters at Seymour, Ind., succeeding E. G. Owens, resigned to go into other business.

Canadian Pacific.—A. Stevens, chief train despatcher at Vancouver, B. C., has been appointed Superintendent at Winnipeg, Man., succeeding J. T. Arundel, transferred.

Chicago, Rock Island & Pacific.—The headquarters of J. C. Nolan, Superintendent of the Louisiana division, have been moved from Ruston, La., to El Dorado, Ark.

Colorado & Southern.—H. E. Renick, Trainmaster at Denver, Colo., has been appointed Assistant Superintendent of the Fort Collins, Clear Creek and Pueblo districts, with office at Denver.

Erie.—The offices of C. C. Riley, Superintendent of Transportation, and G. W. Kirtley, Assistant Superintendent of Transportation, have been moved from Jersey City, N. J., to New York.

Fitzgerald, Ocilla & Broxton.—M. W. Gant has been appointed Trainmaster, with office at Fitzgerald, Ga.

Georgia, Florida & Alabama.—W. R. Parsons has been appointed Trainmaster at Bainbridge, Ga., succeeding to the duties of D. L. Turner, Jr., Acting Trainmaster.

Kalamazoo, Lake Shore & Chicago.—James Grant, Secretary, has been appointed General Superintendent, with office at South Haven, Mich., succeeding Blaine Gavett, resigned to go to another company.

Missouri Pacific.—See St. Louis & San Francisco.

Missouri Southern.—J. T. Fredricks has been appointed General Manager, with office at Leeper, Mo., succeeding P. H. Walsh, resigned. H. A. Radtke has been appointed Superintendent, with office at Leeper, Mo., succeeding C. M. Phelps.

Northwestern Pacific.—W. S. Palmer, General Superintendent of the Northern district of the Pacific system of the Southern Pacific, has been appointed General Manager of the Northwestern Pacific, succeeding James Agler, resigned.

Panama.—J. A. Smith has been appointed General Manager, succeeding W. D. Bierd.

Paris & Great Northern.—W. H. Upton has been appointed General Superintendent, with office at Paris, Tex., succeeding E. W. Dickson.

St. Louis & San Francisco.—J. A. Frates, Trainmaster at Springfield,

Mo., has been appointed General Superintendent of the Third district, with office at Chaffee, Mo., succeeding J. H. Elliott. J. G. Lorton, Superintendent of the Valley division of the Missouri Pacific, has been appointed Superintendent of the Northern division of the St. Louis & San Francisco, succeeding J. E. Hutchison, promoted. See Colorado Southern, New Orleans & Pacific, under Executive, Financial and Legal Officers.

Southern Pacific.—W. R. Scott, Superintendent of the Western division, has been appointed General Superintendent of the Northern district of the Pacific system, with office at San Francisco, Cal., succeeding W. S. Palmer, resigned to go to the Northwestern Pacific. J. H. Young, formerly General Superintendent of the First district of the St. Louis & San Francisco, succeeds Mr. Scott, with office at Oakland Pier, Cal. See Northwestern Pacific.

Tehuantepec National.—W. N. Cartwright, Superintendent of Transportation, has been appointed Superintendent, with office at Rincon Antonio. J. H. Sayers has been appointed Terminal Superintendent at Coatzacoalcos, V. C., succeeding J. J. Lewis, resigned.

Traffic Officers.

Chicago, Indianapolis & Louisville.—The office of Traffic Manager, held by the late Charles H. Rockwell, has been abolished. B. E. Taylor has been appointed General Freight Agent, succeeding O. C. Carter.

Louisville & Nashville.—W. A. Russell, Assistant General Passenger Agent, has been appointed General Passenger Agent, succeeding C. L. Stone, who is now Passenger Traffic Manager of the Missouri Pacific.

Engineering and Rolling Stock Officers.

Baltimore & Ohio.—Lucius T. Gibbs has been appointed Electrical Engineer, succeeding W. D. Young, resigned.

T. H. Russum, supervisor car department, has been appointed to the new office of Superintendent of the Passenger Car Department and his former office has been abolished. J. J. Tatum, general foreman car department at Mt. Clare, Baltimore, Md., has been appointed to the new office of Superintendent of the Freight Car Department. The offices of both are at Baltimore, Md. J. F. Bowden, general foreman locomotive department at Trinidad, D. C., has been appointed Master Mechanic at Parkersburg, W. Va., succeeding J. P. Dorsey, resigned.

Chicago & Eastern Illinois.—V. I. Smart, Signal Engineer, has resigned. L. C. Hartley, Assistant Engineer of the Pittsburg, Cincinnati & St. Louis at Logansport, Ind., succeeds Mr. Smart.

Chicago & North-Western.—John Charlton, foreman of shops at Antigo, Wis., has been appointed Master Mechanic of Chicago terminals, succeeding L. M. Carlton, resigned.

Erie.—Charles James, Master Mechanic at Galion, Ohio, has been appointed Master Mechanic at Port Jervis, N. Y., succeeding G. A. Moriarty, resigned to go to another company. E. S. Fitzsimmons, general foreman boiler maker, succeeds Mr. James.

Missouri Pacific.—W. L. Calvert, Master Mechanic of the Valley division, with office at McGehee, Ark., has been appointed to the new office of Master Mechanic of the White River and Memphis divisions, with office at Carter, Ark. J. T. Johns succeeds Mr. Calvert. W. A. Bedell has been appointed Master Mechanic at Van Buren, Ark., succeeding B. Donahue, resigned. The White River and Memphis divisions were formerly under the authority of the Master Mechanic at Van Buren.

Oregon Short Line.—C. C. Stroufe has been appointed Assistant to the Chief Engineer, with office at Portland, Ore.

Pennsylvania Lines West.—See Chicago & Eastern Illinois.

Purchasing Agents.

Northern Pacific.—L. Crassweller, Assistant Purchasing Agent, has been appointed Purchasing Agent at Tacoma, Wash.

LOCOMOTIVE BUILDING.

The Bessemer & Lake Erie, it is said, has ordered 21 locomotives.

The Tehuantepec National is said to be in the market for locomotives.

The Jamaica Government Railway is said to have ordered two locomotives.

The Atchison, Topeka & Santa Fe denies having ordered a number of 16-wheel Mallet compounds, as reported in the *Railroad Gazette* of August 16. This type of locomotive will not be used by the road for some time to come.

The Grand Rapids & Indiana has ordered four simple consolidation (2-8-0) locomotives from the American Locomotive Co., for January, 1908, delivery.

General Dimensions.

Type of locomotive	Consolidation
Weight, total	178,000 lbs.
Weight on drivers	152,000 "
Diameter of drivers	56 in.
Cylinders	21 in. x 28 in.
Boiler, type	Belpaire wide firebox
" working steam pressure	200 lbs.
" number of tubes	314
" material of tubes	Charcoal iron
" diameter of tubes	2 in.
" length of tubes	174 "
Firebox, length	102 "
" width	62¼ "
" grate area	44.5 sq. ft.
Heating surface, total	2,530.0 "
Tank capacity	6,000 gals.
Coal capacity	24,000 lbs.

Special Equipment.

Air-brakes	Westinghouse
Bell ringer	"Little Giant"
Boiler lagging	Keasbey & Mattison
Brake-beams	Greeo
Couplers	Kelso and Pitt
Headlights	Star
Injector	Nathan
Piston rod packings	Grand Rapids & Indiana
Valve rod packings	Grand Rapids & Indiana
Safety valve	Kunkle
Sanding devices	Leach
Sight-feed lubricators	Nathan
Springs	Railway Steel-Spring Co.
Steam gages	Ashton
Steam-heat equipment	Grand Rapids & Indiana
Tires—tender wheel	Schoen

The Butte, Anaconda & Pacific, as reported in the *Railroad Gazette* of August 2, has ordered four simple consolidation (2-8-0) locomotives from the American Locomotive Co., for November delivery.

General Dimensions.

Type of locomotive	Consolidation
Weight, total	185,000 lbs.
Weight on drivers	167,000 "
Diameter of drivers	52 in.
Cylinders	21 in. x 28 "
Boiler, type	Straight top
" working steam pressure	200 lbs.
" number of tubes	270
" maker of tubes	Shelby
" diameter of tubes	2 in.
" length of tubes	12 ft. 10 "
Firebox, length	108 "
" width	60 "
" material	American Locomotive Co.'s standard
" grate area	45 sq. ft.
Heating surface, total	2,646 "
Tank capacity	6,000 gals.
Coal capacity	12 tons

Special Equipment.

Air-brakes	Westinghouse
Axles	Cambria steel; Coffin process
Bell ringer	"Little Giant"
Boiler lagging	Keasbey & Mattison
Brake-beams	Standard Steel Car Co.
Brake-shoes	American Brake-Shoe & Foundry Co., steel back
Couplers	Major
Headlights	Dressel
Injector	Ohio
Journal bearings	Ajax metal
Piston-rod packings	Jerome
Valve-rod packings	Jerome
Safety valve	Ashcroft
Sanding device	Leach
Sight-feed lubricators	Detroit
Springs	Railway Steel-Spring Co.
Steam gages	Ashcroft
Tires—driving wheel	Latrobe
Tires—truck wheel	Latrobe
Tires—tender wheel	Griffin

CAR BUILDING.

The Tehuantepec National is said to be in the market for cars.

The Utah Light & Railway Company, Salt Lake City, is said to have ordered 50 cars.

The Eldorado & Wesson has ordered one coach from the Hicks Locomotive & Car Works.

The Beaumont & Great Northern has ordered one coach from the Hicks Locomotive & Car Works.

The American Steel & Wire Company, Chicago, as reported in the *Railroad Gazette* of August 30, has ordered 25 cars.

The Stephenville, North & South Texas, Stephenville, Tex., has ordered 20 box cars of 60,000 lbs. capacity from the American Car & Foundry Co., one first-class coach from the Hicks Locomotive & Car Works, and one combination caboose from the Handlan-Buck Manufacturing Co.

The Chicago & Illinois Midland has ordered six flat cars, three of 80,000 lbs. capacity and three of 60,000 lbs. capacity, from the Hicks Locomotive & Car Works. These cars will be 41 ft. and 36 ft. long, 8 ft. 11 in. and 8 ft. 9 in. wide, over all. The special equipment includes:

Brake beams	Simplex
Brakes	Westinghouse
Couplers	Tower
Draft rigging	Harrison twin spring and Miner tandem
Paint	Hicks standard

The Atchison, Topeka & Santa Fe, as reported in the *Railroad Gazette* of August 23, has ordered 10 wooden 70-ft. steel underframe combination automobile and horse cars from the American Car &

Foundry Company for November delivery. The special equipment includes:

Brake-beams	Chicago Railway Equipment Co.
Brake-shoes	Perfection
Brakes	Westinghouse
Brasses	Hewitt
Couplers	Janney
Draft rigging	Miner
Lost guards	Seale
Journal boxes	Franklin
Springs	Simplex Railway Appliances

The Union Pacific, as reported in the *Railroad Gazette* of August 9, is building 25 all-steel box cars of 100,000 lbs. capacity at its Omaha shops. These cars will weigh 37,400 lbs., and will measure 40 ft. long, 8 ft. 10⅛ in. wide and 7 ft. 11 in. high, inside measurements. The special equipment includes:

Bolsters, truck	Buckeye
Brake-beams	Waycott
Brake-shoes	Congdon steel back
Couplers	Climax
Door fastenings	National safety
Doors	Security
Draft rigging	Sessions
Journal boxes	National Malleable Castings Co.
Trucks	Andrews cast steel side frame
Wheels	Davis cast steel

RAILROAD STRUCTURES.

BUFFALO, N. Y.—The Delaware, Lackawanna & Western, it is said, is building a reservoir to have a capacity of 25,000,000 gallons, to supply water for the company's engines, also for its East Buffalo shops. The reservoir is to cover an area of 15 acres.

DUNSMUIR, CAL.—The shops of the Southern Pacific at this place are to be enlarged, by an addition 100 ft. long, and six stalls are to be added to the roundhouse. The company also proposes to put up shops about 1,000 ft. long at Chestnut, one mile south of Dunsmuir.

NEW WESTMINSTER, B. C.—The Great Northern has submitted plans for a proposed station to be built at this place.

NEW YORK, N. Y.—The bids recently opened for the construction of the Queens approach for the Blackwell's Island bridge were: Maryland Steel Company, $758,600; Buckley Realty Construction Company, $797,804; Williams Engineering & Contracting Company, $809,345, and the Richard Henningham Company, $914,170. No award has yet been made.

PORTAGE LA PRAIRIE, MAN.—For some time negotiations have been in progress between the Grand Trunk Pacific and residents of this place to build a joint traffic and railroad bridge over the river here.

PORT DANIEL, QUE.—Bids will soon be asked for by the Atlantic, Quebec & Western for bridges to be built on its line between this place and Gaspe Basin.

SACRAMENTO, CAL.—The Northern Electric Company will build a large highway bridge over the Sacramento river.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

APALACHICOLA NORTHERN.—This road is now open for traffic from River Junction, Fla., to Apalachicola, 80 miles.

ATCHISON, TOPEKA & SANTA FE.—Contract is reported let by this company to Ransom & Cook for grading its new yards at Chanute, Kan. Work is also to be started by Harvey Stuyvers on a new roundhouse and shop buildings.

BUFFALO, ROCHESTER & PITTSBURGH.—This company, it is said, is getting estimates for double-tracking its main line from Butler, Pa., northeast to Punxsutawney, 62 miles.

BULLFROG-GOLDFIELD.—See Tonopah & Goldfield.

CANADIAN NORTHERN QUEBEC.—Construction work on the Montfort branch has been finished and the line is now open for freight traffic between St. Jerome and St. Sauveur.

CANADIAN PACIFIC.—Contracts are reported let by this company to McDonell & Czowski, of Vancouver, B. C., for improving the main line grades around Field, B. C. The work involves cutting two tunnels aggregating about a mile and a half, one on each side of the Kicking Horse river, and putting up two bridges. The cost of the work, it is said, will be about $1,500,000, and it will take about a year and a half to finish it. (May 24, p. 727.)

CACHE VALLEY.—This road, which runs from Sedgwick, Ark., to Light, in Green county, has been sold to a syndicate of which J. D. Goldman of St. Louis is President, A. Bertig of Paragould, Vice-President; H. A. Culver, Second Vice-President; S. C. Dowell, Treasurer, and G. W. L. Brown, General Manager, all of Walnut Ridge. The new owners propose to extend the north end of the line from Light east to Paragould, 28 miles, and the south end northeast to Walnut Ridge, 10 miles, or southwest to Newport, 40 miles. (March 15, p. 380.)

CENTRAL OF GEORGIA.—This company [illegible] on improvements which were to cost about $[illegible] reduction of rates ordered by the Georgia Railroad Commission.

CHICAGO & NORTH WESTERN.—The extension from Gregory, S. Dak., to Dallas, 36 miles, has been finished and trains are now run from Homestead through to Dallas.

On the Ashland division the line from Antigo, Wis., to Bryant, has been extended northwest to Van Ostrand, 17.1 miles.

This company has started proceedings in the Superior Court to condemn 97 parcels of land in Chicago near the site of its proposed new terminal station.

DENVER & GULF.—This company has increased its capital stock from $2,000,000 to $10,000,000. The company was chartered this spring to build from Denver, Colo., southeast to Snyder, Okla., [illegible] miles. (May 10, p. 663.)

FLINT RIVER & GULF.—See Gulf Line.

GRAY'S POINT TERMINAL.—See St. Louis Southwestern.

GREAT NORTHERN.—On the Minot division a new line called the Crosby line, has been opened for business from Berthold, N. Dak., northwest to Lignite, 55 miles.

GULF LINE.—Under this name the Flint River & Gulf, operating from Hawkinsville, Ga., southwest to Bridgeboro, 77 miles, has been taken over by this new company. The lease of the Hawkinsville & Florida Southern, which owns the first 44 miles from Hawkinsville south, is also taken over. An extension is projected from Bridgeboro southwest to Bainbridge, 60 miles.

HAWKINSVILLE & FLORIDA SOUTHERN.—See Gulf Line.

INTERCOLONIAL.—The Intercolonial is reported double-tracking its Point du Chene branch from Moncton, N. B., to Painsec Junction, eight miles. The cost of the improvements will be about $300,000.

LAKE SHORE & MICHIGAN SOUTHERN.—A contract for grading is reported let to M. C. Connors, of Appleton, Wis., at $45,000. The amount of material to be removed is estimated at 280,000 yds. and the work is to be finished by December.

LARIMER & ROUTT COUNTY.—New Hampshire and Massachusetts capitalists have organized this company, with a capital of $1,000,000, to build a line from a point on the proposed extension of the Larimer, Hahn's Peak & Pacific, at the Colorado-Wyoming state line south into North Park, terminating near the mouth of Grizzly creek, Colo.

MINNEAPOLIS & ST. LOUIS.—The Missouri river division, built under the name of the Minnesota, Dakota & Pacific, has been opened for business from Conde, S. Dak., west to Lebeau, 115 miles. (Aug. 23, p. 215.)

MINNESOTA, DAKOTA & PACIFIC.—See Minneapolis & St. Louis.

MORGANTOWN & KINGWOOD.—This road has been extended and is now in operation from Kingwood, W. Va., south to Rowlesburg, 18 miles. (July 12, p. 53.)

OHIO RIVER & NORTHERN.—Work, it is said, has begun on this line, projected from Midland, Pa., down the Ohio valley to Wellsville, thence north to Lisbon, Ohio, where connection is to be made with the Lake Erie & Western. All the right of way has been secured. The project is backed by P. F. Smith and W. P. DeArmitt, steel and coal men of Pittsburg, and other eastern and Ohio capitalists. J. L. Francis, of Chicago, is also interested.

OPELOUSAS, GULF & NORTHEASTERN.—See Texas & Pacific.

ST. LOUIS SOUTHWESTERN.—The Gray's Point (Missouri) Terminal Railway has given a mortgage to secure funds for construction and improvements of the line, new yard facilities and terminals. Plans are also under consideration for an extension of the road.

SAN FRANCISCO, IDAHO & MONTANA.—Grading, it is said, has been started on this line from Caldwell, Idaho, on the Oregon Short Line, southwest to Winnemucca, Nev., on the Southern Pacific main line, 196 miles. (Aug. 30, p. 248.)

SARATOGA & ENCAMPMENT.—This road has been opened for business from Walcott, Wyo., south to Saratoga, 24 miles. (May 24, p. 728.)

SEABOARD AIR LINE.—On the Sarasota branch, the sixth division, under construction between Terra Ceia Junction, Fla., and Terre Ceia, 5.4 miles, has been finished and is open for business.

SOUTHERN PACIFIC.—On the Coast division, the Coast Line Railway has been opened for business from Santa Cruz, Cal., to Davenport, 11.4 miles.

SOUTHERN RAILWAY.—Announcement is reported made by this company that, owing to recent adverse railroad rate legislation in some of the southern states, and to general conditions, the double tracking of the road between Chattanooga and Ooltewah Junction, Tenn., and north to Greensboro, N. C., has been suspended. Con-

tracts had been reported made for double-tracking work in Tennessee aggregating several millions of dollars.

Stephenville, North & South Texas.—This road has been opened for business from Stephenville, Tex., south to Alexandria, 13 miles. (Aug. 30, p. 248.)

Tennessee Railway.—This road has been extended from Montgomery, Tenn., south to Smoky, six miles.

Texas & Pacific.—The Opelousas, Gulf & Northeastern is now in operation from Melville, La., southwest via Opelousas to Branch, 41 miles. Track is being laid south from Branch to Crowley, 15 miles, and this section is to be opened for business September 15. This extension is ultimately to be built to a point on the Gulf of Mexico. An extension is also to be built from the northern terminus to a point on the Mississippi river.

Tonopah & Goldfield.—This company recently finished the Bullfrog-Goldfield line from Goldfield, Nev., south to Bullfrog and to Rhyolite, 81 miles. An extension is projected from Gold Center, near Bullfrog, south to Greenwater, Cal., about 50 miles. (May 31, p. 760.)

Union Central.—Incorporated in Texas with a capital of $225,000 and office in Dallas, to build a line from Dallas, Tex., southeast through Kaufman, Henderson, Anderson, Cherokee, Nacogdoches, San Augustine and Sabine counties to the Sabine river, on the Louisiana state line, 225 miles. The incorporators include: W. J. Hogue, W. R. Stout, W. S. Maple, M. C. Gillette, of Dallas; W. H. Marsh, of Tyler; T. B. Poindexter, J. J. Stubbs, of Wortham; J. B. Gordon, Fairfield; H. H. Hyde, Houston, and James A. Lucas, Edgewood.

Wichita Falls & Northwestern.—This company, which was incorporated last year to build a line from Wichita Falls, Tex., northwest to the Red river, thence through Oklahoma to Mangam, Okla., 90 miles, is now in operation from Wichita Falls north to Kell, Okla., 27½ miles. It is reported that the directors recently decided to issue bonds to secure funds to finish the 32 miles of line between the Red river and Frederick, Okla.

Youngstown & Ohio River.—This company has given a mortgage to secure funds, of which $1,500,000 will be used to cover the cost of construction. The line is building from Salem, Ohio, to East Liverpool via Lisbon, and will operate into Youngstown over the Youngstown & Southern. The company has leased the Pittsburg, Lisbon & Western from Salem to Washingtonville, seven miles. The Youngstown & Ohio River is being built by the Cleveland Construction Company. It is to be in operation by December of this year. (March 15, p. 394.)

RAILROAD CORPORATION NEWS.

Apalachicola Northern.—E. A. Faulhaber, of St. Louis, Mo., has been appointed Receiver of this road, which runs from River Junction, Fla., where it connects with the Atlantic Coast Line, the Seaboard Air Line and the Louisville & Nashville, to Apalachicola, Fla., 80 miles.

Arkansas Valley.—See Atchison, Topeka & Santa Fe.

Atchison, Topeka & Santa Fe.—At the annual meeting on October 24, the stockholders will be asked to ratify the lease to this company of the Fresno County Railway and to ratify the purchase of the Arkansas Valley, the Holly & Swink and the Eastern Oklahoma. These companies have been controlled through stock ownership.

Brooklyn Rapid Transit.—See Coney Island & Brooklyn (Electric).

Canada Atlantic.—The stockholders will vote on September 24 on the amalgamation of this company with the Grand Trunk, which bought it two years ago. The road runs from Depot Harbor, Ont., to the Vermont state line, 400 miles, and leases or controls 58 miles of branches.

Canadian Northern.—The Dominion Securities Corporation, Toronto, and William A. Read & Co., New York, are placing an issue of $1,500,000, series O, equipment trust 4½ per cent. notes issued by the Imperial Rolling Stock Company, a subsidiary of the Canadian Northern. The notes mature in 10 equal annual instalments beginning June 1, 1908, and are secured on 750 box cars, 170 dump cars, 140 flat cars, 25 cabooses, four snow plows, 21 ten wheel locomotives and 29 passenger train cars.

Chicago, Burlington & Quincy.—A quarterly dividend of 2 per cent. on the $110,839,100 capital stock has been declared, raising the annual dividend rate from 7 per cent. to 8 per cent. An extra dividend of 6 per cent. on the stock was also declared; both are payable October 1. The new rate will pay the Great Northern and the Northern Pacific, who own nearly all the stock of the C., B. & Q., for their expense in paying the interest on the joint 20-year, 4 per cent. collateral bonds which they issued in 1901 in exchange for that stock; the extra dividend just declared repays the two companies for the difference during the last six years between the interest they paid and the amounts they received in dividends. The bonds were exchanged on the basis of $200 in bonds for $100 in stock.

Chicago Great Western.—President Stickney, on his recent return from England, said that plans were nearly completed for new financing which would take care of the needs of the company for the next 10 years.

Coney Island & Brooklyn (Electric).—The stockholders of this company, which is a subsidiary of the Brooklyn Rapid Transit, have agreed to forego the dividends for the next two years in order to pay for improvements. The quarterly dividend was passed last spring. (May 10, p. 664.)

Eastern Oklahoma.—See Atchison, Topeka & Santa Fe.

Fort Wayne, Cincinnati & Louisville.—See Lake Erie & Western.

Grand Trunk.—See Canada Atlantic.

Great Northern.—At the annual meeting on October 10, the stockholders are to act on a proposition to buy all the properties of the following companies which make up the system: The St. Paul, Minneapolis & Manitoba, the Eastern of Minnesota, the Willmar & Sioux Falls, the Park Rapids & Leech Lake, the Minnesota & Great Northern, the Duluth, Watertown & Pacific, the Dakota & Great Northern, the Montana Central, the Duluth, Superior & Western Terminal, the Montana & Great Northern, the Billings & Northern, the Spokane Falls & Northern, the Columbia & Red Mountain, the Washington & Great Northern, the Seattle & Montana, the Minneapolis Union Railway and the Duluth & Superior Bridge.

Holly & Swink.—See Atchison, Topeka & Santa Fe.

Interborough-Metropolitan.—The quarterly dividend of 1¼ per cent. on the $45,380,300 cumulative preferred stock due October 1 has been passed. No action has yet been taken on the 7 per cent. dividend on the Metropolitan Street Railway stock guaranteed by the New York City Railway, but the usual quarterly dividend of 2¼ per cent. has been declared on the stock of the Interborough Rapid Transit. (Aug. 30, p. 248.)

Interborough Rapid Transit.—See Interborough-Metropolitan.

Lake Erie & Western.—At the annual meeting on October 2, the stockholders will vote on the proposed merger with this company of the Fort Wayne, Cincinnati & Louisville, which runs from Fort Wayne, Ind., to Connersville, with a branch from Newcastle to Rushmore, 129 miles in all.

Metropolitan Street Railway.—See Interborough-Metropolitan.

National of Mexico.—Arrangements have been made for extending the $8,500,000 outstanding 5 per cent. four-year notes maturing October 1, 1907, being part of an authorized issue of $10,000,000, until April 1, 1909, at the same rate of interest. This extension is at the option of the holders of the notes; they may have the notes redeemed on the original date of maturity, at par, but those who are willing to have them extended will receive new notes and $35 additional in cash for each $1,000 note.

New York Central Lines.—Gross earnings for the month of August, 1907, were as follows:

	1907.		Changes.
New York Central & Hudson River	$9,264,420	Inc.	$640,911
Lake Shore & Michigan Southern	4,135,926	"	312,520
Lake Erie & Western	188,666	Dec.	20,570
Chicago, Indiana & Southern	248,516	Inc.	17,837
New York, Chicago & St. Louis	884,757	"	75,188
Michigan Central	2,474,261	"	298,780
Cleveland, Cin., Chicago & St. Louis	2,471,386	"	106,100
Peoria & Eastern	259,136	Dec.	27,047
Cincinnati Northern	95,341	"	19,705
Pittsburgh & Lake Erie	1,519,196	Inc.	261,993
Rutland	293,568	"	6,050
	$22,135,473	Inc.	$1,712,057

Toledo, Ann Arbor & Detroit (Electric).—The property of this company, which has been in the hands of a receiver since August, 1906, is to be sold under foreclosure on September 16. The upset price is $80,000. The road is partly built between Toledo, Ohio, and Ann Arbor, Mich.

Union Pacific.—The syndicate headed by Kuhn, Loeb & Co., New York, which underwrote the $75,000,000 convertible 4 per cent. 20-year bonds last spring, expires on September 16. The last instalment was paid on September 10, and it is understood that this amount, which was about $30,000,000, was at once used to take up the notes issued to the Pennsylvania for Baltimore & Ohio stock. It is said that the syndicate disposed of only about 2½ per cent. of the bonds.

Western Pacific.—It is said that this company has acquired control of the Yosemite Valley Railroad, which was recently opened for traffic from Merced, Cal., to Yellowstone Park, 85 miles.

Yosemite Valley.—See Western Pacific.

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EDITORIAL ANNOUNCEMENTS.

THE BRITISH AND EASTERN CONTINENTS edition of the Railroad Gazette is published each Friday at Queen Anne's Chambers, Westminster, London. It contains selected reading pages from the Railroad Gazette, together with additional British and foreign matter, and is issued under the name Railway Gazette.

CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.

ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

OFFICERS.—In accordance with the law of the state of New York, the following announcement is made of the office of publication, at 83 Fulton St., New York, N.Y., and the names of the officers and editors of The Railroad Gazette:

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CONTENTS

VOL. XLIII., No. 12. FRIDAY, SEPTEMBER 20, 1907.

The salient item in the statistics of the railroads of the country for the fiscal year ending with June, 1906, which have just been reported by the Interstate Commerce Commission, is the average of gross earnings, which, for the first time, exceeds ten thousand dollars a mile. This figure differs but slightly from that given by Poor. The fact that the growth of business on existing railroads is much more rapid than the extension of railroad lines is also indicated by the statement of the density of freight traffic, which in the present report is 982,401 ton-miles per mile of line, an increase of no less than 14 per cent. over the year preceding. Another aspect of the same fact is the length of four-track railroad in the country, which now aggregates 1,280 miles. The number of cars owned by the railroads, passenger, freight and service, has now almost reached two millions. The next report—which will be for a date already three months past—will show a figure farther from the two million mark than the present one. The number of persons employed by the railroads has also reached a round figure—a million and a half—which will be surprising to the reader who has not watched the prodigious growth of the transportation industry. This is an increase of 50 per cent. over the record of so recent a year as 1901.

The results of the tests made to determine the pressure of locomotive wheels against the rails when rounding curves reported by George L. Fowler elsewhere in this issue are a very important contribution to the knowledge on this subject which up to this time has been vague and unsatisfactory. Wellington and Forney wrote from a theoretical and somewhat crude experimental standpoint on the action of wheels and trucks on curves and the Williams Bridge wreck on the New York Central more recently brought out a great mass of more or less conflicting theoretical calculations based on widely different assumptions. While Mr. Fowler's experiments unfortunately were not carried out fully enough to warrant formulating a law expressing the relation between speed, curvature, wheel loads, wheel base and the side pressure against the rail, the incomplete data obtained give grounds for casting doubt on the theoretical calculations which give results much lower. Some of the complex stresses involved must have heretofore been overlooked or misapplied in making assumptions. The best proof of this is that in the case of the Williams Bridge wreck all of the facts tend to show that the rails were spread by the action of the locomotive while all the calculations so far published give stresses which are below the ultimate strength of the fastenings. It is to be hoped that further tests along this line will be carried out in the near future in order to establish definitely the pressures which must be safely provided for. The apparatus has been perfected sufficiently to give reliable results under any normal conditions of speed, curvature and wheel loads, and nothing now remains but for some railroad to provide the necessary track and locomotives to be tested.

A member of the motive-power department of a large road writes to ask for information as to the average natural life of passenger cars, especially on large systems having branch lines on which such cars can be run after they become unsuited for main line service. We do not know that any statistics on this subject have ever been compiled. Car men, when asked this question, generally answer, "about 25 years." But they do not mean by this that as a result of deterioration the car at the end of that time is suitable only for the scrap heap. Passenger cars are maintained at all times in condition to transport passengers safely; therefore from the standpoint of their physical condition their lives are without a limit. Freight cars not infrequently reach a state of such general dilapidation as to be condemned, but not so with passenger equipment. When passenger cars are condemned, it is because they have become so antiquated in style and arrangement as to be unfit for further use. This is the basis for the 25-year estimate. During that period, and even a shorter one nowadays, a car will have passed through all the stages of service from the splendors of the "crack" limited, down through local and branch line service, to end up possibly in a work train or some such humble service before going finally to the scrap heap.

The rate of depreciation allowed in the rules of interchange for passenger cars might be taken by the uninformed as a basis from which to compute the average life of passenger equipment. That is not the case, however. When the passenger rules were first adopted —in 1890—they contained no provision for valuation of destroyed cars. The committee appointed to revise these rules in 1900 included in their proposed revision a clause for settlement for destroyed cars, in which allowance for depreciation was made at the rate of 4 per cent. a year up to 60 per cent. of the original value of the car. This was rejected by the association, however, and the code remained without such a clause until 1906. The present revised rules were then adopted, and for the first time terms for settlement for destroyed cars were laid down. The depreciation allowance is at the rate of 3 per cent a year up to 50 per cent. of the original value of the car. This figure is altogether arbitrary.

however, and was agreed on in response to the demand that the rules contain such a clause. It is thought by many to be too high, this doubtless being the case when one's own car is destroyed; when it comes to paying somebody else's claim the allowance probably seems much too small.

One of those entries not conspicuous in itself, but whose variation upward casts its deep shadow ahead, appears in the item "taxes" on the railroads of the country as returned for the years 1905 and 1906 in Poor's Manual soon to be published. For the year 1905 the taxes were $54,553,620; for 1906 they were $68,169,833, an increase of $13,616,213, or about 25 per cent. During the same years railroad mileage of the country increased only about 2½ per cent., and total railroad assets which, in a rough way, may be regarded as the "gross" object of taxation, increased somewhat less than 8 per cent. Taxation, in ratio, thus went up ten times as fast aud far as mileage and three times as fast as total railroad valuation. But this is not all and is a meager and deceptive test, for the taxes for 1906 were, in fact, based on assessments and on tax methods in force during the previous years and before "corporation baiting" got its full sweep and swing. The data of railroad taxation are, practically, two years behind, and not until next year, at the very earliest, shall we be able to measure the reach of the new taxation impacts due to state legislation during the year past. A good many legislatures have been giving the subject attention adversely to the railroads, and in two or three states, like New Jersey, the changes have been severe, almost revolutionary. The outcome is not yet. But we venture to predict that when the final accounting is had in the courts and elsewhere of the railroads as creditors of the public the increment of taxation will cut no small figure. If it results in harmonizing the medley and welter of tax expedients in the various states there may be a final gain even if coupled with some antecedent loss. Meanwhile, as a theoretical study, at least, economists may well stand aghast at the complexities of applying existing mazy and hybrid railroad tax methods to state or federal plans of "revaluation."

Organizations of shippers to bargain for freight rates are proposed by a correspondent in another column. Shippers do thus organize to some extent now; and the National Industrial Traffic League, lately formed, proposes to cover the wide field more systematically than it has been heretofore covered. The only new suggestion offered by our correspondent, therefore, is that Boards of Trade be clothed with some official authority. This suggestion is offered with evident diffidence, as well it may be; for a trade organization which is to have real authority to speak for individual shippers should have only very limited powers. Perhaps the power to advertise itself as a public body, to gather facts and to record and certify to votes or letter ballots would be about all that it would be safe to begin with. The desideratum is to establish a body which could promptly and truly represent all of the shippers and receivers within a given territory—perhaps a county or half a state—while still retaining the close relations between individuals and the central organization that is to be seen in the Merchants' Association of New York and like organizations in other cities. The statutes forbidding preference for one shipper over another are now everywhere construed very strictly, so that a railroad traffic manager who wishes to consult "the public" before making a change in a rate must be careful to find out just who the representative of the public is, or rather, just what "public" a given representative has the right to speak for. Hence the need of a shippers' organization recognized by the state. If a voluntary and unincorporated merchants' association should freeze out a single merchant, a railroad manager dealing with the association would have to be on his guard against being jailed for discrimination. Is it practicable to establish an efficient and impartial shippers' committee which all classes of shippers would support?

In the point made by our correspondent concerning the partisanship of state railroad commissions there is a slight suggestion of humor. These bodies have indeed become so intensely partisan, and their partisanship so pleases the public, that the old idea of an unprejudiced commission seems in danger of dropping out of sight. In the new law passed this year in Georgia, the radical members of the Legislature have gone so far as to intimate that the less a candidate knows about railroading and about law, the better will be his chance of appointment. What other interpretation can be put upon that clause of the statute which names the qualification of candidates and in so doing expressly stipulates that these two branches of knowledge shall be ignored? We have called this humorous; but probably we are wrong. The fear of getting pro-railroad men on commissions seems to be a serious matter; and in other states than Georgia. Is it impossible to get fair-minded men who are not devoid of legal and railroad knowledge? Even the carefully prepared New York state law, fathered by Governor Hughes, seems to assume that the Public Service Commissions are liable to pursue the same headlong, ignorant course pursued by the legislatures, for it provides for a regular salaried lawyer as adviser to each of the two commissions. Governor Hughes himself, a thoroughly public spirited man, seems to be possessed by this same notion that only through partisan commissions can the railroads be curbed; for in selecting 10 commissioners, he seems to have found only two who were familiar with railroad affairs. It would be hard to find another state where there has been even this slight recognition of "the other side." In the present state of mind of the governors and legislators of many of our states the only way for a commission to satisfy what seems to be public sentiment is to proceed with feverish speed to "jump on" the railroads at every vulnerable point. As long as this is so the least that the conservative legislator or the conservative adviser of a governor can do is to see that a lawyer, presumably level headed and not carried away by the ill-considered behavior of the legislatures, is appointed to stand by and restrain zealous commissioners, so that their course shall be somewhere within the bounds of reason. But what a commentary on the meaning of "Commission!" The normal function of a commission—which is a committee—is to investigate and report upon the whole of a subject—that is to say, to fairly set forth all aspects of it. Partisanship is excluded, almost, by the word itself. If the present tendency continues the statutory legal advisers will be the real commissioners; for a man possessing accurate and intimate knowledge of a subject must inevitably prevail finally over a man, or a dozen men, swayed only by impulse. Georgia has provided for a legal adviser to the Commission, the same as New York.

There are indications that the problem of securing better rails is rapidly approaching solution, and that this favorable result is primarily due to publicity of the bad condition, which has enabled the American Railway Association to act for all the railroads in a united investigation. A significant incident is that the Bethlehem Steel Company offers to furnish rails for a moderate advance on the $28.00 price, with .04 phosphorus and a 20 per cent. discard from the ingot. If for an increased cost of less than 25 per cent. the railroads can have rails which are reasonably safe and with a life more than double, a considerable improvement in the situation is manifest. It will be recalled that following the publication of statistics of breakage and a large number of representative photographs showing the kinds of breakage, the American Railway Association, on the initiative of Mr. Wilgus, discussed the subject at its Chicago meeting, to which representatives of the manufacturers were invited, and this discussion was followed by the appointment of a committee. There are now in session meetings of a sub-committee of the American Railway Association's committee, consisting of Mr. Richards, of the Pennsylvania; Mr. Isaacs, of the Southern Pacific; Mr. Montfort, of the Louisville & Nashville, and Mr. P. H. Dudley. In conference with them are four representatives of the manufacturers: Mr. Wood, of the Maryland Steel Company; Mr. Bostwick, of the Carnegie Company; Mr. Carhart, of the Illinois Steel Company, and Mr. Abbott, of the Lackawanna Steel Company. This sub-committee will report early next week, and there is possible, indeed there is some hope for, an agreement on specifications acceptable to the manufacturers. The attitude of the manufacturers has entirely changed, apparently, if words count for anything. Both Mr. Schwab and Judge Gary have made public statements to the effect that their rail orders have stopped, awaiting an agreement on specifications acceptable to the railroads. Judge Gary adds a statement of that kind of truth which is self evident, but which has more than a commonplace value in view of the development of facts about defective steel rails and the firm attitude of the railroads. Judge Gary says:

> "The time has gone past for the great corporations to ignore the public and the public interest. 'The public be damned' policy, if that phrase was ever actually used, will not go in these days. The heads of our great industrial enterprises can never adopt that attitude, not alone as a matter of policy but in the interest of their own undertakings."

The only feature of the distressing collision in New Hampshire, reported this week, that is at all novel, is the statement of the cause, given by the officers of the road to the newspapers, which is clear

and frank, and evidently as full as can be asked for at this time. The officers even tell us the length of service of the two men between whom lies the responsibility for the error in the telegraphic order delivered to the freight conductor. This is a detail which is always of interest to the public. The recognition of this fact by railroad officers nowadays is perhaps to be credited to the Interstate Commerce Commission, which asks this question in connection with the reports of accidents which are required by the Federal law. The New Hampshire collision is due to an error of the same class as that which figured in the disaster at Salem, Mich., only eight weeks before. Despatchers' and operators' errors of all kinds, when they are aggregated for 225,000 miles of road, as they are in the records now furnished to American newspaper readers, are so numerous that no detail is unfamiliar. That the victims of this collision were in a light car, placed in the train between heavier ones, is also commonplace. There seems to be no end to the life of old passenger cars, although their use between heavy ones has been vigorously denounced these many years. This collision, like Salem, might be made the text for an instructive study of the best way to secure safety under the American despatching system. But why should such a study be made? Has not every railroad superintendent and trainmaster long since become convinced that the system has in it more loop holes for danger than any division officer on earth can watch and safeguard? As in repairing a thin dam made of bad material, new leaks will develop in one part while attention is being centered at another. At least, this is the incontrovertible verdict that the public is obliged to render on the basis of known results, whatever railroad officers may believe or may be trying to accomplish. The Boston & Maine is spending large sums of money on automatic block signals. It recognizes the absolute necessity for the adoption of the space interval principle in running trains, in place of the time-interval-and-train-despatcher method. As on most other roads, the process of introducing the better method is slow. Even the state railroad commissioners of Massachusetts, Indiana and New York, who recognize the need of the block system, are slow. Possibly this slowness is financially justifiable. But meanwhile people are being killed by the car-load.

MORE DIFFICULTIES IN GEORGIA

The Georgia Railroad Commission finds that the gross rate reductions received through the instrumentality of the commission by 69 Georgia cities and towns, based on the business of 1906, amounted to $1,896,199. But Commissioner Joseph M. Brown points out that, in the meantime, the price of commodities affected has actually increased. "It is clearly proven," he says, "that the reduction in freight rates, although the unjust discrimination caused by them required that they should be made, signally failed to reach the masses of the people. And let me add that the increase in prices has often been made at the expense of even the retail dealers."

Mr. Brown continues: "It is, therefore, certainly pertinent to ask, 'Shall the transportation facilities necessary for the commerce and intercourse of the people of Georgia be made subservient to the demands for other and greater dividends for the manufacturers of Georgia and of other states from which Georgia jobbers buy? Ought not the railroads to be protected in the power to furnish to the people prompt and safe service for person and property, and should not future reductions in their revenues be made on such items as will reach the masses of the people?' There are thousands of citizens of Georgia who own railroad stocks and bonds. Shall their sources of support be destroyed for the purpose of giving other dividends to the manufacturers and jobbers? Remember, again, there are tens of thousands of people in Georgia who are members of the families of railroad employees. Shall they be reduced to beggary by bankrupting the railroad companies in order to give the manufacturers and jobbers another dividend? In the mean time it is certainly pertinent to ask directly the question which is clearly inferred from the facts I have adduced, viz.: 'Wherein has it benefited the people to reduce the freight rates?'"

Of course Mr. Brown is not arguing a case for the railroads. His point of view is not that railroad rates have been made too low, but that the wicked manufacturers, all over the state, are charging too much. Why not appoint another full-powered committee to supervise all wholesale and retail prices? The step is not a very long one, and the citizens of Georgia could then buy shoes at a dollar a pair, or whatever price the commission in its wisdom might fix. There is abundant historical authority for this. Rhode Island, for example, decreed in 1786 that merchants must accept at par the unredeemable, depreciated paper currency in payment for their goods. There were no ifs, buts or ands about this decree, yet somehow it failed of its purpose, because the unregenerate merchants closed their shops. We leave it to the reader to apply the parallel, if there is one, in this example of rate regulation *in extenso*.

THE ERIE AND THE SOUTHERN DIVIDENDS.

At a time when the cost of capital is so great that it is practically out of reach, except in small quantities, it is not surprising that the Erie Railroad, perhaps the most prominent example in the country of a financially top heavy system, should be chary of its dividend payments. And when to this high cost of money is added local legislative hostility, discouraging new investment at the same time that it reduces the earning power of present investment, it is natural that the Southern Railway should adopt the conservative course of cutting its preferred dividend from five to three per cent, to release funds much needed for improvement work. In the 1907 fiscal year, the Southern earned $56,657,991, as against $53,641,436 in the same months of the year previous, but net decreased nearly two millions in that same period, and it may be safely hazarded that the company did not earn more than the requirements on the three per cent. basis. But it is also true that expenditures for maintenance of way, structures and equipment have been on so liberal a basis, during the past two years, that money is being plowed back into the property, and operating expenses are somewhat higher than strict necessities of upkeep would require. In the 1906 year the company charged maintenance of way and structures at approximately $1,034 per route mile, locomotives at $2,632 per locomotive, passenger cars at $955 per car, and freight cars at $72. It is obvious that these figures represent, as they have represented for some years past, a wholesome and commendable effort to do as much work on the property as possible out of earnings, and the Southern, like all the roads in its territory except, perhaps, the Louisville & Nashville, has urgent need of this sort of rehabilitation. Last fall, the new financing of the road and the continuous betterment expenditure out of earnings began to bear fruit, and the road was apparently earning its full preferred dividend and some two and one-half per cent. on the common besides. But all this year the expense account has been mounting fast, especially in labor costs, both by the hour unit and by the efficiency unit, while there is scarcely a state which the lines pass through that has not sought to reduce the company's income and at the same time to increase its taxes and to regard all failure of service as wilful, as President Finley has pointed out, and to penalize such failures heavily. As we see it, when a railroad is making every effort and spending all available funds—even funds which might properly be credited to the dividend account—in an attempt to perfect its physical condition; excessive taxes, excessive damage awards and penalties for unsatisfactory performance tend directly to wrecked trains, and cost human lives. The southern legislatures may eventually learn that promiscuous attacks on the credit and earning power of their carriers, combined with enforced additions to the expense accounts, do not lead to better railroad conditions in the South; in the meantime there must be wrecks, and dividends must be passed.

The case of the Erie is quite different from that of the Southern. When the 1907 earnings were given out, it was shown that there had been a substantial increase, not only in gross, but in net, in spite of the prevailing costs of labor and materials. According to the face of these returns, which cannot be analyzed until the detailed statement of transportation and maintenance costs is published, dividends on the preferred stock were earned twice over, and they were declared at the usual rate, but made payable in 1917, four per cent. warrants for the amount being given to stockholders.

The Erie has a highly competitive position in trunk line territory; it is terribly burdened by the sins of its fathers, and the skill and courage of its president in putting the road on its feet, financially and physically, has been one of the noteworthy achievements of the last decade. But money for improvement work it must have, both to continue the grade revision, now well in hand, and to provide additional heavy equipment, and the ordinary channels through which money is procured are, to all intents, closed to the Erie at present. With a good surplus, the management may well have hesitated to pass the dividends, not only in justice to the stockholders, but because of the effect on the company's credit. The warrants represent what may be called an enforced loan of $2,-

500,000 at four per cent., while it is quite certain that the market rate for this sum would have been in the neighborhood of double that rate; more rather than less. The problem of the Erie may be stated as that of keeping its property in condition and continuing to do business until the other trunk lines grow up to its capitalization. There is no longer any question that it is urgently needed as a carrier, and it should normally show good increases, year by year, until the debt looks less formidable in proportion to the traffic than at present. But meantime it is unavoidable that new capital should be put into the property, and the year 1907 has been a crucial one in securing this capital, bringing out, as it has, two interesting expedients, the expensive, discounted-paper type of loan, last spring, and the economical dividend warrants, this fall. It is rather curious to note that the cash value of these warrants at the present time bears just about the same relation to their par value that the reduced Southern dividend bears to the full five per cent.

Train Accidents in August.[1]

Our record of train accidents occurring on the railroads of the United States in August includes 18 collisions and 25 derailments and three boiler explosions, 46 accidents in all. This record is not published in full except in the cases of the few accidents which are especially prominent—in the present instance four collisions and eight derailments. The record of "ordinary" accidents—which term includes, for our present purpose, only those which result in fatal injury to a passenger or an employee or which are of special interest to operating officers—is given at the end in the shape of a one-line item for each accident, showing date, location, class and number of deaths and injuries. This record is based on accounts published in local daily newspapers, except in the cases of accidents of such magnitude that it seems proper to send a letter of inquiry to the railroad manager.

The accident most fatal to passengers in August appears to have been that at Kelly, Pa., on the 6th, where five passengers and one trainman (the engineer) were killed and 18 passengers were injured. Southbound train No. 6 was derailed by running into a freight car which had fallen upon the southbound track in consequence of a break-in-two in a northbound freight. The passenger train was running about 40 miles an hour. The engine was wrecked and three passenger cars were overturned.

The derailment at Red Rock, Okla., on the 1st, is reported as unexplained. Both of the passenger coaches, together with the baggage car and the locomotive, fell into the ditch.

The derailment on the Chicago, Rock Island & Pacific, at Thompson, Neb., on the 22d, was due to the opening of a derailing switch in front of a passenger train when it was too late for the train to be stopped. The tender, mail car and baggage car were overturned and the engineman was killed. The train was running at about 25 miles an hour. The point of derailment was the approach to the crossing of the Burlington road, and the signalman—who decamped immediately after the derailment—is supposed to have become confused and to have assumed that the train approaching was on the Burlington track. There was, in fact, no Burlington train in sight.

The accident at Kingsley, Miss., on the 22d, was the derailment of a freight train which fell against the cars of a work train standing on a side track, causing the death of seven laborers of the work train.

The butting collision at Sapulpa, Ind. T., on the 24th, is reported as due to the failure of the train despatcher to issue the proper order to the eastbound train. Of the killed four were trainmen and the fifth was reported as unidentified.

The collision at Foul Rift, N. J., on the 15th, was due to the neglect of an operator to deliver an order to the southbound train. This operator (at Belvidere Junction, two miles north of Foul Rift) was ordered to hold a southbound freight, but he did not do so, and this train collided with a northbound train. The engineman of the northbound train was killed and three trainmen were injured. The operator was not the regular attendant at that station. A coroner's jury found the operator responsible, but recommended that no legal action be taken against him because of the failure of the despatcher to comply with the rule which requires meeting orders [if practicable] to be sent so that the superior train shall receive them at some station before it reaches the appointed meeting place. Whether or not the words which we have shown in brackets were in the rule, or, if in it, were given weight by the jurymen, does not appear. The jury deliberated 12 hours.

The derailment at Chester, Mass., on the 4th, was due to the runaway of a heavy eastbound freight train on a 1½ per cent. grade, about 20 cars being wrecked. The train after running about 10 miles at a high speed collided with an empty engine which was backing down the grade, but the empty engine, though damaged, did not leave the track. The derailment of the freight appears to have been immediately due to damage sustained by its engine when it bumped the empty engine. The failure to control the speed of the freight train was due to neglect of the train crew to test the air after taking on four cars at the front end of train at the top of the grade. Investigation indicated that an angle cock between the fourth and fifth cars was not opened, so that when occasion required an emergency application it could not be made upon the whole train. In ordinary service on this grade freight trains are controlled by hand brakes, the air being used in emergencies.

The derailment at Melrose Junction on the 7th was due to the runaway on a steep grade of a freight train made up of 50 cars loaded with coal. It occurred about 3 a.m. The train had been run properly for about nine miles down the grade but then became uncontrollable, and after running about three miles at high speed was thrown off the track at a derailing switch, the engine and 42 cars falling down a bank. One trainman was injured. The failure to control the speed appears to have been due to mismanagement of the air-brakes by the engineman.

These two runaways, though not resulting in any fatalities, are among the most costly wrecks of the month.

The collision at Auburn, N. C., on the 6th, was investigated by a coroner's jury; and the cause, as given in the words of the conductor, was "I simply forgot my orders, that's all"; and a similar neglect seems to have been the cause of the butting collision at Dalton, Ga., on the 8th.

The derailment at Tulsa, Ind. T., on the 30th, due to a train running on to a burning bridge, is reported as the fourth serious train accident near that place within a few days, all believed to have been due to the malicious acts of train wreckers.

[1] Abbreviations and marks used in Accident List:
rc.....Rear collision.
bc.....Butting collision.
xc.....Other collisions: as at crossings or in yards. Where only one train is mentioned, it is usually a case of a train running into a standing car or cars, or a collision due to a train breaking in two on a descending grade.
b.....Broken.
d.....Defective.
dr.....Defect of roadway.
eq.....Defect in car or engine.
n.....Negligence.
unf.....Unforeseen obstruction.
unx.....Unexplained.
derail.....Open derailing switch (negligence of engineman or signalman).
ms.....Misplaced switch.
acc. obst.....Accidental obstruction.
malice.....Malicious obstruction of track or misplacement of switch.
boiler.....Explosion of boiler of locomotive on road.
fire.....Cars burned while running.
Pass.....Passenger train.
Ft.....Freight train (includes empty, engines, work trains, etc.).
*Wreck wholly or partly destroyed by fire.
†One or more passengers killed.

Train Accidents in the United States in August, 1907.

Collisions.

Date.	Road.	Place.	Kind of Accident.	Kind of Train.	No. persons reported Kil'd.	No. persons reported Inj'd.
3.	Boston & Albany	W. Brookfield,	rc.	P. & Ft.	2	0
*6.	*Southern*	Auburn.	bc.	P. & Ft.	3	3
5.	Missouri Pacific	Kirkwood.	bc.	Ft. & Ft.	1	5
6.	Baltimore & Ohio	Lemont.	bc.	P. & Ft.	0	7
8.	Great Northern	Park River.	xc.	Ft.	3	0
8.	W. & *Atlantic*	Dalton.	bc.	Ft. & Ft.	4	3
11.	Buff., Roch. & Pitts.	Chambersville.	bc.	Ft. & Ft.	0	4
15.	*Pennsylvania*	Foul Rift.	bc.	Ft. & Ft.	1	3
15.	Ludington & Nor.	Ludington.	bc.	P. & Ft.	0	7
22.	Penn. W.	Hingerstown.	bc.	Ft. & Ft.	1	0
*24.	*St. Louis & San Fran.*	Sapulpa.	bc.	P. & P.	5	5
25.	Baltimore & Ohio	Deshler.	bc.	P. & Ft.	1	3
26.	Norfolk & Western	Rarden.	bc.	Ft. & Ft.	2	6
28.	C., N. O. & T. P.	Clifton.	bc.	P. & Ft.	2	0
27.	Int. & G. N.	San Marcos.	xc.	P. & P.	0	11
30.	C., C., C. & St. Louis	Kenton.	bc.	Ft. & Ft.	1	2
30.	D., L. & W.	Stroudsburg.	bc.	Ft. & Ft.	1	0
31.	A. C. L. and S. A. L.	Trilby, Fla.	xc.	Ft. & Ft.	1	0

Derailments.

Date.	Road.	Place.	Kind of train.	Cause of derlmt.	No. persons reported Kil'd.	No. persons reported Inj'd.
1.	*Atch., Top. & S. F.*	Red Rock.	Pass.	unx.	1	29
4.	*Boston & Albany*	Chester.	Ft.	runaway.	0	8
7.	*Erie*	Melrose Junctn.	Ft.	runaway.	0	1
†6.	*Pennsylvania*	Kelly, Pa.	Pass.	acc. obst.	6	18
10.	Great Northern	Milan, Wash.	Pass.	unx.	0	15
11.	St. Louis & San Fran.	Mount'n Grove.	Pass.	unx.	2	3
14.	Southern	Brevard.	Pass.	unx.	0	6
15.	Int. & G. N.	Latexo.	Ft.	ms.	1	1
15.	Chic., Burl. & Q.	Russell, Ia.	Pass.	b. truck.	0	15
15.	Missouri Pacific	Roper, Kan.	Pass.	unx.	0	15
†15.	Chic., Burl. & Q.	Weston, Mo.	Pass.	b. wheel.	1	3
16.	Wabash.	Randolph, Mo.	Pass.	unx.	0	5
18.	Great Northern	Virginia, Minn.	Ft.	b. rail.	2	1
19.	Chic., Mil. & St. P.	Keystone, Ia.	Pass.	acc. obst.	0	20
20.	El Paso & S. W.	Alamogordo.	Ft.	d. track.	1	0
22.	*Yazoo & Miss. Valley*	Kingsley, Miss.	Ft.	unx.	7	0
23.	Louisville & Nash.	Johns, Ala.	Pass.	loose rail.	1	12
22.	*Chic., R. I. & Pac.*	Thompson, Neb.	Pass.	neg.	1	0
25.	Den. & Rio Grande	Fernleaf.	Pass.	d. switch.	0	20
26.	Southern	Red Hill.	Pass.	b. rail.	0	1
27.	T. St. L. & W.	Bowman.	Pass.	d. switch.	1	7
29.	*St. Louis & San Fran.*	Tulsa, I. T.	Pass.	ms.	0	3
*30.	*St. Louis & San Fran.*	Tulsa, I. T.	Pass.	bridge.	0	2
30.	Atch., Top. & S. F.	Shoemkr, N. M.	Pass.	unx.	0	3
		Other incidents.				
1.	Pennsylvania (West.)	Urbana	Ft.	boiler.	3	0
5.	Atch., Top. & S. F.	El Toro.	Ft.	boiler.	1	2
25.	Central of Ga.	Raccoon Mills.	Ft.	boiler.	3	0

Of the 22 serious electric car accidents reported in the newspapers in the month of August, seven are reported as having each

caused one or more fatal injuries, namely, Westerly, R. I., Odell, Ill., Brooklyn, N. Y. (two), Alliance, Ohio, La Crosse, Wis., and Charleston, Ill. The last mentioned, occurring on the 29th, was a butting collision causing the death of 14 passengers. This was reported in the *Railroad Gazette* of September 6 and 13.

Uniform Classification—Significant Testimony.

The proposal to establish one uniform classification of commodities for all freight tariffs in the United States, which has been before the country for 15 or 20 years, has been favored by the Interstate Commerce Commission and by various state railroad commissions and has been constantly opposed by railroad men, by all railroad men we believe, who are fully conversant with the subject, except those who have deemed it their duty to try to comply with the wishes of the advocates of the change in spite of the difficulties of the task. At last, however, we have a strong voice on the conservative side from a state railroad commissioner, Mr. Mayfield of Texas. Mr. Mayfield has had long experience and his epitome of this matter is a forcible one. It is in a letter to O. P. Gothlin, member of the Ohio Railroad Commission. He says:

"In my judgment, uniform classification is little short of an illusion; it is absolutely impracticable and altogether unwise. Classification is but a process of rate making, and uniform classification, to be of substantial value, must be followed by uniform rate making, which at once demonstrates the utter absurdity of the whole scheme.

"Such a thing as uniform classification cannot be maintained within the limits of even a state, much less the Union. For example, take the conditions that prevail in the state of Texas, where rates on state commerce are prescribed absolutely by agents of the government, and uniformity in all respects is looked after with especial care.

"The railroad commission of Texas has prescribed a classification of its own, and the fact remains that not exceeding 15 per cent. of the commerce of this state is governed by this classification, and I dare say the same general conditions prevail in the territory of Official, Southern and Western classifications.

"Within this state we have upwards of 40 separate commodity tariffs, and most of these separate tariffs embrace innumerable commodities, and the whole of them means nothing more nor less than a classification different from that prescribed in the Standard Classification.

"There are many factors to be considered in rate making, and an important one is the character and density of a commodity for which a rate is prescribed. These conditions shift and differ as you shift and change from one section of the country to another, and rates must be prescribed taking into consideration those shifting conditions; and, therefore, I repeat that the scheme in my opinion is visionary and absolutely impracticable."

The school which the Pennsylvania Railroad has established for the training of telegraph operators and station agents at Bedford, Pa., was opened on Monday last, September 16. The manager is Mr. J. F. Cessna. It is estimated that the Pennsylvania will need 700 additional operators to comply with the federal eight-hour law which goes into effect next March. Students are to be taught not only the work of the telegraph office, including the rules for handling despatchers' orders, but also the general duties of station agent, including practice in keeping station agents' accounts. It is expected that the course will require from six to eight months, and "immediately upon its completion graduates will be provided with salaried positions." A nominal charge of $2 a month is made for tuition. The company advertises for students between the ages of 17 and 25 possessing good health and a fair knowledge of English, mathematics and geography; "men of ability, energy, decision and action." As the *Railroad Gazette* is constantly setting forth in all departments of railroading the highest ideals that it knows of, it will be ungracious to question the judgment of that officer of the Pennsylvania who seeks men like General Sherman or Bismarck or Gladstone to fill the position of telegraph operator; but unless he pays a good deal higher wages than prevail on most railroads he will probably have to put up with men possessing perhaps one, two or three of the four virtues which he names. Men of 25 who possess any of them in a marked degree will be found to be now getting from $75 to $100 a month, and they don't have to work alone out in the woods. Candidates 17 years old may possess the first two or three, at least potentially; but to possess all may be a disadvantage. It may be better if the young men do not develop the third and fourth until after they have been trained awhile. Possibly this neighborly criticism applies only to the press agent, however. The main idea of the school is highly commendable. It is unbusinesslike to depend for recruits on self-taught operators, acquiring their knowledge in the offices of all kinds of station agents; and this notwithstanding the fact that innumerable high railroad officers began their careers in that way; and it is worse than unbusinesslike to set a labor union rule in the matter of apprentices.

When one says that history repeats itself he usually refers to events, more or less alike, which have occurred a few hundred or thousand of years apart; but History, like all the rest of us now lives a fast life, hence we read of "experiments" with hoops for delivering orders to moving trains (on the Pennsylvania Railroad) which "began late in 1906." It is about 20 years, if memory serves, since the successful use of hoops in this way in Iowa was reported in the *Railroad Gazette*. Several American railroads adopted the practice some years since, however, so perhaps History is not particularly interested. The Pennsylvania has introduced a modification a holder for holding up two hoops, one for each of the two engines of a double-header. Each of the 57 block offices on the Middle Division is supplied with three holders and 50 hoops. As the Pennsylvania has an enterprising signal department the reader may be inclined to surprise at this evidence of progress in a method of train management which has to do with old-fashioned practice—practice which does not have much use for signals. An explanation, or partial explanation, may be found in the fact that the Middle Division is the one least advanced in signaling. There being no heavy and frequent passenger service on the division, the company's investments in automatic signals and short block sections have been allotted to other divisions. On the New York Division and other well-signaled sections the strictly modern method of conveying running instructions to enginemen wholly by fixed signals is in vogue to some extent; and the use of tissue-paper orders, to be handled by greasy hands and read by dim lights, is correspondingly lessened. The hoop is a highly useful device (though it has done little for the pockets of American exploiters of railroad appliances); but we may hope some time to get beyond it.

The French papers are criticising the poor results that were obtained by the state in the operation of its railroads for the year 1906 in comparison with those obtained by the private companies. According to the report that has been issued, the net gain for the five great companies was as follows: The Nord, 8,500,000 fr.; Est, 8,000,000 fr.; Paris, Lyons & Mediterranean, 8,500,000 fr.; Orleans, 1,600,000 fr., and the Ouest, 1,700,000 fr., while the state system falls behind with a net loss of 300,000 fr. It is estimated that had the state system increased in the same proportion as the other roads it would have shown a net gain of 846,000 fr., whereas in reality it fell 1,346,000 fr. below this figure. From which it is argued that the state management is not equal to that of the private companies.

Chicago, Milwaukee & St. Paul.

Official mention is at last made in an annual report of the Pacific coast extension, but even now the undertaking is not described in any detail. The official map published with the report just issued makes no note of the new line, the only direct mention of which is as follows by President Earling:

"Companies organized under the laws of South Dakota, Montana, Idaho and Washington have undertaken and are now engaged in the construction of a line of railroad from the Missouri river to Seattle, Tacoma and other Puget Sound points. It has long been apparent that an outlet to the Pacific Coast would be of great benefit to the property of your company, and accordingly your company has advanced, and is now from time to time advancing, sums of money to aid those companies in the construction of this line. Each of the companies is progressing satisfactorily with its work, and it is expected that the entire line will be completed during the year 1909. In the opinion of the directors, large and important benefits will result to your company and also to the western companies through the interchange of the constantly increasing traffic between the Great Lakes and the Pacific Coast."

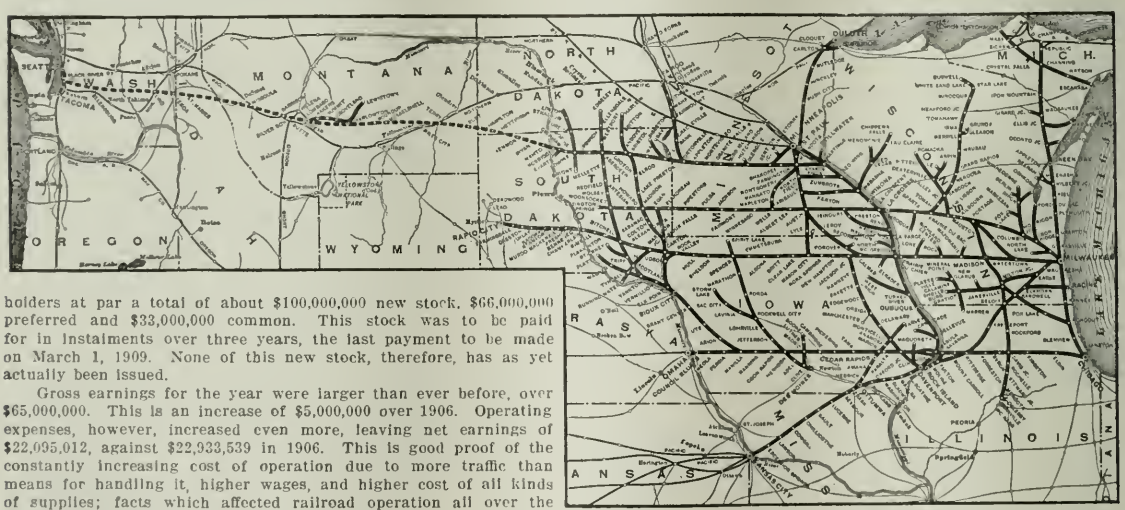
However, as was the case a year ago, there are indirect references to the new project much more definite and striking. Two years ago there was no item of "advances to other railroad companies" on the St. Paul's balance sheet. Last year this item appeared with about $9,500,000 so advanced. On June 30, 1907, it had increased to $32,339,271, which may be roughly taken as the cost of the new extension up to the present time. There has at the same time been a large increase in the stock of material and fuel on hand, as shown on the balance sheet. The value of this was $2,700,000 in 1905, $4,900,000 in 1906 and almost $6,000,000 on June 30, 1907, the increases probably representing stocks accumulated for use on the new line. The map shown herewith, including the Pacific extension, is one recently issued by the passenger department. The line should be in operation as far as Butte, Mont., some time in the first half of 1908. An article describing progress on the western end of the extension is published on another page of this issue; a similar article appeared in the *Railroad Gazette* of July 19, 1907. The country through which the western part of the extension is to pass was described in the issue of September 21, 1906.

Roswell Miller, chairman of the board, has been quoted as follows in regard to the Pacific extension:

"The line will be 150 miles shorter from Chicago to Seattle than the

Northern Pacific, and about 80 miles shorter than the Great Northern. Over the mountains the grades will be from 1⅞ per cent. to 1⅝ per cent. compensated. The Northern Pacific grades are in all cases 2½ per cent., and many of them are not compensated, and therefore average as high as 2⅝ per cent. Aside from the mountain grades, the St. Paul will have a much lower grade than the Northern Pacific, and the mountain grades are so bunched that they will not impede traffic. The extension is compelled by physical conditions to run along the Northern Pacific for a considerable distance, and to cross it several times. This, however, does not apply to much territory which produces a large business and therefore the competition will not be severe. The estimated cost of the extension will be $40,000 a mile for the main line, which includes equipment, and $30,000 a mile for branches. This contemplates a strictly first-class road in all respects."

While the fact of the Pacific extension is at last officially recognized in an annual report, the means by which the bulk of the new capital necessary for its construction is being raised—in itself the most important single event in the history of the St. Paul for the past year—is not even hinted at, except as the balance sheet shows a liability of $24,690,000, representing subscriptions to capital stock. The only new stock issue which is directly mentioned is that of $25,000,000 common stock made last fall. This amount of new stock had been authorized by the shareholders on October 4, 1902, following a threatened break with the Union Pacific over the division of through rates to the coast. Since that time it had remained in the treasury unissued, suggestive always of the possibility of an extension of the St. Paul to the coast. Twenty-five million dollars, however, is only a small part of the money which will be necessary before the St. Paul has its own through line from Chicago to Puget Sound. Consequently, late in December, there was offered to stockholders at par a total of about $100,000,000 new stock, $66,000,000 preferred and $33,000,000 common. This stock was to be paid for in instalments over three years, the last payment to be made on March 1, 1909. None of this new stock, therefore, has as yet actually been issued.



Chicago, Milwaukee & St. Paul.

Gross earnings for the year were larger than ever before, over $65,000,000. This is an increase of $5,000,000 over 1906. Operating expenses, however, increased even more, leaving net earnings of $22,095,012, against $22,933,539 in 1906. This is good proof of the constantly increasing cost of operation due to more traffic than means for handling it, higher wages, and higher cost of all kinds of supplies; facts which affected railroad operation all over the country in the late fiscal year.

Freight earnings and revenue freight ton miles each increased about 10 per cent. The principal increases in tonnage were as follows: Flour and other mill products, 168,125 tons; wheat, 71,869 tons; fruit and vegetables, 53,114 tons; bituminous coal, 158,110 tons; iron and other ores, 565,054 tons; stone, sand, etc., 130,704 tons; lumber, lath and shingles, 100,989 tons; petroleum and other oils, 72,252 tons; castings and machinery, 92,154 tons; commodities not specified, 463,159 tons. The only decreases in tonnage were in barley; oats; corn; sash, doors, blinds and other forest products; lime, cement and plaster. Although there was an increase of 6 per cent. in the tonnage of agricultural products as a whole, these comprised a slightly smaller percentage of the total than in the previous year. The St. Paul's traffic, in fact, is so diversified that the company's dependence is not on any one particular product. With the development of the central West the road has become more than a granger line and carries large quantities of manufactures, coal, lumber and general merchandise. The Pacific extension should open up large new traffic areas which will not only furnish large quantities of raw products to be shipped eastbound, but will demand in return the manufactures of other products of the East and central West; in both directions the St. Paul will get a long through haul.

Less was spent on maintenance of way than in the preceding year. Less rails and ties were laid, and less was spent on ordinary roadway maintenance. Per mile of road, maintenance of way cost $827, against $856 in 1906. The St. Paul has long been noticeable among the railroads of the country because it spends so little per mile on keeping up its line. The particular reason for this is that it has so large a proportion of branch-line mileage. Taken as a whole, it is a local road with most of its mileage on the prairies, where the cost of track maintenance is at a minimum. With completion of the Pacific extension and the establishment of this as the St. Paul's one dominating through route, the cost of roadway maintenance per mile operated will tend to increase. At present the amount spent appears to be about the minimum with which the property can be kept in proper condition.

Maintenance of equipment stands at $8,600,000, against $5,600,000 in 1906, an increase of $3,000,000, or over 50 per cent. This large increase appears to have been mainly due to the charging of $3,346,610 to operating expenses for replacement of equipment, against $694,646 in 1906 and $682,389 in 1905 similarly charged. The increase in the total expenditures last year on this account is perhaps most strikingly shown in the item "maintenance of equipment per revenue train-mile," which increased from 19.27 cents to 27.99 cents. The increase is also shown when the account is analyzed into its separate units. The cost per locomotive was $2,548, against $1,454 in 1906; $775 per passenger car, against $663 in 1906, and $102 per freight car, against $46 in 1906. The marked increase in the locomotive and freight car items suggests that these classes of equipment have been maintained at a minimum or below during recent years, as well as the tremendous traffic handled during the year. The St. Paul builds more of its locomotives and cars than any other railroad. Improvements to its Milwaukee shops, costing $652,000, have been made during the year, and at present these shops can turn out 10 locomotives a month and 28 freight cars a day.

Conducting transportation shows an increase of $3,083,088, or 15 per cent. There were large increases under various heads. The item, engine and roundhouse men, which increased $232,000 in 1906, was larger by $561,000 last year. Fuel and other supplies for locomotives increased $283,000 in 1906 and $877,000 in 1907. Train service and supplies increased $156,000 in 1906 and $364,725 in 1907. Switchmen, flagmen and watchmen, after rising by $183,000 a year previous, increased $269,000 last year. Station service and supplies increased $260,000 in 1906 and $324,000 in 1907. Use of cars and locomotives increased, $125,000 in 1906 and $152,000 in 1907. This last item shows an increase of nearly 300 per cent. in two years and probably represents the pressing into service of foreign cars to relieve the extreme car shortages.

The St. Paul's new line from Chamberlain, S. Dak., on the Missouri river, to Rapid City, 219 miles, is finished and nearly ready for operation. The Chicago & North-Western, starting from the Missouri river at Pierre, S. Dak., has also been pushing a line to the principal city of the Black Hills district, and the two roads reached their destination at about the same time this summer, thus adding another to the many points at which the St. Paul and North-Western are keen competitors.

Considerable second-track work has been done during the year, as well as reduction of grades at various points on the line. Large improvements of this sort are still necessary to put the existing lines which will be used as the eastern end of the through line to Puget Sound in shape for heavy through traffic. Aside from such general improvements, it is not probable that the St. Paul, with the tremendous project of the Pacific extension on its hands, will undertake any large amount of new building in other directions.

it was, in fact, announced last spring that some $9,000,000 worth of new extensions and improvements had been indefinitely postponed. In order to carry the new stock issues at the present dividend rates it will be necessary for the Pacific extension to make a strong showing from the first, for the existing lines cannot bear the whole burden alone. It is entirely probable that the extension will do this, in spite of the fact that it is being built at the highest cost of labor and materials ever known. Yet if the earlier transcontinentals were built at a cost nearly as low in some cases as one-half what the St. Paul is paying, they run through long stretches of country which for years were barren of traffic. To-day enterprise and development in the Northwest are at a maximum. The new country which the St. Paul opens up should be rich in traffic from the start. Such business will be in addition to the developed and profitable through traffic to and from Puget Sound.

The principal results of the last two years' operation are summed up in the following table:

	1907.	1906.
Mileage worked	7,049	6,961
Passenger earnings	$12,102,196	$11,125,345
Freight earnings	44,115,059	40,187,710
Gross earnings	69,548,554	55,423,053
Maint. way and structures	8,820,998	5,955,432
Maint. of equipment	8,789,757	5,508,046
Conducting transportation	22,782,468	18,699,381
Operating expenses	58,453,542	42,489,514
Net earnings	22,095,012	22,933,539
Betterments and improvements	1,415,747	4,764,556
Net income	14,988,644	13,323,231
Surplus for the year	5,072,463	7,009,896

CONTRIBUTIONS

Shippers' Organizations to Bargain for Rates.

New York, Sept. 3, 1907.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The *Journal of Commerce*, quoting a statement made by Mr. Plant, of the Southern Railway, in the suit against that company by the state of North Carolina, to the effect that "there should be a mutual understanding between the railroads and the public and an equitable arrangement as to rates," says: "This is a new position for railroad men to take, but it is eminently judicious in purpose. Heretofore railroad managers have claimed the right to fix rates for themselves and with sole regard for the interests of the railroads, adjusting them in such a way as to secure the largest return that the conditions of traffic will admit of. State railroad commissions, on the other hand, have been apt to be arbitrary and to assume that rates should be made as low as the traffic will bear without being discontinued by bankruptcy of the roads. If the business is to go on successfully regulation and operation must be brought into amicable relations. Those responsible for the management of railroads must arrange their schedules of rates, but this should be done with the fullest publicity and a complete disclosure of the conditions supposed to justify them."

The editor of the *Journal of Commerce* is right in declaring that the public ought to be represented; yet he ignores the fact, even while referring to it, that the public is represented already—by the state railroad commissions. What is the reason for this? The editor, like the rest of us, evidently is painfully aware that most of the state commissions are of doubtful value to the public. And the trouble is not because the commissions are not devoted to the public. They certainly aim with zeal to stand up for the public as against the railroads—although ostensibly they are independent bodies, of judicial temper, devoted to justice whether justice be for or against the railroads. No; the weakness of the commissions is due to their ignorance and their mistaken political zeal.

Mr. Plant's suggestion should not fall to the ground however, notwithstanding this blind and one-sided attitude of the present representatives of the public. The public which deals with the railroads—that is to say, the shippers—might well appoint representatives of its own. Probably the most satisfactory arrangement for carrying on negotiations between railroads and shippers that has ever been tried was that established through the traffic bureaus, such as were quite popular in St. Louis and certain other cities some 15 years ago, and which still continue to give efficient service in some places. It is only repeating an elementary truth to say that the "authority" who deals with the railroads on behalf of shippers, should, first, know accurately and in detail the needs and desires of the people whom he represents, and, secondly, should be enthusiastically devoted to the interests of these people. The average state railroad commissioner is enthusiastically devoted to those voters or the representatives of those voters who, he believes, will rule at the next election. It might be well even to go so far as to have boards of trade incorporated, and perhaps given some semblance of authority. That would be better than to continue our present farcical arrangements. Even in such a situation as that of the present year in Kansas where the railroads and the state commissioners reached a compromise on freight rates, there still seems to be a sad lack of harmonious purpose. The need of the day is a railroad commission of strong business men [illegible], politicians and country lawyers should be kept in the rear.

I want to say a word also for the railroads. The *Journal of Commerce* in proposing that the freight traffic manager in fixing his rates, shall make "complete disclosure" of the conditions on which he bases his decisions is quite superfluous. That is an idea that can never be put in practice. To even approximate a full understanding between the railroad and the public as to the reasons for a 10 per cent. increase in the rate on an important commodity, it would be necessary to hold a six days' public debate. Only by prolonged discussion would it be possible to settle the difference between the freight agent's estimate of the conditions and the estimate supported by the other side.

The only feasible way to make freight rates, in most cases, is by bargaining. The railroads must be allowed—at least in the beginning—to proceed on the theory of what the traffic will bear. The soundness of this theory is not shaken by the fact that it has often been abused by shortsighted traffic managers. It is proper for the public to see that the traffic manager does not punish traffic by charging it what it will *not* bear, but restraint of an overzealous freight agent is far different from cutting his head off. Anyone who tries to reverse the true theory of rate making only stultifies himself. "Complete disclosure" of conditions is a good goal at which to aim, and shippers may rightfully be on their guard constantly against unnecessary concealment by the railroads; but the theorist must deal with conditions as he finds them. Even state operated railroads are obliged to ride rough shod over his theories.

PROFESSOR.

Safety at Crossings Without Whistling.

Philadelphia, Pa., Sept. 16, 1907.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I have just read with interest your editorial of last week on the Noise Nuisance. Many sensitive railroad men as well as thousands of sensitive passengers will endorse your denunciation of the loud whistle and the careless engineman. You might well have gone more fully into particulars. One of the most useless functions of the locomotive whistle is the regular enforcement of the rule regarding whistling for highway crossings, where such crossings are guarded by a flagman and in many cases by both flagman and gates. This unnecessary practice is observable in many places; and it appears to be kept up in spite of the fact—not in ignorance of it—that at hundreds of crossings in this country and Europe a saner practice prevails. On the New York, New Haven & Hartford many years ago an order was issued that where crossings were provided with attendants, the whistle need not be sounded. The attendants probably in most cases had in their cabins electric bells warning them of the approach of trains. On the Boston & Albany as much as 30 years ago, whistling was abandoned at crossings which were watched, as well as at many others also. At that time many of the gatemen's cabins had no electrical connection. An officer of the legal department of that road said in substance that the disuse of the whistle at these crossings had not increased the company's burden of expense either by adverse rulings of the judges in law suits, or by added severity in the awarding of damages by juries. The notion that every time a railroad relaxes its precautions at highway crossings even a hair's breadth, it incurs new dangers in the courts, is imaginary.

There are many highway grade crossings in England, a common American impression to the contrary notwithstanding; and the whistle nuisance has been done away with in that country long since, if, indeed, it ever existed to the barbarous extent which obtains in this country.

Why should not our ideas of whistling be reversed? Why not begin with the presumption that in ordinary circumstances whistles are not needed; that they should be used only by order or permission of municipal authorities? Why do cities and towns allow unrestrained use of locomotive steam whistles for calling in flagmen, for giving switching signals in large yards, and for other things of secondary importance, when hand bells or small mouth whistles or hand motions would answer just exactly as well? It is to be confessed that town officials are negligent in matters of this kind, perhaps as generally as are railroad superintendents, but in the universal apathy of railroad officers, it might be a good thing to stir up the municipal authorities.

O. F. M.

A Few Phases of Railroad Science.

TO THE EDITOR OF THE RAILROAD GAZETTE:

There never was a time in the history of railroading when so many people were coming forward to explain why this difficulty existed, and how that trouble could be eliminated if only the other fellow would do so and so. Some of these are instructive, some amusing, and some are neither.

Why we are getting this flood of explanation is of course quite

plain. It is simply because the troubles exist, and so far all the explanations offered have not reduced one trouble, nor have the suggested remedies, with one or two exceptions, been worth the time it took to write them. The exception par excellence is, of course, that of James J. Hill, and when his words are carefully considered and stripped to the bone they amount to simply this. The railroads of America that are in trouble must get busy and spend money, spend lots of it and spend it right. The people who put in their time offering other remedies are like the wild turkey in the trap, they go doddering around looking for a hole where there is none but will not get down and use the only opening that exists.

That this remedy should be unpopular goes without saying, but the fact must be recognized sooner or later that the art of making bricks without straw went out about the time the children of Israel followed Moses out of Egypt. Corporations as well as individuals when they find themselves in trouble can look back and see where they have been doing something wrong, and the sin of the railroads has been the heart breaking race for the prize of a larger "net increase over the same period last year." The object in itself is all right, but the mistake has been in the foolish idea that too great a proportion of this increase was theirs to salt away and keep. It was not, and now they must go back and dig it up again, or if it is gone beyond reach mortgage their future that they may have a future. And the one that does this first will win out first.

The science of railroading like some others is not an exact science. It is still lop-sided and has many anomalies. For instance, while the country as a whole has been advancing by leaps and bounds, business increasing in all directions, and the "net increase over same period last year" has steadily grown, what do we find in the detail of the railroad service? While the car service man is sending in nice little essays on the car situation, cars are standing out of service waiting repairs. The real car man, the man who actually keeps them in condition to be moved, is told to go ahead and rush them out, but do not exceed your expenditure for the same period last year. While loaded cars and empties are waiting to be shunted the yardmaster is howled at by the trainmaster to get a move on and do the work, but do not exceed your expenditure for the same period last year. While the trainmaster is explaining that he cannot move trains without engines, the motive power man is screamed at to get out the locomotives and keep them in good repair, but do not exceed your expediture for the same period last year. The roadmaster is explaining that he cannot get men to work at the old rates, he is told to go ahead and do the work, but do not exceed your expenditure for the same period last year. The superintendent is explaining that the volume of business has outgrown his facilities, that he can no longer handle a traffic that has increased 100 per cent. while his trackage, etc., has increased 10 per cent., or not at all, but he gets the same song, with variations, and the farce goes merrily on.

Never mind that some of the cars are getting older every year, and there are many more of them. Don't take into account that the locomotives are each year more expensive to keep in running order, and the man we pay $2 to to-day is not doing the work a $1.75 man did before. Don't acknowledge that your rails are one year older, that your roadbed requires more labor as your ballast wears thin, shut your eyes to the fact that anywhere off your road the section men can get better pay than you offer. Don't see all, or any of these things, let them all stand still while we make up our "net increase over same period last year." But don't stand still too long, for things that move have a way of running over things that stand still, and there is a pretty general break in the line and a scramble for money. Will the supply be equal to the demand?

Our diagnoses of the evils that afflict us are often wrong, and it follows that the remedies applied are useless. At a meeting of a railroad club some weeks ago the head of the passenger and ticket department read a paper that was very good indeed, and he covered so much ground that by the time he got through you had the feeling that he must surely be the Alpha and Omega of all railroading. While the members were throwing bouquets at him one gentleman during his congratulatory speech told a little story on the side. In this story there was a fat passenger who complained of the dust in the car, the heating appliances, and finally he cursed the whole outfit on account of being jolted by the engine driver's rough handling of the train. The gentleman who told the story had been in the car with the grumbler, but whether he told the yarn to simply amuse the members of the club, or whether he intended it as a gentle hint to the passenger man that he was not the whole thing I cannot say. I do not even know how it struck the company generally but it sounded good to me. Here was a passenger who might be taken as a fair sample of 95 per cent. of all the passengers who traveled on this road. He knew nothing about the head of the passenger department, he was not interested in the man who sold him his tickets, nor did he care a red cent for the conductor, but he had a grievance against the motive power department through the engineer who had jolted him, and against the car department for his other ills, and if he continued to patronize the road or left it for a rival they and they alone would be responsible.

Here was food for thought surely. It was not a new thought to me but brushed up some old ones. Now how many passengers who might travel by a rival line is the passenger department solely responsible for securing and keeping for their own road? I have traveled on railroad trains for 20 years, meeting all sorts and conditions of passengers, and I am prepared to say they are very few. That the passenger department does secure a small number goes without saying, but as for keeping them they have less than nothing to do with it. A passenger man may induce a man, or number of men, to travel by his road once, but if the cars are dirty, the road rough, and the train badly handled he can't get him again, and these are items he has nothing to do with. While if none of these exist, if the cars are right, the road smooth and the train well handled these will attract the passenger in the first place, becoming known to him through that best advertising medium in the world, a satisfied patron, and they will keep him though he never heard of the passenger department or its representatives. And the thought in my mind is was this what the gentleman meant when he told his little story? This may appear somewhat insipid, but it leads us to one more phase of the science of railroading, and how it works out in detail at the present day.

Take any of the railroads where they enter a large city, and let us visit the roundhouse and shops where the locomotives are cared for, and the men to run them are trained, with all that both these employ, and there we will find a man in charge who bears the title of, we will say, master mechanic. Now who is he and what training was necessary for his position? Here is his history: After receiving a good common school education he enters a railroad shop and by constant hard work, honesty, sobriety and much more than average ability, he has risen step by step during 20, 25 or maybe 30 years to the position he now holds. And to fill that position he requires all the knowledge and experience he has gained during a term of years that would have turned him out a lawyer, a doctor or two or three more of the learned professions. And what is his work like? Well, we have no space for a detailed account of that, but we might say he is simply chained to the wheels of the locomotives under his charge, and they never stop rolling, Sunday, Monday, night and day they go on and he must follow. His day is an emergency, and his night is as restful as that of a doctor with a good practise. All his hard earned knowledge and experience fails him at times and he is thrown back on that mother wit that was his only capital to start with, but there is one thing he must not do, and that is to fail, not for a day, not for an hour; there is too much depending on him for that.

Well, a short life and a busy one for him, and so long as he is well paid he has no kick, but is he? A short distance away from him in the same city we find a young man in charge of the same company's ticket office. Who is he, and what was the training necessary to enable him to fill his position? We find he breaks even with the master mechanic at the time they both leave school. But he goes into a comfortable office from 9 to 5 each day and learns to fill in forms and require a good knowledge of time cards. In a year's time he is as fit as ever he will be to fill the position he now holds, but he is too young, so we will give him five years, during which time he has lived soft and had time and opportunity to enjoy life. And now we find him in his snug little job where he must sell tickets, answer questions, and send in his reports. When he can he extends the passenger business of his road, but we have seen that he hasn't really much to do with that.

Now which one of these men is most considered by the railroad employing them, and which one receives the greater money consideration from their respective positions? The ticket agent!

I have used the master mechanic as an illustration for the reason that his salary comes the nearest to being equal to that of the ticket agent, but the same thing or more may be said of the roadmaster, the trainmaster, the car foreman, the general shop foreman, the roundhouse foreman and many others, but these hard-working unfortunates are so far behind the passenger department man in all that makes life worth living, and especially in the matter of salary and pickings, that the comparison would be odious, but, odious or not, let us look at one more. The roundhouse or locomotive foreman. He has charge of the care and despatching of the locomotives that do the work of the railroad, of the mechanics who repair them, the cleaners who wipe them and the firemen and engineers who run them. To do this he should be a mechanic for he must decide as to whether an engine is fit to continue running without more than light over night repairs. He should know more than the men under him of the business in hand as he must direct these men, and decide what each shall do. What engineer shall take this run and what fireman is best fitted for that engine, etc. Then it is he who must despatch these engines each day for yard service, extra and regular freight trains and passenger trains. So that he is really responsible if the fast express does not leave on time, if the freights are delayed in starting and if the yard crews have to wait on their engine.

Now this would seem to be a rather important position and the man who fills it worthy of consideration and encouragement. But what are the facts? On nearly all the railroads in America this man is paid about 60 per cent. of what the engineer is paid, and about 85 per cent. of what the fireman receives for his work. Yet he is "over" these men or is expected to keep them up to the mark, to "jolly them along," to maintain discipline and obtain results generally. With such object lessons as the foregoing before them young men of common sense and the ability that would carry them through the long years of training necessary to fit them for the positions of master mechanic, shop foreman, etc., are not entering that branch of the service, and small blame to them.

The condition is not a natural one, and for that reason must pass away, but it will cost the railroads of America much money in passing. It is largely in their own hands to say how much, by applying the old principle that a stitch in time saves nine.

Let us just glance at this again. Suppose we go out looking for material to be worked into—item, one master mechanic; item, one ticket agent. We find two young men of 23 years of age, smart, bright young fellows both, with about the same amount of natural ability, and the same education. We take them in hand and we turn out our passenger man fully equipped for his duties in three years, and 20 years later we begin to look for our master mechanic to chip his shell and give us an idea of what he can do. Now if it takes 20 years to make a master mechanic, or a man thoroughly competent to keep in serviceable condition so important a part of a railroad equipment as the locomotive, there should be some encouragement offered for men to enter that branch so that the supply may not run out.

As I said before, I only use the position of master mechanic as an illustration; the same thing applies to the man who has charge of the balance of the rolling stock, and to the man who is responsible for the condition of the permanent way.

Never in the history of railroading on this continent have there been so many accidents due to the failure of equipment as at present. There has been volumes written on the few important accidents that were attributable to a failure of that complex piece of machinery, the brain of man, but what do they amount to, compared to the number due to failure of locomotives, cars and track? I am not speaking now only of the accidents where human life is lost, and that appear in our little table of statistics, but to the hundreds that do not appear there, but are nevertheless eating the heart out of the railroads, and could be so largely prevented by the expenditure of money in inspection, repairs and maintenance. And this brings us back to Mr. Hill's text: Get busy and spend money, and spend it right, and don't forget the human element. The railroad that is the last to increase the pay of its employees is the one that will be left behind in the race; eventually it must pay the price, but it will find itself paying it to the culls, while the other fellow has the good men. That "net increase over the same period last year" may suffer a little for a short time, but it will grow stronger and better with a much more healthy growth in the future.

In North America 30 years ago there were two great railroads growing, and fighting each other step by step whenever they came within striking distance, and between rounds they swatted all the smaller roads that even cheeped in the shell. And this in a vast country whose progress was even then retarded for want of further railroad extension. Year by year since that time they have carried on the war while the country has advanced so rapidly that while one of them was spending hundreds of thousands of dollars to prevent a new road cutting into what they considered their own particular territory, their own line was blocked with a congestion of the very traffic they wanted to prevent the new road getting a portion of, and after it was through they were so busy trying to keep up with the natural increase in their own business they had no time to find out whether the other fellow got any business or not. Now if railroading was an exact science here was an object lesson that might sink into the mind, but did it? Oh no! As soon as they get through throwing money away in that little fire they see another and rush to smother it with good, real money. In all the history of this 30 years war I cannot find that the money spent and the effort put forth has ever resulted in one dollar's worth of benefit to the side spending it, nor that it has been effectual in doing more than very slightly checking the country's advance, and that is after all what they were trying to do, though in all justice to them we must acknowledge they did not know it, nor do they yet.

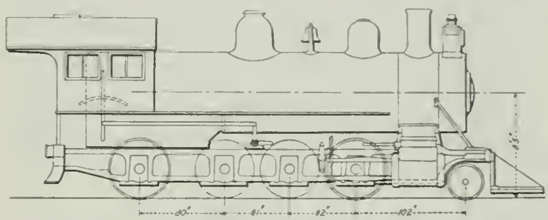
I have never forgotten that incident in the life of David Livingstone, the explorer, where the dogs are turned loose to pursue the lion, but instead of trying to do the work for which they had been raised and fed they "went to fighting among themselves"—and how as a child I did hate those dogs! The same feelings are finding expression to-day among the grown-ups, in the appointments by the various governments of railroad commissions, and the future will show us whether or not this is the panacea we have been looking for. Personally I feel that it is not, but it is nevertheless the best that can be done until such time as the old generation shall have passed away, and newer and more enlightened counsels shall prevail among the railroads themselves. When the small matters in the details of the service shall be hunted out, more attention given to vital principles, wasted energy directed into legitimate channels and the science of railroading be brought to the point where it may more nearly approximate an exact science. F. J. M.

Pressure of Locomotive Wheels Against the Rails.

BY GEO. L. FOWLER,
Associate Editor of the *Railroad Gazette*.

There has been some discussion in the *Railroad Gazette* during the past year (see especially the issues of March 15 and March 22) regarding the stresses that the wheels of cars and locomotives exert on the track on curves of various radii. In the issue of March 22, the results of calculations for New York Central electric and Atlantic locomotives were given. On a 3 deg. [illegible] min. curve it was estimated that the lateral thrust against the rail exerted by the leading truck wheel of the electric locomotive was 6,410 lbs. at 40 miles an hour and by the leading driver 4,710 lbs. For the Atlantic locomotive at the same speed the lateral thrust of the leading truck wheel was estimated at 7,830 lbs. and the leading driver at 6,260 lbs., the speeds being the same. The weights on the wheels were 26,000 lbs. on the truck wheels, and 34,250 lbs. on the drivers of the electric locomotive; and 21,250 lbs. and 52,500 lbs. on the truck and driver wheels of the Atlantic engine respectively.

I have recently been investigating the lateral stresses imposed by car wheels on curves and am led to believe that the calculated



Outline of H4a Consolidation Locomotive; Pennsylvania Lines West.

stresses mentioned above are too low. In this investigation an H4a locomotive of the Pennsylvania Lines West was used to accelerate the car used in making the tests, and incidentally I obtained a number of digrams of the lateral wheel stresses of this engine, one of which is shown herewith. The speed at which this was taken was 30.61 miles per hour and the place was on the outer rail of a curve of 4 deg. 25 min., with a superelevation of the outer rail of $3\frac{7}{8}$ in., corresponding to a speed of 36.66 miles an hour. The engine was of the consolidation type, with the following distribution of weight and a wheel arrangement spaced in accordance with the dimensions given on the accompanying engraving.

Total weight of engine	174,300 lbs.
Weight on truck wheel	18,200 "
" " first driving wheel	36,400 "
" " second " "	39,800 "
" " third " "	40,100 "
" " fourth " "	39,800 "

The lateral thrust as weighed by the track instrument was for the

Truck wheel	13,430 lbs.
First driving wheel	11,450 "
Second " "	13,000 "
Third " "	12,215 "
Fourth " "	11,170 "

I have no comment to make on this other than to say that, as the purpose of the investigation was not to ascertain track stresses for locomotives, no examination was made of the engine to determine the amount of play in the bearings, flange play or any of the other elements that would affect the results.

Attention is called to the fact that the thrust was greatest on the front truck wheel and that there was a decided falling off at the first driver. The second driver followed with a pressure nearly equal to that of the truck wheel, and the last two driving wheel pressures were decreasing quantities.

When the engine was running backward the rear driver exerted a heavier pressure than did the truck wheel when running forward at the same speed.

The work on cars has led to the conclusion that only a long series of carefully conducted experiments will make it possible to evolve the law governing these pressures, as a momentary change in the adjustment of the moving parts with relation to each other will have a measureable effect. And, further, these diagrams that were made by a very sensitive and carefully calibrated apparatus, indicate that the calculations based upon the usual hypotheses give results that are too low for average working conditions, though a

peculiar and momentary position of the moving vehicle or engine may cut them down below that called for by the calculations as the pressures evidently vary from instant to instant between wide limits.

In explanation of the sudden rise in pressure shown on the diagram after the passage of the first driver it should be said that

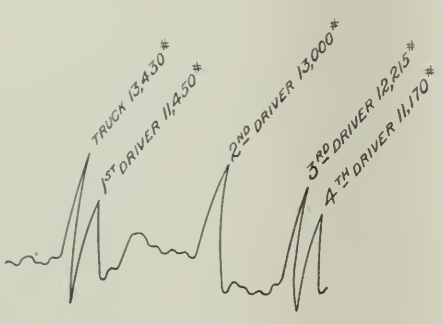


Diagram of Lateral Thrust of H4a Locomotive on 4½° Curve at 30.61 Miles Per Hour.

the initial pressure on the apparatus was accidentally raised just at that instant by a slight movement of the pressure pump which was being used to regulate a small leak in the hydraulic recording apparatus.

Railroad Statistics of the United States for Year Ended June 30, 1906.

The Interstate Commerce Commission has issued an advance abstract of its annual report for the year which ended 15 months ago, from which the principal items are shown in the table below. The preliminary report for the year under review was given in the *Railroad Gazette* November 30, 1906.

Railroad Statistics for Years Ending June 30.

	1906.	1905.	1904.	1903.	1902.
Miles complete	224,363	218,101	213,904	207,977	202,472
Increase, 12 months	6,262	4,197	5,927	5,505	5,234
In hands of receivers	3,971	796	1,323	1,185	1,479
Locomotives, No.	51,672	48,357	46,743	43,871	41,228
Cars, owned, passenger	42,262	40,713	39,752	38,140	36,991
Cars owned, freight	1,837,914	1,731,409	1,692,194	1,653,782	1,546,132
Cars owned, total	1,958,912	1,842,871	1,798,561	1,753,389	1,640,220
Employees	1,521,355	1,382,196	1,296,121	1,312,537	1,189,315
Per 100 miles of road	689	637	611	639	594
Total stock and funded debt, in millions	$14,570.4	$13,805.3	$13,213.1	$12,600.0	$12,134.2
Stock & debt pr mile road	67,936.0	65,926.0	64,265.0	63,186.0	62,301.0
Gross earnings, millions	2,325.8	2,082.5	1,975.1	1,900.1	1,726.4
Average per mile	10,460.0	9,598.0	9,306.0	9,258.0	8,625.0
Passengers carried, millions	800.0	738.8	715.4	694.9	649.9
Carried 1 mile, millions	25,175.5	23,800.1	21,923.2	20,915.8	19,690.0
Tons freight car'd, millions	1,631.4	1,427.7	1,309.9	1,304.4	1,200.3
Carried 1 mile, millions	215,877.6	186,463.1	174,522.1	173,221.3	157,289.4
Av. rate per ton-mile, mills	7.5	7.7	7.8	7.6	7.6
Av. pass. fare pr mile, cts	2.0	2.0	2.0	2.0	2.0

Examining the totals for the year 1906 more in detail the following items will be found of interest:

An increase in mileage exceeding 100 miles appears for 26 states and territories (17 a year ago). The operated mileage for which returns were made was 222,340.30 miles, including 7,865.97 miles of line used under trackage rights. The aggregate length of tracks of all kinds was 317,083.19 miles, classified thus: First main track, 222,349.30 miles, as just mentioned; second track, 17,936.25 miles; third track, 1,766.07 miles; fourth track, 1,279.66 miles, and yard track and sidings, 73,760.91 miles.

The number of corporations reporting was 2,313. During the year companies owning 4,054.46 miles of line were reorganized, merged or consolidated. The corresponding figure for the year 1905 was 3,802.02 miles for the year ending June 30, 1906, the mileage of roads operated by receivers was 3,971.43 miles, or an increase of 3,175.61 miles as compared with 1905. The number of roads in the hands of receivers was 34.

The locomotives, excepting 1,090, were classified as: Passenger, 12,249, freight, 29,848, and switching, 8,485.

The cars were thus assigned: Passenger service, 42,262; freight service, 1,837,914, and company's service, 78,736.

The average number of locomotives per 1,000 miles of line was 232, and the average number of cars per 1,000 miles of line was 8,810. The number of passenger miles per passenger locomotive was 2,055,309, showing an increase of 6,751 miles as compared with the previous year. The number of ton-miles per freight locomotive was 7,232,563, showing an increase of 541,863 miles.

Of the capital outstanding, $11,570,421,478, there existed as stock $6,803,760,093, of which $5,403,001,962 was common and $1,400,758,131 preferred; the remaining part, $7,766,661,385, represented funded debt, consisting of mortgage bonds, $6,266,770,962; miscellaneous obligations, $973,647,924; income bonds, $301,523,400, and equipment trust obligations, $224,719,099.

Of the total capital stock outstanding 33.46 per cent. paid no dividends. The amount of dividends declared during the year was $272,795,974, being equivalent to 6.03 per cent. on dividend-paying stock. For the year ending June 30, 1905, the amount of dividends declared was $237,964,482. The total amount of funded debt (omitting equipment trust obligations) that paid no interest was $287,954,851, or 3.82 per cent. Of the total amount of stock outstanding $2,257,175,799 were reported as owned by railroad corporations, and of railroad bonds $641,305,030 were so reported.

The number of tons of freight carried one mile per mile of line was 582,401, indicating an increase in the density of freight traffic of 121,005 ton-miles per mile of line.

The average revenue per passenger per mile for the year carried out to three decimals was 2.002 cents. For the preceding year the average was 1.962 cents. The ratio of operating expenses to earnings for the year 1906 was 66.08 per cent.; for 1905, 66.78 per cent.

Gross earnings $2,325,765,167, were $243,282,761 greater than for the year 1905. Operating expenses ($1,536,877,271) were $146,275,119 more than in 1905. The gross earnings in detail were: Passenger revenue, $510,032,583—increase, $37,337,851; mail, $47,371,453—increase, $1,945,328; express, $51,010,930—increase, $5,861,775; other earnings from passenger service, $11,314,237—increase, $274,095; freight revenue, $1,640,386,655—increase, $189,613,817; other earnings from freight service, $5,645,222—increase, $564,956; other earnings from operation, including unclassified items, $60,004,087—increase, $7,684,939.

The operating expenses assigned to the four general classes were: Maintenance of way, $311,720,820; maintenance of equipment, $328,554,658; conducting transportation, $836,202,707; general expenses, $59,752,230; undistributed, $646,856. Operating expenses averaged $6,912 per mile of line; increase $503 per mile.

The income from operation (net earnings) was $788,887,896; increase $97,007,642. The net earnings per mile of line for 1906 averaged $3,548; for 1905, $3,189, and for 1904, $2,998. The amount of "other" income was $256,639,591, including income from lease of road, $119,604,619; dividends on stocks owned, $66,861,656; interest on bonds owned, $20,537,011, and miscellaneous income, $49,636,305. The total income of the railroads ($1,045,527,487)—that is, the net earnings and income from lease, investments and miscellaneous sources—is the amount from which fixed and other charges against income are taken to ascertain the sum available for dividends. Such deductions aggregated $660,341,159, thus leaving $385,186,328 as the net income for the year ending June 30, 1906, available for dividends or surplus.

The amount of dividends declared was $272,851,567, leaving as the surplus from the operations of the year $112,334,761. The figures for income and expenditures are compiled from the annual reports of leased roads as well as of operating roads, and thus necessarily include duplications in certain items.

The total number of casualties to persons was 108,324, 10,618 killed and 97,706 injured. These figures include the casualties to persons trespassing, of whom 5,381 were killed and 5,927 were injured. The total number of casualties to persons other than employees from being struck by trains, locomotives or cars was 5,127 killed and 4,905 injured. With regard to trainmen—that is, enginemen, firemen, conductors and other trainmen—it appears that one trainman was killed for every 124 employed and one was injured for every eight employed. With respect to the number of miles traveled, the figures for 1906 show that 70,126,686 passenger-miles were accomplished for each passenger killed, and 2,338,859 passenger-miles for each passenger injured. For 1905 the figures were 44,320,576 passenger-miles for each passenger killed, and 2,276,002 passenger-miles for each passenger injured. Other details of casualties have been reported in the quarterly bulletins, which have been published in the *Railroad Gazette*.

Die Work.

In a paper before the convention of the Master Blacksmiths' Association, G. H. Steward stated that the use of dies for forming pieces that would formerly have been made by hand had grown to great proportions. Citing the practice of the Altoona shops of the Pennsylvania Railroad, he said that they now have complete sets of dies and formers for steel car work and are using them on the buildozer for making all parts of steel passenger, baggage, mail and dining cars from the deck moulding at the top to the trucks, excluding the welding of the rods and similar parts. The cost at first was high, owing to the dies being charged to the first lot of cars; but now the work can be done for one tenth what it would cost to do it by hand, and better results are obtained. In all there are 1,054 dies in use at this place for the different pieces that are formed.

As for the material from which the dies should be made, it has been found that, usually, cast-iron is the best. But where they are to be used under the drop hammer or where a sharp corner is to be formed it will be found to be necessary to use cast-steel for the

purpose as cast iron will not be strong enough to withstand the strain. In this, as in all other matters, good judgment must be used in order to secure the best results.

In constructing dies for hot work, especially for pressing, it is well to use plenty of material, so as to have them of sufficient strength, as there is a loss of both time and money when a die breaks at a weak point.

It is also good practice to core out dies that are to be used for large work, as this serves not only to reduce the weight, but forms air chambers that will materially assist in keeping the back part cool besides giving an opportunity to circulate water through the casting if it is required, as unsatisfactory results have sometimes been obtained when the die has expanded under the influence of the heat.

Progress on the Western End of the St. Paul's Pacific Extension.

Nearly all of the preliminary work connected with the driving of the new 8,000-ft. tunnel through the main range of the Bitter Root mountains on the Pacific coast extension of the Chicago, Milwaukee & St. Paul has been completed. The location through this district has been finally settled and a few hundred feet of the tunnel have already been driven. This, together with the preliminary work noted above, constitutes the progress made on this section of the line during the past summer. Thus, briefly stated, this does not look like much, but in reality it amounts to considerable. The work preliminary to active operations in the tunnel involved the

Unfinished Grade on the St. Joseph River.

perfection of a large organization and the installation of considerable heavy machinery at a point several miles distant from any present railroad connection. With this now accomplished the contractors, Winston Brothers Company, expect that progress on the tunnel will be rapid.

Along the St. Joseph river from Ferrel, Idaho, to Lake Chatcolet the line is about one-tenth completed. During the summer all of the right-of-way has been cleared and all the heavy cuts have been opened; also considerable light grading in the vicinity of St. Joe and St. Maries has been finished. The heavy cut through the village of St. Maries is just being opened by steam shovel.

The specifications for the main line call for a 0.3 per cent. maximum grade and 3 deg. maximum curves, but along the river between St. Joe and St. Maries considerable temporary line, with some 10 deg. curve, is being built. This line is a detour around a hill which will eventually be pierced by a tunnel. This tunnel will be through solid rock all the way and the temporary track around it is being built with the intention of having trains in operation by the spring of 1909, some time before the tunnel could be finished.

Two locating parties are now engaged in locating a branch from St. Maries up the St. Maries valley, through Santa, Idaho, and thence over the divide into the Palouse wheat country. This will be the first branch to be built on the western extension and will tap some of the richest timber land in Idaho.

It is now generally admitted, even by officers of the company, that trains will be operated by electricity from the eastern end of the big Bitter Root tunnel westward for some ten miles down the St Joe valley and through eastern Washington to some point west of Tekoa, to be determined later. This will probably be the first stretch of transcontinental train line in the country to be operated

The Village of St. Maries, Idaho.

by electricity. The power will be obtained from the St. Joseph river between Ferrel and North Fork. The flowage rights have already been secured; during the summer the surveys for the location of the dams were completed. Plans are now being drawn and active work will commence in the immediate future.

It is proposed to build 11 dams across the river, varying in height from 20 to 75 ft. The total development will be 180,000 h.p.,

Cross Sectioning on Cliff Along St. Joseph's River.

making it one of the biggest hydro-electric propositions in the West. This amount of power will be considerably in excess of the requirements of the railroad and to dispose of the residue high tension transmission lines are to be built to Spokane and also to the Coeur d'Alene mining district in the vicinity of Wallace, Idaho.

The main line of the new road goes through Tekoa, Wash., 35

miles south of Spokane. Up to the present no official announcement of any arrangements for running trains into Spokane has been made. The prevailing opinion in the vicinity is that the St. Paul will use the tracks of the Spokane & Inland Empire Railroad (electric) between Tekoa and Spokane; it is inconceivable that no arrangement will be made for entering the metropolis of eastern Washington.

Progress during the summer between Tekoa and Ellensburg, Wash., has been made more rapid than in Idaho. Considerable of the grade has been finished, probably 35 per cent. Between Ellensburg and the Cascade tunnel the work is in a much more advanced stage. Miles of line, including the trestles, have been finished. Considerable progress has been made on the steel bridges. Easton, near the eastern end of the tunnel, will be made a division point.

The situation at the Cascade tunnel is about like that at the Bitter Root tunnel. The preliminary work of organization and installation of machinery was completed during the summer and the bore has been well started. It is probable that a temporary line will be built over the divide so that trains may be operated previous to the completion of the tunnel.

Between the tunnel and Seattle the line is nearly finished and it is possible that the track will be laid this winter. Work on the grade between Seattle and Tacoma has been actively pushed all summer and will soon be finished. But little terminal work has been done either in Seattle or Tacoma. Roughly speaking, the line between Puget Sound and the Columbia river is 50 per cent. nearer completion this fall than is that portion between the Columbia river and Butte. It has been announced that the line from Seattle to eastern Washington, using the temporary switch-back over the Cascade divide, will be in operation in time for the next year's eastern Washington wheat crop.

July Railroad Law.

The following abstracts cover the principal cases decided in the federal courts during July:

Joint liability between connecting carriers.—The mere fact that the destination of a shipment received by a railroad company for transportation is beyond its own line or that it was received from another railroad company to be transported to a point on its own line does not create any joint responsibility between the two railroad companies where the shipment over each line is under a separate contract which limits its liability for loss or injuries to such as may occur on its own line. McGuire v. Great Northern Railway Co., 153 Fed. Rep. 434.

Duty to provide safe place for work.—Though it is the general rule that a master is to provide a safe place for an employee to work, there are many qualifications of the rule. Thus it is held that the jacking up of the end of a railroad car for the purpose of repairing the trucks is an exception. Work of this character is a part of the duty of the servants making the repairs and there can be no recovery against the railroad company for an injury resulting to a fellow servant from their negligence in doing the work if the appliances were sufficient. Moit v. Illinois Central Railroad Co., 153 Fed. Rep. 354.

Adverse possession of land grant lands.—The Supreme Court decides that a railroad company which has complied with all the terms of a congressional land grant as fixed by Congress and by the act of the state legislature after the acceptance of the grant has such title to lands within the place limits of the grant that title by adverse possession may be acquired by an occupant though a final certificate and patent have not been issued. Iowa Railroad Land Co. v. Blumer, 27 Sup. Ct. 709.

Remedy for unreasonable interstate rate.—The rule that an action at law to recover excessive interstate freight charges cannot be maintained until the commission has acted on the question will not prevent a federal court which has suspended a proceeding of this character, pending action by the commission, from granting relief as a court of equity, on a petition filed after the commission has acted, stating in substance the commission's findings and report, and this more especially where the carrier through its attorneys has stipulated in open court that a decree of restitution might be made in case the finding was in favor of plaintiff. Southern Railway Co. v. Tift, 27 Sup. Ct. 709.

Reasonableness of rates.—The mere fact that an interstate rate has been duly published and filed by a carrier with the Interstate Commerce Commission is insufficient to raise the presumption in law that the rate is reasonable. In testing the reasonableness of an increased freight rate the expenditures of the carrier for permanent improvements should not be charged to the current or operating expenses of a single year. Illinois Central Railroad Co. v. Interstate Commerce Commission, 27 Sup. Ct. 700.

Duty of employees to observe rules.—Where the rules for guidance of an engineer or other employee in given circumstances are plain and unambiguous and have been assented to by the employee, his failure to observe such rules or his disobedience of them at a time when he is capable of observing them is negligence as a matter of law and will prevent a recovery of damages for his injuries resulting therefrom. The rule was applied in a case where an engineer approaching a switch which was not protected by signals, took his chances of passing it in safety at a high rate of speed in violation of his rules and was injured. St. Louis & San Francisco Railroad Co. v. Dewees, 153 Fed. Rep. 56.

Assumption of risk by brakeman.—A brakeman riding on cars and looking toward the rear of the train was injured by striking the eaves of a building which projected slightly over the track. The eaves had been in this position for over 15 years, during which time no accident had occurred. There was ample room on the top of the car for the brakeman to perform all his duties without incurring any danger from the eaves and the brakeman was fully informed as to the position and location of the eaves. The court held that the danger was an open and visible one and was assumed by the brakeman and he could not recover damages for his injuries. Southern Railway Co. v. Carr, 153 Fed. Rep. 106.

Abandonment of right of way.—A railroad company wrongfully holding a right of way for a spur track to certain factories which belonged to another company is not entitled to retain possession on the theory that the route was abandoned because the rightful owner constructed a track over another route which it was compelled to do because of its inability to obtain possession of its own right of way and the new route was temporarily adopted without any intention of abandoning the other route. Atlanta, etc., Railroad Co. v. Southern Railway Co., 153 Fed. Rep. 122.

Filing of rates on inland transportation of goods to or from foreign countries.—The rates of transportation from places in the United States to ports of trans-shipment and from ports of entry to places in the United States of goods carried on through bills of lading are required to be filed and published under the amended interstate commerce act. This requires filing where the goods are carried under an aggregate through rate which is the sum of the ocean rate and the domestic rate, or if carried under a joint through rate by virtue of a common control management or arrangement of the inland and ocean carriers. Armour Packing Co. v. United States, 153 Fed. Rep. 1.

Obligation of purchasing railroad to assume contracts of predecessor.—The Circuit Court of Appeals of the Sixth Circuit holds that the Ohio statute allowing railroad companies to purchase non-competing lines and providing that the purchasing road shall be subject to all the "duties, obligations and restrictions" of the predecessor company does not require the purchasing company to fulfill a contract to carry a shipper's product at a rate agreed upon with the former company. This is not an "obligation" within the meaning of the statute, the purchaser never having agreed to assume the liability. Rice v. Norfolk & Western Railway Co., 153 Fed. Rep. 497.

Speed of trains.—It is a general rule of general acceptance among the courts that in the absence of a regulating statute or ordinance a railroad company may run its trains at such a rate of speed as it deems convenient for the conduct of its business without being guilty of negligence *per se* in case a derailment occurs and injures one on its train by permission but not as a passenger. Chicago & Northern Railway Co. v. O'Brien, 153 Fed. Rep. 511.

Construction of indictments under Elkins law.—Judge Hazel announces as a rule for the construction of indictments under the Elkins law that any doubts as to the correct construction of the statute should be resolved in favor of the evident intention of Congress that equality among shippers should be maintained and unjust discrimination and favoritism of all kinds condemned, leaving the question whether the existing conditions justified the difference in rates charged to be determined as one fact on the trial. He also holds that the act is not restricted to departures from an established tariff rate, but is violated if any other advantage is given to a shipper whereby a discrimination is practiced. United States v. Vacuum Oil Co., 153 Fed. Rep. 598.

Evasion of interstate commerce law by use of different routes.—The words "between any points" in Section 6 of the Interstate commerce law making it unlawful for any common carrier or party to any joint tariff to charge a shipper a greater or less rate for transportation "between any points" as to which a joint rate is named thereon then is specified in the schedule filed with the commission in force at the time is not limited to points on the established route but forbids the transporting of property between different terminals in different states at a greater or less rate than the established rate though over different routes. United States v. Pennsylvania Railroad Co., 153 Fed. Rep. 625.

Duty of local carrier to file rates.—The provision of the interstate commerce law requiring several common carriers operating a through line engaged in interstate commerce to file schedules of rates constituting the basis of a through interstate rate, intends that each carrier though operating a line wholly within a state must comply with the provision, if it is a portion of a through route engaged in interstate commerce through a common arrangement with other connecting carriers. United States v. New York Central & Hudson River Railroad Co., 153 Fed. Rep. 630.

Solenoid Signals on the Manhattan Elevated.

The Interborough Rapid Transit Co. has recently put in service on the sharpest curves of the elevated lines 21 semaphore block signals, operated by solenoids energized by current taken from the third rail. The current for the track circuit is also obtained from the third rail. Eight of these signals have been installed at the reverse curves on the three-track Ninth avenue line at 110th street, four on the Third street curve of the Sixth avenue line, four on the Murray street curve of the same line and five near Coenties Slip on the Second avenue line, a total of 21. Twenty more will shortly be put in service at other curves on the Second and Third avenue lines. Nine signals of this type, but controlled with an alternating

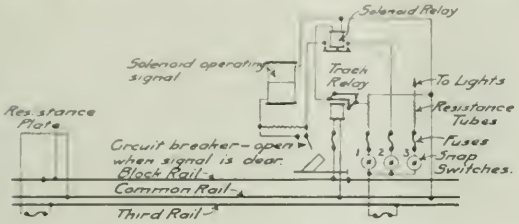


Fig. 1—Diagram of Connections for Solenoid Signal.

current track circuit, have been in use for more than 1½ years on the West Farms elevated extension of the subway. The signals at Murray street and Third street on the Sixth avenue line replace mechanical signals operated by track instruments which have been in use at these points for many years. Four of the signals at 110th street are for the middle express track, which is used by southbound express trains in the morning and by northbound expresses at night.

The apparatus and circuits for a typical block section are shown diagramatically in Fig. 1. Only one of the track rails is insulated for the block section, which varies in length for the different curves on which the signals are used. At the outgoing end of the block the third rail is connected through a fuse to a resistance plate having two taps at the upper end, one of which is connected to the insulated track rail and the other to the opposite or common track rail, which is grounded for the return power circuit. The resistance is adjusted to give a difference of potential between the two track rails of 10 volts. At the entering end of the block the two track rails are connected together through a two-point track relay, which is wound to pick up at three volts. The normal difference of potential of 10 volts is sufficient to care for the widest variations in voltage of the third rail current passing through the resistance plate.

Fig. 3—High Semaphore Solenoid Signal for Manhattan Elevated.

At the signal, a tap from the third rail connects to a bus bar on which are three snap switches, one in the solenoid relay circuit, one in the solenoid circuit, and one in the signal lamp circuit. When no train is in the block the track relay is energized and its two contacts are closed. Current from the third rail passes through switch 1, resistance, track relay armature, solenoid relay coil and thence to common rail or ground. Current also flows through switch 2, armature of solenoid relay and resistance of 3,000 ohms to solenoid coil and thence to ground, holding the signal in the proceed position.

When a train enters the block the track relay opens, releasing the spring-actuated quick-break solenoid relay, whose armature carries 600 volts. This breaks the solenoid circuit and permits the signal arm to go to stop by gravity. An oil dash pot is provided to cushion the shock of the moving arm. When the train passes out of the block the track relay picks up causing the solenoid relay in turn to pick up. A current of 600 volts then flows through the solenoid relay armature and the circuit breaker which is closed. This gives a powerful circuit in the signal solenoid to move the signal down, but as soon as the arm reaches the proceed position the circuit breaker opens, cutting in the high resistance and allowing only a small current, enough to hold the signal in the clear position, to flow through the solenoid.

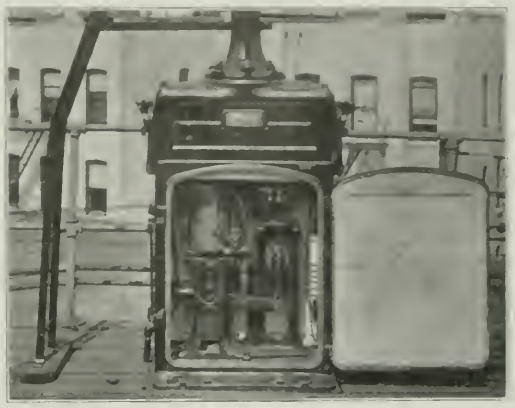


Fig. 2—View of Mechanism of Solenoid Signal.

Fig. 2 shows the signal mechanism enclosed in the iron case at the foot of the mast. The solenoid plunger is connected to a pivoted lever to which the dash pot is fastened at its outer end. The signal pull rod is fastened about midway between the solenoid plunger and the dash pot. Resistance tubes are mounted on one side of the case and the circuit breaker attached to the signal rod can be seen just above the dash pot. In the upper part of the case are the two relays and the snap switches. The entire mechanism is simple, strong and compact and cannot easily get out of order. Good results have been obtained from the special track relays employed, which are made with carbon points on the springs bearing on german silver pedestals. The quick-break solenoid relays, carrying 600 volts, have also proved entirely satisfactory. Pittsburg insulated joints of the latest pattern are used in the track and are said to be standing up well under the heavy traffic which passes over them. On the northbound local track at 110th street,

Fig. 4—Centrally Pivoted Semaphore Signal for Express Track at 110th Street.

56 trains pass in one hour from 8:40 to 9:40 a.m., and in 24 hours 771 trains use the northbound local track at this point.

Fig. 4 shows the special signal arm used for the middle express track at 110th street. Owing to the narrow clearance of only 40 in. between trains on the middle track and outside tracks, a standard semaphore arm could not be used unless elevated above the tops of the cars. The centrally pivoted arm shown was therefore designed. It is 36 in. long and 6 in. wide, and when in the clear position the upper corner is about 6 in. below the window sill of a car. The arm is made of sheet metal in two pieces, hinged with a spring so as to prevent damage in case a projection on a car should strike either end. It is painted red with white bands on the front side and white with black bands on the back side. The signal mechanism is in a case supported on the elevated structure below the deck. Four signals of this type are in use.

All the signal apparatus was furnished by the Union Switch & Signal Co., Swissvale, Pa., but the signals were installed by the regular force of the Interborough Rapid Transit Co. under the direction of J. M. Waldron, Signal Engineer.

Wages and Retail Prices of Food in 1906.

The annual investigation of the Bureau of Labor into wages and the retail prices of food, the report on which has just been placed in the hands of the printer, shows that in the principal manufacturing and mechanical industries of the country average wages per hour in 1906 were 4.5 per cent. higher than in 1905, the regular hours of labor per week were 0.5 per cent. lower, and the number of employees in the establishments investigated was 7 per cent. greater. The average full-time weekly earnings per employee in 1906 were 3.9 per cent. greater than in 1905.

During 1906 wages were increased generally in nearly all industries, 40 of the 41 industries covered by the investigation showing some increase. The greatest increase was in the manufacture of cotton goods, where the average wages per hour in 1906 were 11.2 per cent. higher than in 1905. In the manufacture of electrical apparatus and supplies the increase was 10.1 per cent. In street and sewer work done by contract the increase was 8.7 per cent.; in iron and steel, Bessemer converting, 8.5 per cent., and in the manufacture of cigars, 8.4 per cent. In the manufacture of bar iron the increase in wages per hour was 6.9 per cent. and in the building trades, 6.1 per cent. Briefly stated, two industries showed an increase in hourly wages of more than 10 per cent., 7 industries an increase of 5 per cent., but less than 10 per cent., and 31 industries an increase of less than 5 per cent. In one industry—paper and wood pulp—there was a decrease of 1.1 per cent. In the industries as a whole, weighted according to importance, the increase in hourly wages was 4.5 per cent.

The fact should be borne in mind that these figures apply only to wageworkers in manufacturing and mechanical industries and do not show conditions, so far as salaried employees are concerned.

The retail prices of food, weighted according to consumption in representative workingmen's families, were 2.9 per cent. higher in 1906 than in 1905. As the advance in wages per hour from 1905 to 1906 was greater than the advance in the retail prices of food, the purchasing power of an hour's wages, as measured by food, was greater in 1906 than in the preceding year. In 1906 the purchasing power of an hour's wages as expended for food was 1.4 per cent. greater than in 1905, and the purchasing power of a full week's wages was 1 per cent. greater in 1906 than in 1905, or, in other words, an hour's wages in 1906 in the manufacturing and mechanical industries of the United States would purchase 1.4 per cent. more food than an hour's wages in 1905, and a full week's wages in 1906 would purchase 1 per cent. more food than a full week's wages in 1905.

The price of food was higher in every month of 1906 than in the corresponding month of 1905. The increase over the corresponding month of the preceding year, which in February, 1906, was only 0.4 per cent., grew steadily greater throughout the year, the price in December, 1906, being 5.1 per cent. above that of the preceding December. The price in December, 1906, was 4.8 per cent. higher than the average for the year 1906, which year showed a higher average than any other year during the seventeen years, 1890 to 1906, covered by the investigation of the Bureau of Labor.

The increase in prices in 1906 over 1905 applied, in unequal degree, to 25 of the 30 articles included in the investigation. The articles which showed the greatest advance in prices are lard, 9.8 per cent.; evaporated apples, 9.1 per cent.; fresh pork, 8.8 per cent.; dry or pickled pork, 8.7 per cent.; bacon, 8.1 per cent.; ham, 7.3 per cent., while the advance in fresh fish and mutton exceeded 5 per cent. The only articles which showed any material decrease are flour and sugar.

The articles which showed the most marked advance in prices in December, 1906, over December, 1905, are butter, 15 per cent.; lard, 13.9 per cent.; fresh pork, 12.2 per cent.; dry or pickled pork, 11.6 per cent.; bacon, 11.1 per cent. and ham, 9.8 per cent. The only articles which showed any marked decline in price in December, 1906, from the price in December, 1905, are potatoes, 5.8 per cent., and flour, 4.8 per cent.

As compared with the average for the ten-year period, 1890 to 1899, the average wages per hour in 1906 were 24.2 per cent. higher, the number of employees in the establishments investigated was 42.9 per cent. greater, and the average hours of labor per week were 4.6 per cent. lower. The average earnings per employee per full week in 1906 were 18.5 per cent. higher than the average earnings per full week during the ten years, 1890 to 1899.

The retail price of the principal articles of food, weighted according to family consumption of the various articles, was 15.7 per cent. higher in 1906 than the average price for the ten years, 1890 to 1899. Compared with the average for the same ten-year period, the purchasing power of an hour's wages in 1906, as measured by food, was 7.3 per cent. greater, and of a full week's wages, 2.4 per cent. greater, the increase in the purchasing power of the full week's wages being less than the increase in the purchasing power of hourly wages because of the reduction in the hours of labor.

The table following shows the per cent. of increase or decrease in wages per hour, hours of labor per week, the purchasing power of wages, etc., in 1906 in the manufacturing and mechanical industries, as compared with each year preceding, back to and including 1890, and as compared with the average for the ten years, 1890 to 1899:

Per Cent. of Increase (+) or Decrease (—), in 1906, as Compared with Previous Years.

Year.	Employees.	Hours per week.	Wages per hour.	Full-time wkly earnings per employee.	Weighted according to family consumption.	—Retail prices of food—Purchasing power— Hourly wages.	Full-time weekly earnings per employee.
Avg. 1890 1899..	+ 42.9	—4.6	+ 24.2	+ 18.5	+ 15.7	+ 7.3	+ 2.4
1899.	+ 50.7	—5.3	+ 23.8	+ 17.3	+ 13.0	+ 9.6	+ 3.9
1898.	+ 46.9	—5.1	+ 23.8	+ 17.6	+ 11.5	+ 11.1	+ 5.5
1897.	+ 44.1	—5.1	+ 23.2	+ 17.0	+ 13.5	+ 8.5	+ 3.9
1896.	+ 43.8	—4.9	+ 23.1	+ 17.1	+ 10.8	+ 11.1	+ 5.7
1895.	+ 51.9	—4.4	+ 26.9	+ 21.3	+ 16.0	+ 9.3	+ 4.5
1894.	+ 48.2	— 4.7	+ 26.3	+ 20.4	+ 18.3	+ 6.8	+ 1.8
1893.	+ 44.9	—4.4	+ 24.6	+ 19.1	+ 21.2	+ 2.8	— 1.7
1892.	+ 44.1	—5.1	+ 23.2	+ 17.0	+ 13.5	+ 8.5	+ 3.9
1891.	+ 46.9	—5.1	+ 23.8	+ 17.6	+ 11.5	+ 11.1	+ 5.5
1890.	+ 50.7	—5.3	+ 23.8	+ 17.3	+ 13.0	+ 9.6	+ 3.9
1899.	+ 42.9	—4.6	+ 24.2	+ 18.5	+ 15.7	+ 7.3	+ 2.4
1898.	+ 34.3	—4.3	+ 24.0	+ 18.6	+ 15.2	+ 5.7	+ 1.2
1897.	+ 27.5	—3.8	+ 21.8	+ 17.1	+ 16.3	+ 4.7	+ 0.7
1896.	+ 23.6	—3.3	+ 17.7	+ 13.8	+ 14.4	+ 2.8	— 0.6
1895.	+ 20.0	—2.8	+ 15.0	+ 11.9	+ 10.0	+ 4.5	+ 1.7
1894.	+ 15.6	—2.0	+ 10.7	+ 8.5	+ 4.3	+ 6.0	+ 4.0
1893.	+ 13.0	—1.2	+ 6.8	+ 5.5	+ 4.9	+ 1.8	+ 0.6
1892.	+ 13.7	—0.5	+ 6.2	+ 5.6	+ 3.6	+ 2.5	+ 2.9
1891.	+ 7.0	—0.5	+ 4.5	+ 3.9	+ 2.9	+ 1.4	+ 1.9

Twenty-five Passengers Killed at West Canaan, N. H.

In a butting collision on the Boston & Maine, near Canaan, N. H., about 4.26 o'clock on the morning of September 15, 25 passengers were killed and as many more were injured. Canaan is between White River Junction and Concord, and is 18 miles east of White River Junction. The collision occurred in a dense fog where the enginemen approaching each other could see nothing until they were very near together. Both were running fast, the freight on a down grade of about 50 ft. to the mile. The passenger train was No. 30, southbound; and the northbound train (freight) was No. 267. An order had been delivered to the freight intended to give it the right of the road over passenger train No. 34, but, by a mistake in transmitting or copying, the order as delivered read "No. 30," and this caused the collision. Most of the victims were in a passenger car of comparatively light construction which was immediately behind a heavy baggage car and was completely telescoped by it.

An officer of the road issued a statement of the cause which says: "Train 267 arrived at Canaan at 4:10, on time. Train 30, consisting of engine, baggage car, coach, smoker and one sleeping car, left White River Junction at 3.55 a.m., 45 minutes late. Train 34 left White River Junction at 5 a.m., one hour and 36 minutes late. At East Andover, 27 miles south of Canaan, an order was sent 267 (and the same order to trains 30 and 34 at White River Junction), giving the former (267) 40 minutes on the time of train 30 and 30 minutes on the time of train 34, these orders being repeated back and completed in the usual manner.

"At Canaan orders were sent 267 annulling the former order and giving it one hour and ten minutes on the time of 34. The same order was given to No. 34 at White River Junction, both were repeated back to the despatcher, and, according to the records, exactly as sent, although, for some as yet unexplained reason, the order which was delivered to the engineer and conductor of No. 267 at Canaan gave them one hour and ten minutes over train 30, which had not then arrived at Canaan. This order should have read 'No. 34,' and, according to the despatcher's records, it was so sent and repeated by the Canaan operator. This discrepancy can be cleared only by a thorough investigation, which will be made at once."

This seems to indicate that the conductor of the freight, having been informed (erroneously) that No. 30 was 70 minutes late, and having calculated that this would permit him to go to the next station, went on in disregard of the right of passenger train No.

34 for No 34, according to the *Official Guide* is due at Canaan at 4 20, only 10 minutes after the time (4 10) given in the statements as the time that the freight arrived there; but another statement says that the freight conductor held an order received at West Hanover that No 34 was 40 minutes late.

The error lies between J A Crowley night despatcher at Concord, who has been in the service seven years, and John Greeley, night operator at Canaan, who has seen 23 years' service.

The Uniform Bill of Lading.

The proposal to have the new uniform bill of lading which was agreed to at Chicago adopted formally by the Interstate Commerce Commission is not going to have plain sailing, after all. In the order issued by the Commission on the eighth of July, calling upon all railroads to appear in Washington, October 15, to present their objections, if they had any, it was stated that the petitioners and all the railroads in Official Classification territory had approved the form, but objections are now likely to be presented by the Freight Claim Association and by a conference of bankers and freight receivers, which was recently held in New York city. The Freight Claim Association embraces in its membership, of course, many claim agents of roads not in Official Classification territory. The president of the Association, Mr. R. C. Richards, has issued a circular calling the attention of the members to that clause in the proposed bill, which makes the carrier liable for fire loss for 48 hours after freight has arrived at destination, and he suggests that, in view of the hearing to be held at Washington, October 15, each road should carefully consider whether it approves this clause.

Quoting the fire-loss clause (printed in italics below), Mr. Richards says:

"This would, if adopted, presumably make the carrier liable as an insurer for such damage until 48 hours had elapsed after notice had been given of the arrival of the property and in case of loss or damage occurring after that time 'The burden to prove freedom from such negligence shall be on the carrier or party in possession.'

"In the following states of the Union the liability of the carrier now ceases as soon as the property (if in less than carload lots) is unloaded into the freight house and ready for delivery; if in carload lots—when the car has been placed on delivery track; no notice being required:

"Georgia, Illinois, Indiana, Iowa, Massachusetts, Missouri, North Carolina, Pennsylvania, South Carolina, Tennessee.

"No argument is necessary to demonstrate that this rule, which has been announced by the highest courts of the states above mentioned, is much more favorable to the carrier than the one intended to be prescribed in the proposed uniform bill of lading.

"In the states named below, the liability of the carrier as an insurer now ceases as soon as the property has been unloaded and is ready for delivery (if in less than carload lots), or placed for unloading if in carloads and consignee has had a reasonable time (which may be less than 48 hours) to unload. No notice being required:

"Arkansas, Kansas, Kentucky, Louisiana, New Hampshire, Vermont, West Virginia, Wisconsin.

"This rule, which the Supreme Courts of the states last mentioned have held to be the law, is also distinctly more favorable to the carrier than the one proposed in the bill of lading under discussion.

"In the following states the liability of the carrier now ceases after the property has been unloaded and is ready for delivery (if in less than carload lots), and if in carload lots after car has been placed for delivery and notice has been given or sent to the owner of the arrival and a reasonable time to take possession (which may be less than 48 hours, depending upon the circumstances of the case):

"Alabama, California, Minnesota, Mississippi, Oklahoma, Ohio, Michigan, New York, Texas.

"The rule adopted in these states is unquestionably as favorable as the one proposed for adoption in the bill and I believe will, upon careful consideration, be found to be more to the interest of the carriers. In the other states the question seems not to have been determined.

"I understand that in none of the states is the burden of proof now on the carrier to show itself free from negligence where claim is made for loss or damage to property held by it as a warehouseman; on the contrary, the burden is now on the owner to show that the property was damaged by the negligence of the carrier. If the clause referred to in the proposed bill of lading is agreed to by the carrier and printed in the bill, the burden of proof would be changed and the carrier would in all probability, in view of the well known tendencies of juries, be made liable as an insurer until the property was actually delivered to the consignee, even though the loss or damage was brought about by violence of mobs or strikers and without any negligence on the part of the carrier who was compelled to hold the goods in its freight house because the consignee neglected or refused, for his own convenience, to remove the same.

"There would seem to be no good reason why the railroads of the country should voluntarily assume such additional liability, the burden of which the law has never imposed upon them and which if assumed might in a single instance (such as the destruction of large terminals by fire originating without the carrier's negligence, but caused by mobs) amount to hundreds of thousands of dollars.

"I am advised that there is no provision in the law empowering the Interstate Commerce Commission to change the law of the land or the rules of evidence or to require interstate carriers to use a bill of lading containing such provisions. * * *"

So much for Mr Richards' objection. The New York complainers are from two classes; first heavy receivers of cotton, hay, grain and fruit and provisions, and, second, members of the New York State and the American Bankers' Associations. These merchants are constantly paying for thousands of dollars' worth of merchandise on drafts supported by bills of lading and both merchants and bankers desire to have all bills of lading more thoroughly protected against fraud. Their main trouble is with forged and altered bills of lading. This danger, so far as it can be dealt with by the railroads, is an obscure one, for it can be completely met only by employing a most experienced, intelligent and upright business man at every little shipping station in the country. Courts have in many cases held that a bill of lading given for freight not actually delivered did not bind the railroad. The bankers want to have all bills serially numbered or otherwise safeguarded so that the banks can treat them as incontestable. In England, they say, this difficulty has been provided for by statute.

The conditions of the proposed uniform bill, as printed by the Interstate Commerce Commission, are given below. The foot notes indicate additions which will be proposed by the American Bankers' Association.

UNIFORM BILL OF LADING—ORIGINAL.

———— ———— Railroad Company.

Received subject to classification and tariffs in effect on the date of issue of this Original Bill of Lading at ————, ————, 1907, from ————

————, the property described below, in apparent good order, except as noted (contents and condition of contents of packages unknown), marked, consigned and destined as indicated below, which said company agrees to carry to its usual place of delivery at said destination, if on its road; otherwise to deliver to another carrier on the route to said destination. It is mutually agreed, as to each carrier of all or any of said property over all or any portion of the said route to destination and as to each party at any time interested in all or any of said property, that every service to be performed hereunder shall be subject to all the conditions, whether printed or written, herein contained (see conditions on back hereof) and which are agreed to by the shipper and accepted for himself and his assigns as just and reasonable. In issuing this bill of lading this company with respect to the portion of the route beyond its own line acts only as agent and agrees to transport only over its own line.

Nothing herein contained, however, shall be construed as exempting the initial carrier from the liability, if any, imposed upon it by law for loss, damage, or injury not occurring on its own line or its portion of the through route or occurring after said property has been delivered to the next carrier.

*If the word "order" is written in connection with the name of the party to whose order the property is consigned, the surrender of the original bill of lading, properly endorsed, shall be required before delivery of the property.[1] Inspection will not be permitted on order bills of lading unless permission is endorsed on the original bill of lading or given in writing by[2] the shipper.

If the word "order" does not so appear, the bill of lading is "not negotiable," and said property may be delivered without requiring such surrender.

NOTE.—The foregoing will appear on the front, or first, page of the bill of lading.

The bill of lading is to be signed by the shipper and [by the] agent of the carrier issuing same, and space should be provided for such signatures.

The detail arrangement respecting such other matters as customarily appear on the face of the bill of lading will be later prescribed.

CONDITIONS.

SECTION 1. The carrier or party in possession of any of the property herein described shall be liable for any loss thereof, or damage thereto, except as hereinafter provided.

No carrier or party in possession of any of the property herein described shall be liable for any loss thereof or damage thereto or delay caused by the act of God, the public enemy, quarantine, the authority of law, or the act or default of the shipper or owner, or for differences in the weights of grain, seed, or other commodities caused by natural shrinkage, or discrepancies in elevator weights. *For loss, damage, or delay caused by fire occurring after 48 hours (exclusive of legal holidays) after notice of the arrival of the property at destination or at port of export (if intended for export) has been duly sent or given, the carrier's liability shall be that of warehouseman only. Except in case of negligence of the carrier or party in possession (and the burden to prove freedom from such negligence shall be on the carrier or party in possession)* the carrier or party in possession shall not be liable for loss, damage, or delay occurring while the property is stopped and held in transit upon request of the shipper, owner or party entitled to make such request[3]:

*The committee of the American Bankers' Association proposes a slight change in this paragraph and also proposes six new clauses to be inserted as indicated by the six following footnotes:

[1] When the bill has been surrendered it shall be immediately canceled. This provision shall apply even though the bill is marked not negotiable.

[2] By the holder thereof whether for value or for collection.

[3] Who, in the case of an order bill, shall be the holder thereof

or resulting from a defect in the property or from riots or strikes. When in accordance with general custom, on account of the nature of the property, or when at the request of the shipper the property is transported in open cars, the carrier or party in possession (except in case of loss or damage by fire, in which case the liability shall be the same as though the property had been carried in closed cars) shall be liable only for negligence, and the burden to prove freedom from such negligence shall be on the carrier or party in possession.

SEC. 2. No carrier shall be liable for loss, damage, or injury not occurring on its own road or its portion of the through route, nor after said property has been delivered to the next carrier, except as such liability may be imposed by law, and any carrier shall be entitled to recover from the common carrier, railroad or transportation company on whose line the loss, damage or injury shall have been sustained the amount of such loss, damage, or injury as it may be required to pay to the owner of such property or to the holder of this bill of lading, provided that it has given notice to such carrier, railroad or transportation company at least 15 days before the payment of such claim, but no obligation respecting such recovery is hereby assumed by or imposed upon the shipper, owner, or consignee.

SEC. 3. No carrier is bound to transport said property by any particular train or vessel, or in time for any particular market or otherwise than with reasonable despatch, unless by specific agreement endorsed hereon. Every carrier shall have the right in case of physical necessity to forward said property by any railroad or route between the point of shipment and the point of destination; but if such diversion shall be from a rail to a water route the liability of the carrier shall be the same as though the entire carriage were by rail.

The amount of loss or damage for which any carrier is liable shall be computed on the basis of the value of the property (being the bona fide invoice price, if any, to the consignee, including the freight charges, if prepaid) at the place and time of shipment under this bill of lading, unless a lower value has been agreed upon or is determined by the classification or tariff upon which the rate is based, in either of which events such lower value shall be the maximum amount to govern such computation, whether or not such loss or damage occurs from negligence.

Claims for loss, damage, or delay must be made in writing to the carrier at the point of delivery or at the point of origin within 60 days after delivery of the property, or, in case of failure to make delivery, then within 60 days after a reasonable time for delivery has elapsed. Unless claims are so made the carrier shall not be liable.

Any carrier or party liable on account of loss of or damage to any of said property shall have the full benefit of any insurance that may have been effected upon or on account of said property.[*]

SEC. 4. All property shall be subject to necessary cooperage and baling at owner's risk. Each carrier over whose route cotton is to be transported hereunder shall have the privilege, at its own cost, of compressing the same for greater convenience in handling or forwarding, and shall not be held responsible for deviation or unavoidable delays in procuring such compression. Grain in bulk consigned to a point where there is a railroad, public or licensed elevator may (unless otherwise expressly noted herein, and then if it is not promptly unloaded) be there delivered and placed with other grain of same kind and grade without respect to ownership, and if so delivered shall be subject to a lien for elevator charges in addition to all other charges hereunder.

SEC. 5. Property not removed by the party entitled to receive it within 48 hours (exclusive of legal holidays) after notice of its arrival has been duly sent or given, may be kept in car, depot, or place of delivery of the carrier, or warehouse, subject to a reasonable charge for storage and to carrier's responsibility as warehouseman only; or may be, at the option of the carrier, removed to and stored in a public or licensed warehouse at the cost of the owner and there held at the owner's risk and without liability on the part of the carrier, and subject to a lien for all freight and other lawful charges, including a reasonable charge for storage.

The carrier may make a reasonable charge for the detention of any vessel or car or for the use of tracks after the car has been held 48 hours (exclusive of legal holidays) for loading or unloading, and may add such charge to all other charges hereunder, and hold such property subject to a lien therefor. Nothing in this section shall be construed as setting aside any local law or rule affecting car service or storage.

Property destined to or taken from a station at which there is no regularly appointed agent shall be entirely at risk of owner when unloaded from cars or until loaded into cars, and when received from or delivered on private or other sidings shall be at owner's risk until the cars are attached to and after they are detached from trains.

SEC. 6. No carrier will carry or be liable in any way for any documents [or] specie, or for any articles of extraordinary value not specifically rated in the published classification or tariff, unless a special agreement to do so and a stipulated value of the articles are endorsed hereon.

SEC. 7. Every party, whether principal or agent, shipping explosive or dangerous goods, without previous full written disclosure to the carrier of their nature, shall be liable for all loss or damage caused thereby, and such goods may be warehoused at owner's risk and expense or destroyed without compensation.

SEC. 8. The shipper, owner, or consignee shall pay the freight and all other lawful charges accruing on said property before delivery. If upon inspection it is ascertained that the articles shipped are not those described in this bill of lading the freight charges must be paid upon the articles actually shipped.

SEC. 9. Except in case of diversion from rail to water route, which is provided for in Section 3 hereof, if all or any part of said property is carried by water over any part of said route, such water carriage shall be performed subject to the liabilities, limitations and exemptions provided by statute, and to the conditions contained in this bill of lading not inconsistent with such statutes or this section, and subject also to the condition that no carrier or party in possession shall be liable for any loss or damage resulting from the perils of the lakes, sea, or other waters, or from explosion, bursting of boilers, breakage of shafts, or any latent defect in hull, machinery, or appurtenances; or from collision, stranding, or other accidents of navigation, or from prolongation of the voyage. And any vessel carrying any or all of the property herein described shall have the liberty to call at intermediate ports, to tow and be towed, and assist vessels in distress and to deviate for the purpose of saving life or property.

The term "water carriage" in this section shall not be construed as including lighterage across rivers or in lake or other harbors, and the liability for such lighterage shall be governed by the other sections of this instrument.

When property is carried under a rate which includes marine insurance the liability of the water carrier shall cover all risks insured against and shall at least equal the liability hereunder for rail carriage in closed cars.

SEC. 10. Any alteration, addition or erasure[*] in this bill of lading which shall be made without an endorsement thereof hereon, signed by the agent of the carrier issuing this bill of lading, shall be without effect, and this bill of lading shall be enforceable according to its original tenor.

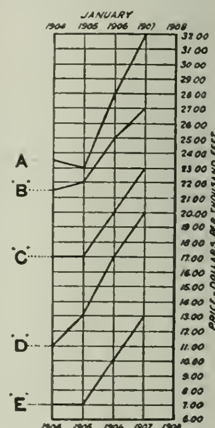
[*] So far as it is consistent with the terms of the contract or policies of insurance.

But this provision shall not apply to property on which order bills have been issued unless such bills are marked "shippers load and count." (S. L. & C.)

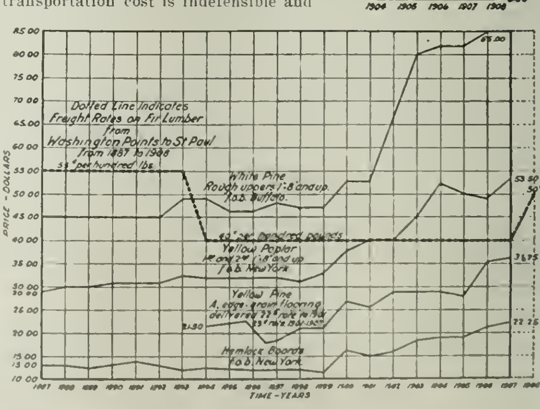
[*] Fraudulent or otherwise.

Increased Cost of Lumber.

The following diagrams from the report on increased lumber prices, issued by the United States Department of Agriculture, show how great the increases have been in the last 20 years, and especially in the last five years. Lumber prices, prior to 1893, show little change, and the tonnage handled by the railroads was of relatively slight importance; but in 1893 the railroads, having an excess of eastbound empty cars on account of the steady increase in westbound merchandise shipments and construction material, created by the growth of the Pacific Coast country, lowered the freight rate to a 40 per cent. basis in an effort to encourage the lumber industry and to get a back haul.



From 1893 until 1900, although the tonnage increased, the lumbermen secured only a moderate advance in prices, but in recent years conditions have changed materially. The prices of lumber have almost doubled and the principal difficulty the lumberman has had has been to get his product hauled to eastern markets. The demand for cars has exceeded the supply and the railroads have been compelled to send empty cars across the continent for this purpose. In the face of these conditions, it is claimed by the railroads that the continuance of a rate which does not bear its proper share of the transportation cost is indefensible and indicates that other traffic is being saddled with a burden not co-ordinate with the factors which should determine proper rates. The diagrams, as shown, tend to indicate that the old rates inaugurated to fit the conditions of 1891 are not co-ordinate with the conditions which exist to-day. A 10 per cent. increase from the Pacific Coast to St. Paul and Minneapolis has been proposed and is apparently justified by existing conditions.



Prices of Washington Fir Lumber.

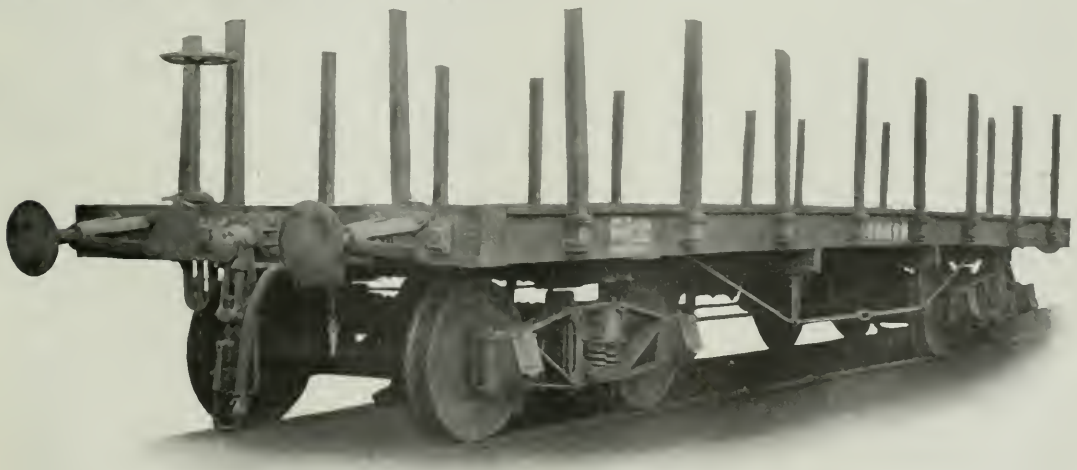
A Fir car siding and roofing, 1 in. x 4 in., or 6 in.
B Fir flooring, 1 in. x 4 in. or 6 in., 10 ft. to 16 ft.
C Fir drop siding, 1 in. x 6 in., 10 ft. to 16 ft.
D Fir car sills, rough, 35 ft. to 40 ft.
E Fir railroad ties, 7 in. x 9 in. x 8 ft.

American Cars for Chinese Railroads.

The Middletown Car Works, Middletown, Pa., has recently built and shipped to the Sun Ning Railroad in China a number of 20-ton box and flat cars which are a combination of United States and German standard construction. The Sun Ning Railroad is a short road being built in Central China by native capital and in some of the details of its equipment it reflects the influence of the German engineers in charge of the Shantung Railroad. The gage of the road is 4 ft. 8½ in. and in most other respects the standards employed in the United States have been followed but the coupling attachments of these cars are of German design and were imported from Germany by the builders. The center line of draft is 3 ft. 5⅝ in. above the rails and a form of screw coupling is employed with the usual side buffers. The car bodies and trucks are built to M. C. B. standards throughout.

20-Ton Box Car; Sun Ning Railroad.

The box cars have wooden underframes and bodies with corrugated iron roofs. They are 29 ft. 6⅜ in. long, 8 ft. ⅜ in. wide and 6 ft. 4 in. high, inside measurements, and 32 ft. long over end sills. The trucks are of the diamond arch bar type with double I-beam bolsters and channel swing plank. Cast-iron wheels 33 in. in diameter, M. C. B. axles with 3¾-in. x 7-in. journals and M. C. B. boxes are used. The cars are fitted with Westinghouse air-brakes with 8-in. cylinders. The flat cars are 32 ft. long and 8 ft. 9 in. over the floor, and are identical in other respects with the box cars.



20-Ton Flat Car; Sun Ning Railroad. Built by the Middletown Car Works.

Vanadium Steel.

For several years the question of the use for modern metallurgy has been that of investigating the several alloys of steel that have a tendency to modify the texture of the metal so that it may be better and better adapted to the diversified requirements of modern industries. The addition of a foreign metal may result in increasing the resistance to shock, or raising the limit of elasticity, or in increasing the ductility of the steels so that these various modifications necessitate a very careful study of the alloy. The last to be used, and one which, for many years, has attracted a great deal of attention among metallurgists, is vanadium.

Before pointing out the characteristic properties of vanadium steel our readers will permit of a short digression regarding vanadium itself. At the beginning of the last century vanadium was discovered and christened "Erithrone" by a professor of mineralogy in Mexico, Del Rio, who first gave the new metal the name of "panchrome." An analysis of a specimen of this mineral sent to France by Humboldt, led Collet Descotils to admit the presence of chromium, but not that there was a new metal, and Del Rio himself retracted his first opinion and attributed the brown appearance of Zimapan to a basic chromate of lead. Thus, scarcely had it become known before it was disowned by its discoverer and was relegated to Zimapan without arousing any controversy whatever. Thirty years after, in November, 1830, Berzelius wrote to Dulong that: "M. Sofstrom, Director of Mines at Fahlun, in examining a sample of iron that was remarkable for its extreme softness, had detected the presence of a substance * * *." This new substance, which was somewhat more abundant in the pig than in the puddled iron, and consequently more abundant in the slag, was called "vanadium," a word taken from Vanadia, a surname of Freya, one of the principal goddesses of Scandinavian mythology. Vanadium was thus rediscovered, but the investigation of its properties has only been consummated recently.

In 1841 vanadium was found in a large number of iron and copper mines, and French science claims the honor of having recognized it as one of the most widely diffused of the metals of the crust of the earth. The masses of bauxites of the south of France contain it in notable quantities, from which it is obtained for use in ceramics just as the clays are. But the actual amount contained is very small, being from 0.09 to 0.06 per cent. at Rovest and in Calabria. The researches of Dienlafait, of MM. Osmond and Witz show that the basic slag of the oolithic mineral of Mazenay contains more than 1 per cent. of vanadium. In short, it appears that the rocks in which vanadium occurs are those formed by the deposits of ancient seas that have dried.

The content of vanadium rarely reaches 0.1 per cent. in those

minerals in which it is encountered. The principal minerals are vanadinite, which is a chlorovanadinate of lead; chilecite, a double vanadinate of lead and copper; dechinite, acroxene and enoynchite, which contains a large proportion of zinc. The presence of arsenic produces cuprodecloizite. These minerals are very numerous and, not to weary the reader, it may simply be added that one of the minerals that is richest in vanadium is the vanidiferous mica, roscoelite. To recapitulate, the principal minerals from which vanadium is obtained are: Vanadinite, which is found in Spain and which contains about 40 per cent. of lead, from 12 to 13 per cent. of vanadic oxide and silicon, some iron and silver; the vanadiferous ores of Colorado and the vanadiferous deposits of South America.

The metal vanadium is obtained by concentrating the oxide which is reduced in the presence of the oxide of iron in an electric furnace as in the production of aluminum. The two processes produce a ferro-vanadium, which frequently contains 80 per cent. of vanadium.

Vanadium was first used in the preparation of a black ink that was compounded by Berzelius, and then in coloring where it replaced the old process using the sulphate of copper. Extracted from the Creusot slag, it cost about $27 a pound and sold for $90. It was also used in ceramics and even in therapeutics.

The use of vanadium in metallurgy dates from 1896, when M. Choubley, Manager of the Firminy works, made a number of tests on ordinary steel tempered at 1,650 deg. Fahr. and annealed at about 480 deg. Fahr. to which a powder composed of the oxide of vanadium and aluminum was added. Although these tests were fruitless at first, the following results were finally obtained:

	Ordinary steel.	Vanadium steel.
Limit of elasticity	48,760 lbs.	70,625 lbs.
Ultimate strength	56,500 "	74,304 "
Elongation	10 per cent.	11.3 per cent.
Contraction of area	54 "	47 "

This shows an increase of 44.8 and 31.5 per cent. for the limit of elasticity and ultimate strength respectively. M. Chowbley decided to use a ferro-vanadium to add to the steel bath. This steel hardened in a remarkable manner under the influence of a rise of temperature.

More methodical investigations were undertaken by Mr. Arnold, a Professor in the Mechanical Institute of Sheffield in 1900. Vanadium was introduced as ferro-vanadium containing a small quantity of aluminum with the following results:

—Chemical analyses.— Combined carbon.	Estimated aluminium.	Aluminum per cent.	Estimated vanadium.	Vanadium, per cent.	Remarks.	—Physical properties— Limit of elasticity in lbs. per sq. in.	Ult. strength in lbs. per sq. in.	Elongation, per cent.	Reduction of area, per cent.
					Steel.				
1.00	0.04	0.07	0.12	0.14	11 mins. before pouring.	43,600	68,760	6.5	6.9
1.02	0.53	0.09	0.50	0.29	With the charge	43,760	77,140	8.5	10.0
1.00	0.53	0.36	0.50	0.58	21 mins. before pouring.	65,660	86,625	7.0	7.6
0.80	0.33	0.45	1.00	1.11	10 min. before pouring.	52,760	78,045	10.0	17.6
1.04	0.92	0.21	1.00	0.77	With the charge	59,530	85,075	7.5	9.3
					Iron.				
0.05	0.12	0.05	1.00	0.85	10 mins. before pouring.	20,460	26,445	37.0	12.0

These results are very interesting and show what they are for themselves; an almost pure steel containing 1.10 per cent. of carbon had a limit of elasticity of about 30,500 lbs. per sq. in. of section and an ultimate breaking strength of 60,900 lbs. By referring to the table it will be seen that an addition of 0.14 per cent. of vanadium without making any appreciable change in the ductility of this steel raised its limit of elasticity by about 13,200 lbs. and its ultimate strength by about 79,000 lbs. Again the addition of 0.30 per cent. of vanadium raised the ultimate strength to 77,150 lbs. per sq. in., and 0.60 per cent. to 92,425 lbs. According to Mr. Arnold there is nothing to be gained by adding more than 0.60 per cent. of vanadium, for steel containing 0.77 per cent. gives almost identically the same results as that with 0.58 per cent.

The tempering makes it possible to obtain remarkable mechanical results with tools of vanadium steel, for the ⅝ in. in diameter of the following composition:

Vanadium	0.268 per cent.
Nickel	2.54 "
Carbon	0.156 "
Manganese	0.42 "
Phosphorus	0.022 "
Sulphur	0.028 "

The physical properties of the annealed metal were:

Ultimate strength	88,575 lbs. per sq. in.
Limit of elasticity	81,175 lbs. per sq. in.
Elongation	31 per cent
Contraction of area	57.5" cent

After having been treated to about 3,650 deg. Fahr., which brought it up to a cherry red, it was plunged into cold water and then, without being reheated, it gave the following results:

Ultimate strength	95,500 lbs.
Or an increase of more than 147 per cent	
Limit of elasticity	88,475 lbs
Or an increase of more than 181 per cent.	
Elongation	10.0 per cent.
Reduction of area	18.3 per cent

These figures show a great increase in ultimate strength and limit of elasticity.

An examination under the microscope shows that vanadium tends to delay the separation of the carburets, which facilitates the operation of tempering, which can be done by merely raising it to a temperature of 1,600 deg. Fahr., and then immersing it in water without allowing for any reheating. Vanadium so hardens the molecular elements of the steel, such as the ferrite, that it is possible to bend a square bar cold without developing any fracture. Finally, one of the characteristics of vanadium steel is the very small proportion of contained carbon, which is usually from 0.10 to 0.15 per cent.

Vanadium steels may be divided into three classes: (1) Steels containing vanadium only; (2) steels containing vanadium and nickel; (3) steels containing vanadium and chromium.

The first usually contains from 0.10 to 0.15 per cent. of carbon and from 0.15 to 0.25 per cent. of vanadium. Vanadium has almost as much of an effect as the carbon upon the steel, and the fact that the tensile strength of almost pure iron, that is iron obtained electrolytically, is increased, for example, from 24,000 lbs. to 27,000 lbs. per sq. in. of section by the addition of a few tenths of vanadium, is certainly very remarkable and the obtaining of so great an effect with so small a cause can be classed among the marvels of modern science. The following are some interesting results that have been obtained by the addition of vanadium:

	—In lbs. per sq. in.— Ultimate strength.	Limit of elasticity
Soft steel, low in phosphorus	27,200	25,400
Carbonized by casting in a graphite crucible	28,100	25,000
With 0.50 per cent. of vanadium added	42,570	33,550
With 1 per cent. of vanadium added unannealed.	62,460	49,750
Same as above, annealed	45,235	37,050

This 1 per cent. vanadium steel is ordinarily used for pieces subjected to vibration, for it resists tensile stresses admirably and is elastic.

The second class of vanadium steels are those containing vanadium and nickel. Usually the proportions are from 0.20 to 0.40 per cent. of vanadium and from 2 to 6 per cent. of nickel. With these steels the tensile strength obtained ranges from 35,000 to 39,000 lbs. per sq. in. with a limit of elasticity of from 22,500 to 31,500 lbs., and an elongation varying from 30 to 35 per cent. After tempering the tensile strength and the limit of elasticity rises to 99,000 lbs. and 88,000 lbs. respectively, while the elongation is reduced to from 8 to 10 per cent. The nickel has a peculiar action in this respect that, up to a content of 8 per cent., it makes the steel hard, and that from 8 to 15 per cent. it makes it brittle so that it can be broken with a hammer; and that from 15 to 25 per cent. its ductility increases rapidly beyond which it remains stationary. Vanadium makes nickel steel more homogeneous and diminishes the tendency to brittleness which the nickel causes, though it is true that it is rarely used where the nickel content is more than 8 per cent. Owing to the fact that the nickel gives the metal a high capacity to resist shock, these steels are especially adapted for use in piston rods, cranks, coupling rods, small shafts and the like.

The third class of vanadium steels comprise those containing vanadium and chromium, and the best proportions are those included within the following limits:

Carbon	0.20 per cent.	0.40 per cent.
Chromium	1.00 "	1.00 "
Vanadium	0.20 "	0.20 "

Chromium increases the resistance to shock and the tensile strength, but it has a tendency to produce a very hard metal and one that is difficult to work hot, while welding can only be successfully done electrically, because of the tendency of chromium to oxydize and change into slag. The addition of chromium makes the metal difficult to cut and to work cold, and the Carnegie Steel Co. has found no better method of cutting sheets and plates made of chrome steel than to use a smooth disc revolving at high speed. This disc is 6 ft. in diameter and is mounted in the same way as a circular saw and can cut plates up to 6 in. in thickness. A jet of steam is made to impinge continuously against the metal on the line of the cut. The addition of from 0.15 to 0.25 per cent. of vanadium will counterbalance the tendency of the chromium and facilitate the cutting of steel sheets.

These steels are especially adapted for making crank shafts, propeller shafts, locomotive and car axles, vertical shafts, etc.

The following results show very clearly the influence of vanadium upon chrome steel:

Steel.			—Lbs. per sq. in.— Ultimate strength.	Limit of elasticity.	—Per cent.— Elongation.	Reduction of area.
carbon manganese			25,150	14,855	35	60
" plus 0.50 per cent.	chromium		32,250	20,640	33	61
" " 1.00 "	chromium		36,120	23,220	30	57
" " 0.10 "	vanadium		32,250	27,090	31	60
" " 0.15 "	vanadium		34,185	29,025	26	59
" " 0.25 "	vanadium		36,665	32,250	24	59
" " 1.00 "	chromium					
and 0.15 "	vanadium		44,795	34,185	21	57
" plus 1.00 "	chromium					
and 0.25 "	vanadium		58,050	46,085	19	16
" plus 1.00 "	chromium					
and 0.15 "	vanadium					
tempered			78,025	67,080	16	18
" plus 1.00 "	chromium					
and 0.25 "	vanadium					
tempered			90,235	75,140	12	45

The conclusion reached from all of these investigations which have been carried on in recent years is that vanadium can be used to replace nickel, tungsten and molybdenum in the steel alloys.—*Revue Industrielle.*

Electric Locomotives of the Pennsylvania Railroad.

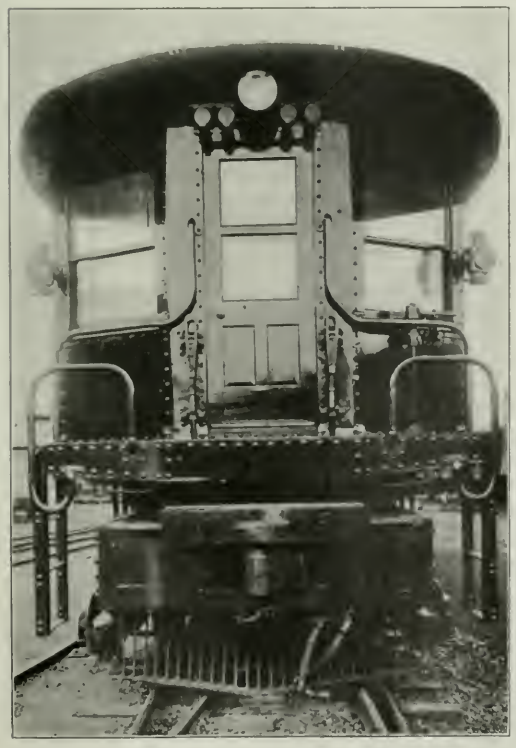
With a view to determining the type best adapted to pulling its heavy passenger trains through the New York tunnels, the Pennsylvania Railroad has in progress a series of experiments upon electric locomotives. Through the experiments, which are being conducted on its West Jersey & Seashore division and the Long Island Railroad, the company intends to determine some of the general characteristics of the electric locomotive and to secure operating data based on actual service.

Of the two direct-current locomotives now undergoing tests, one is equipped with four 325 h.p. geared motors and the other with four gearless motors in order that the relative merits of the two types may be determined.

The locomotive with gearless motors has one of its trucks equipped with two 320 h.p. motors supported by springs from the main journals and wholly independent of the truck frame, while the other truck has two 300 h.p. motors rigidly fastened to the truck frame. This arrangement will demonstrate the advantages of the two methods of motor suspension under the same conditions of service.

In exterior appearance the two locomotives are almost identical. They resemble somewhat a short truck passenger car with few windows and large wheels. The trucks are of the four-wheel type having frames placed outside the wheels, with pedestal boxes and adjustable wedges similar to those used in locomotive practice. On account of their short wheel base the trucks have a tendency to tilt in operation, and thereby shift a portion of the effective load from one pair of wheels to the other. By an ingenious automatic switching mechanism the power delivered by the motor on the heavily loaded axle is increased and the power delivered by the motor on the lightly loaded axles diminished in proportion to the difference in axle loads. By this expedient the pulling power of the locomotive is increased.

Side View of Electric Locomotive; Pennsylvania Railroad.



End View of Electric Locomotive; Pennsylvania Railroad.

The outer-end casting of each truck carries the coupler, draft spring and buffer arrangement, so that strains caused by pushing, pulling and buffing are taken directly by the truck frames and do not come upon the underframe of the cab, except as they are transmitted between bolsters through the center sill. In order to allow sufficient lateral play when the locomotive is coupled to a long passenger car with considerable overhang, the coupler head has a free movement of 15 in. on either side of the center line of the truck. To facilitate coupling and uncoupling on curves, the coupler can be swung sideways and its uncoupling pin raised by means of levers at the end of the cab, which can be operated from the platform.

Driving wheels are 56 in. in diameter, with removable tires secured by retaining rings. They are carried by axles 8 in. in diameter at the center, provided with 6-in. x 11-in. journals.

The spring rigging is of the locomotive type, with semi-elliptical springs over the journal boxes, and equalizers between the springs. To prevent teetering, the equalizer beam is not provided with a fixed fulcrum, but instead supports two nests of helical springs, which in turn help to support the truck frame.

The collector shoes are attached to the four end journal boxes, and are made of two castings forming a spring hinge, with one wing lying in a horizontal plane, and sliding on top of the third rail. The current passes from the third rail through the collector shoes and the heavy cables connected thereto to the fuse-boxes fixed near the shoes.

The cab is entirely of metal, its underframe composed of a center sill, built of two 10-in. channels, side sills of 7-in. x 3½-in. angles, plate bolsters and end sills. Within the cab the apparatus is distributed along the sides, leaving a passageway through the middle. The equipment on one side of the cab consists of three main reservoirs, a sand-box with electro-pneumatic valves underneath, a switch group, two line switches, a case of diverters, and two sets of storage batteries. That on the other side consists of a compressor, a compressed air cooler, a fan and motor, a reservoir for control apparatus, a sand-box, two line switches, a whistle reservoir, a motor cut out, a switch group, and a case of diverters.

The locomotive control mechanism is in duplicate, and placed in diagonally opposite corners of the cab, so that the motorman can operate a locomotive, or group of locomotives, from either end of the cab, in either direction. By means of a special grouping of switches it is possible to obtain a constant flow of current without a break, when changing from series to series parallel, and from series parallel to full-multiple. The preliminary tests made with the locomotive proved that by means of this system of grouping switches, the acceleration of the locomotive could be made practically uniform. Both ends of the cab are provided with sockets, so that when two or more locomotives are coupled together connections can be made by means of these sockets, and the group of locomotives can be simultaneously operated and controlled by the motorman of one locomotive.

Hung from the ceiling in the center of the cab are two plug switches and another ammeter shunt. The conductors from the third rail shoes are connected to one switch, and the trolley cable is connected to the other.

The switches in the switch group are operated by air pressure. The air valve is actuated by a control magnet on a 14-volt circuit. When current flows through the magnet armature opens the air valve, admitting air behind the piston, which closes the switch through which the main current flows. By breaking the control circuit the armature of the magnet is released, which closes the air passage from the reservoir and prevents the egress of air from the cylinder. A spring under the piston pushes it up, and thus opens the main circuit. The line switches are actuated in a similar manner, and also open when an excess of current flows through them by the air valve, admitting air behind the piston, which closes the switch through which the main current flows. By breaking the control circuit the armature of the magnet is released, which closes the air passage from the reservoir and prevents the egress of air from the cylinder. A spring under the piston pushes it up and thus opens the main circuit. The line switches are actuated in a similar manner, and also open when an excess of current flows through them.

The cab can be lighted by three lamps, which are in series with the lamps with the headlights; but normally these lamps are to be concealed. Five more lamps, which are in series, are distributed over the ceiling, to assist in lighting the cab when repairs are under way, but are not used when the locomotive is in service.

The storage batteries are in two sets so that they can be charged alternately by being placed in series with the motor of the air compressor, one set being charged while the other set is in service, the alternation being made each day.

Locomotives are equipped with hand, straight air, automatic and high-speed brakes. The principal dimensions, which are the same for both locomotives, are:

Number of pairs of driving wheels	4
Diameter of driving wheels	56 in.
Axles	diameter, 8 in.; journals, 6 x 11 "
Length, inside couplers	37 ft. 10½ "
Length over platforms	35 " 8 "
Wheel base of trucks	8 " 6 "
Total wheel base of locomotives	26 " 1 "
Width, cab	10 " 1⅜ "
Width, body	9 " 11¾ "
Height, rail to top platform	5 " 5 "
" " " roof	13 " 4 "
" " " bell (extreme)	14 " 5⅜ "
Weight: Locomotive No. 1001 (geared motors)	175,100 lbs.
Weight: Locomotive No. 1002 (gearless motors)	195,200 "

Rapid Transit Conditions in New York.

The report of the Board of Rapid Transit Railroad Commissioners for the city of New York for the year 1906, presumably the last report which this body will make, since it has now been superseded in its functions by the Public Service Commission of the First District, contains much interesting data about passenger traffic in New York City and presents graphic estimates of what traffic in future years may be expected to be. We show the diagrams illustrating traffic movement, which the commission has prepared.

The total number of passengers carried in the subway during 1906 was 149,778,370, as indicated by ticket sales. The smallest number of passengers carried any one month was 8,555,795 in August, 1906, and the largest number was 15,609,516 in December. These months of minimum and maximum traffic showed increases of 41 and 14 per cent., respectively, over July, which was the month of minimum traffic in 1905, and December, the month of maximum traffic. The average number of passengers carried per month in 1906 was 12,466,786. The heaviest traffic was at the Brooklyn bridge station. Over 19½ million people boarded trains at this station during the year, and if it be assumed that an equal number left the trains there, over 39 million people, exclusive of those transferring from one train to another, passed through the station. Twice as many passengers used the Brooklyn bridge station as any other single station on the road.

The 10 busiest stations in order of their importance are:

1. Brooklyn Bridge.
2. Grand Central.
3. 14th street.
4. Times Square.
5. Fulton street.
6. 23d street.
7. 116th street.
8. 125th street and Lenox avenue.
9. Astor place.
10. Wall street.

On the maximum week day, December 24, 1906, 605,246 passengers were carried.

As an indication of the future growth in the city's population, Fig. 1 shows the population of the city in its five boroughs from 1800 to 1905, as obtained from the United States and state censuses. Based upon the average rate of growth per decade, from 1870 to 1900, the curves have been extended to 1930.

Fig. 2 indicates the paid passenger traffic in New York City and its several boroughs from 1901 to 1906, inclusive, with the curves extended to 1916.

Fig 3 shows the detailed variation in the traffic on the surface, elevated and subway lines for the same years as before. The general laws governing the variations in the population and traffic of Greater New York can best be observed by studying Figs. 1 and 2. Considering all the boroughs grouped into one great population center, it appears that during the four years ending June 30, 1905, the total number of paid passengers traveling on all street railways—surface, elevated and subway roads—increased practically in a straight line, that is, the increment in each succeeding year was about the same. During 1906, however, there was a sudden marked increase in the traffic. While the average increment for the four preceding years was only about 63,000,000 per year, during 1906 it amounted to nearly 110,000,000. No census of the population of the Greater City was made in 1906. It is therefore impossible to determine whether this large additional number of riders is due to a corresponding increase in the population, or to an increase in

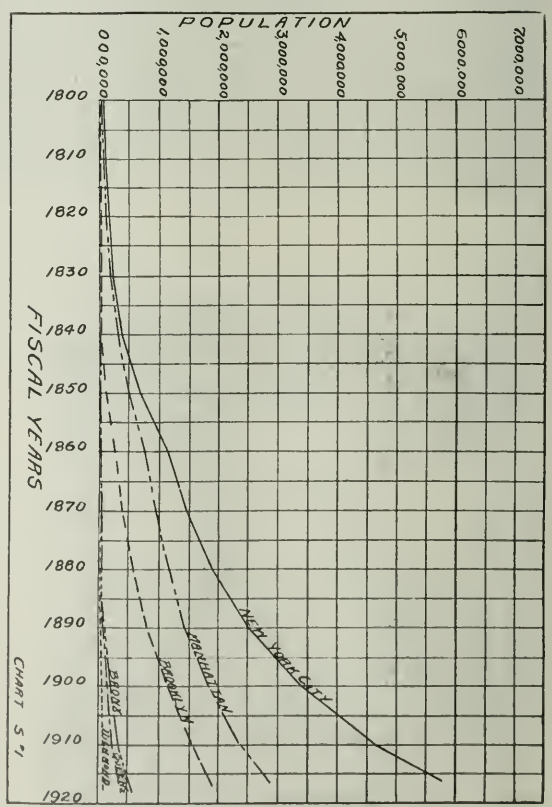


Fig. 1.

the number of riders per capita, but an increase in the population is the most probable cause, as will appear later. The growth of the travel in the boroughs separately has not always been parallel with that in the whole city, as was notably the case during the last three years. During 1902 and 1903, the increases were practically uniform in each borough; the amount of increase in each borough being greater in the order of the size of population of the boroughs—that is, the increase was smallest in Richmond and largest in Manhattan.

During 1904 and 1905, with the travel in the whole city still

increasing at a uniform rate, there was a loss in the rate of increase in the travel in Manhattan, and a corresponding gain in all the other boroughs, but mainly in Brooklyn. This may be accounted for by a temporary movement of some of Manhattan's population to the other boroughs. The only reason that can be ascribed for this migration was the interference with travel in Manhattan due to the building of the subway.

In 1906, when the notable increase in the number of paid passengers in the whole city occurred, there was a general increase in the rate of travel in all the boroughs. This was a greater rate

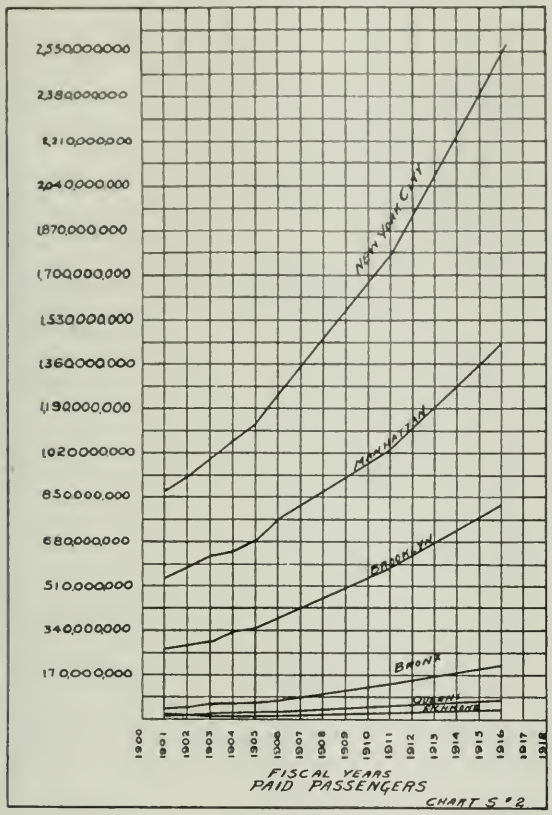


Fig. 2.

than had prevailed during any of the preceding years which have been considered. Manhattan recovered more than was lost during the years 1904 and 1905. All the other boroughs made material gains.

In the upper portions of Manhattan, a territory which was not conveniently accessible before the subway was opened, a great many apartment buildings have been erected. There has been a large movement into this district, the subway stations located here alone have handled nearly 8,500,000 passengers during the fiscal year of 1906. Assuming that most of these people have come into the city from the outlying suburbs in New Jersey, Long Island and Westchester, a total of nearly 17,000,000 additional passenger fares are accounted for on the subway alone.

It would appear, therefore, as already stated above, that the pronounced growth in 1906, in the total number of paid passengers traveling in the whole city, can only be accounted for by a corresponding increase in the city's population. This is probably due to the operation of the city's first subway, a great many suburban people having been induced to come into the city in view of the increased facilities afforded. It is now proposed to take up each borough, more or less in detail, and finally to make some speculations with regard to the transportation requirements within the next decade.

In the borough of Richmond 15,571,889 paid passengers were carried during the fiscal year of 1906; 8,957,414 of these were carried on the surface lines, the remaining 6,614,475 on the steam roads; the daily average was nearly 43,000. During the last five fiscal years the number of passengers carried increased at a fairly uniform rate. The total increase for the five-year period was about 28 per cent. This borough now has on an average about two inhabitants to the acre. It is estimated that its population may be about 100,000 in 1916, or a little less than three to the acre. Approximately 60 per cent. of all the passengers in Richmond, about 26,000 per day, are now transported to and from Manhattan by ferry. The increases in population and passengers transported will probably be greater than indicated above. However, assuming that the same rates are maintained, in 1916 there should be approximately 26,000,000 paid passengers carried in Richmond. About 15,000,000 of these will have to be provided with transportation to and from Manhattan. Each inhabitant of the borough now rides 210 times per year; in 1916 he would ride about 260 times. There are now 130 miles of single track operated in Richmond. The transportation problem here can be taken care of for many years to come by the natural expansion of the present systems to develop new territory and an increase in the car mileage to meet the added demands of the growing population.

In the borough of Queens the conditions are somewhat similar to those in Richmond, except that the population is larger and has increased about twice as fast.

In 1906 the population was 208,596. The completion of the tunnels now under construction will probably cause a phenomenal growth in the population. Based on a normal ratio of growth, however, it is estimated that it will be about 300,000 for 1916. In studying the traffic, the Long Island Railroad has not been included. There were 22,115,729 paid passengers riding on the surface lines during 1906, an increase of nearly 100 per cent. during the five fiscal years, as against the 28 per cent. increase in Richmond. The number of rides per inhabitant is smaller in this borough than in any other. In 1901 there were 73 per capita per

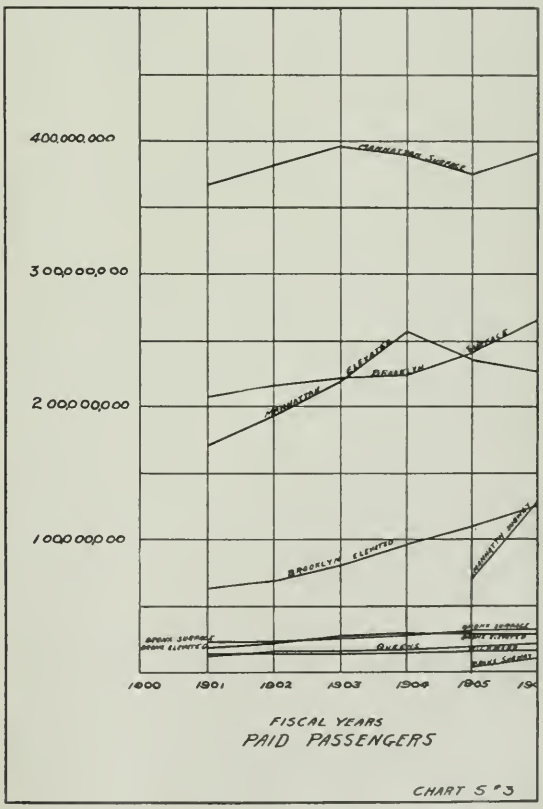


Fig. 3.

year; in 1906, 106. If the traffic increases as rapidly during the next decade as it has during the past five years, in 1916 the travel in Queens borough will equal over 88,000,000 paid passengers. To carry this traffic within the borough, as was the case in Richmond, it will only be necessary to increase the car mileage as occasion demands, and to add to the trackage in undeveloped territory. This does not dispose of the passengers whose objective point is Manhattan; these must be provided with facilities for crossing the East river.

The statistics are not directly available from which the number

of people bound to Manhattan can be determined. It has been estimated, however, that about 60 per cent. of the riding passengers both in Richmond and in Brooklyn cross to and from Manhattan each day. Using this same ratio, then about 53,000,000 people, exclusive of Long Island Railroad passengers, will have to be transported across the East river from Queens in 1916, either by ferries, bridges or tunnels.

The Blackwell's Island bridge and six tunnels are now being constructed between Manhattan and Queens. Two of the tunnels enter Manhattan at Forty-second street and are known as the Belmont tunnels; the other four are the Pennsylvania tunnels through Thirty-second and Thirty-third streets. The bridge provides for two elevated and two trolley tracks; in all there will be five tracks in each direction. The Pennsylvania tunnels will probably be used mostly by Long Island commuters. If these tracks are omitted from consideration three tracks in each direction will still be available for the use of this borough. These facilities should be in operation within four years. Their combined maximum capacity should be over 133,000,000 per year, with a maximum hourly capacity of over 73,000 in one direction. If all passengers are to be provided with seats, then the above figures would become approximately 60,000,000 and 33,000,000, respectively. The residents of Queens will therefore have ample facilities for reaching Manhattan for many years to come.

During the fiscal year of 1906 389,555,025 paid passengers were carried on the street railways in the Brooklyn borough, a daily average of over 1,067,000. This represented 278 rides per inhabitant for the year.

The elevated lines carried 125,221,831 and the surface lines 264,333,194, or about 32 and 68 per cent., respectively, of the total number. Over 60 per cent., or approximately 234,000,000, of all of the above passengers were carried to and from Manhattan over the bridges and ferries. There has been a slight increase each successive year in the rate of increase of the total passengers carried. Considered separately, the riders have increased faster on the elevated than on the surface lines.

The number of surface riders in 1906 was about 27 per cent. greater than in 1901. During the same period the amount of single track operated has increased less than 2 per cent., and the car mileage only about 11 per cent. This has resulted in a greatly increased crowding on all lines. For the same five fiscal years the population has grown less than 18 per cent. Each inhabitant has taken 189 rides on the surface cars during 1906, as compared with 174 rides during 1901.

If the same rates of increase which have prevailed during the past five years are maintained for a decade, in 1911 the number of paid passengers carried on the surface roads in Brooklyn will amount to about 336,000,000; in 1916, to about 426,000,000.

These figures do not represent the maximum rates at which passengers will have to be carried during the rush hours. During these hours it is estimated that transportation will have to be provided on the surface lines at the rate of over 100,000 per hour in one direction in 1911, and 140,000 per hour in 1916.

The travel on the elevated railroads in Brooklyn has very nearly doubled, while the surface roads were gaining 27 per cent. To carry this enormous increase of traffic only 9.346 miles of single track have been added, or only 11 per cent. more than was operated in 1901. The car mileage during the same period has not increased 60 per cent. It appears, therefore, that the increase in facilities on the elevated railroads has not kept pace with the growth in the traffic. The whole transportation system, both surface and elevated roads, is greatly overburdened. It is obvious that in order to provide relief for Brooklyn's population the subway systems must be extended into and through the borough as quickly as possible. When this is done the surface lines will be greatly relieved; they can then be depended upon to fulfil their proper functions, that is, furnish the necessary short-haul service. Long-distance passengers will be provided for on the elevated and subway lines. The capacity of the present surface and elevated lines is about 280,000,000, if moderate crowding is permitted during the rush hours.

From careful estimates it is believed that not far from 560,000,000 paid passengers will have to be provided with transportation in Brooklyn on all lines during 1911, and 800,000,000 during 1916. Deducting the capacity of the present facilities, subways should be built by 1911 to accommodate 280,000,000 people, and by 1916, 520,000,000 people.

To furnish this service with only moderate crowding, one four-track railroad operating ten-car trains should be completed across the East river and into Brooklyn within the next five years; and one more within five years afterwards, or two altogether during the next decade.

If, however, all passengers are to be provided with seats during the rush hours new subways must be provided for 370,000,000 passengers by 1911, and 610,000,000 by 1916, or two four-track railroads must be constructed to Brooklyn within the next five years, and four within the next decade.

The population of the Bronx borough at the end of the fiscal year 1906 was 288,417. It has grown over 38 per cent. during the last five fiscal years. During the same period the number of paid passengers carried on the surface lines, or, it may be said, the travel within the borough, has increased at a uniform rate of more than 36 per cent. The corresponding increase in the passenger car mileage has been less than 27 per cent., consequently the service now provided is not as good as it was five years ago. The trackage is sufficient, and adequate surface car transportation in this borough can be furnished for some years by increasing the car mileage or number of cars in use.

The elevated and subway traffic in the borough represents the travel to Manhattan. The number of paid passengers using the elevated road increased at a uniform rate up to 1904. The next year there was a very slight increase, due wholly to the opening of the West Farms branch of the subway, which had been in operation for seven months. In 1906 the use of the subway caused a falling off in the number of elevated passengers. Apparently the subway has had no effect upon the travel on the surface lines in The Bronx. Probably about 42,000,000 paid passengers will be carried on the surface lines in 1911, and 57,000,000 in 1916.

Manhattan's population was 2,167,585 for the 1906 fiscal year. This represented an increase of about 15 per cent. in five years. The traffic on all the lines in the borough has increased nearly 39 per cent. during the same time, but the growth has not been uniform throughout the whole period. The percentage of increase for each succeeding year was less than that for the preceding year up to 1905. For 1906, as already stated, there was a marked increase in the travel on all lines. While in each year the total travel has increased over that of the preceding year, the same thing cannot be said of the surface, elevated and subway lines when considered separately. During 1902 and 1903 there was a steady increase in the number of paid passengers carried on both the surface and elevated roads. In 1904 there was a falling off on the surface lines and a corresponding increase on the elevated lines. This was probably due almost entirely to the interference with the surface cars caused by the construction of the subway. But the surface and elevated lines showed a loss in 1905, which combined was equivalent to the travel on the subway during that year. Most of the subway passengers, however, were drawn from the elevated lines. There were nearly 21,000,000 less passengers using the elevated than in 1904—a loss of 10 per cent., instead of what should have been a gain of nearly 20 per cent., due to the subway travel. During 1906 the surface roads gained a little over the previous year, but the elevated roads continued to lose passengers.

In the fiscal year of 1906 the surface cars in Manhattan carried 391,354,877 paid passengers. This was a total increase of about 7 per cent. in five years. It has already been shown that the population of the borough increased 15 per cent. during the same period. Each inhabitant rode 194 times during 1901, as compared with 181 times in 1906. It is therefore apparent that the public are not riding on the surface cars as often as formerly. There are several reasons for this. The subway traverses a section of the city which had not formerly been provided with rapid transit facilities; therefore, those who had been compelled before to use the surface cars immediately changed to the subway. Again, a great many have moved their homes from lower Manhattan into upper Manhattan and The Bronx, and in consequence have become patrons of the elevated and subway roads. The number of passengers carried in 1906 does not represent the maximum number carried per year during the last five years. In 1903 there were 396,570,435 surface car passengers, amounting to nearly 200 rides per capita. This was the summit year of the surface car travel. The changes in the trackage and car mileage have not corresponded with the variations in the traffic. The former has increased about 14 per cent., but the latter only about one-half of 1 per cent. The density of traffic, or number of paid passengers per car mile, has increased over 6 per cent.

At present, if there were greater facilities for the long-distance travel, the traffic on the surface lines would be materially less. The surface lines should be wholly available for the short hauls. If the traffic growth on these lines for the five years just past is maintained for a decade the paid passengers would then be about 419,000,000 in 1911, and 448,000,000 in 1916. This number can probably be taken care of on the present surface lines without excessive overcrowding, provided the street conditions are so regulated as to reduce to a minimum the obstruction to car movement, and the size of all the cars in service is increased to the dimensions of the largest cars now being used. It would be of great benefit if the movement of vehicles on the car tracks were prohibited, or at least restricted, particularly during the rush hours. Careful investigations made by the Merchants' Association during 1903 will confirm these statements.

It has already been pointed out that a large number of former patrons of the elevated changed to the subway as soon as it was opened. The elevated and subway roads in Manhattan are considered together, since they both provide for the long-distance travel. The combined traffic on the two systems during the fiscal

year ending June 30, 1906, was 355,331,924 paid passengers, 227,538,369 riding on the elevated roads and the remaining 127,793,555 using the subway. In five years the number of long distance riders has increased over 108 per cent. The number of such riders per inhabitant has been 91 for 1901, and 164 for 1906. The enormous gain indicated above was accompanied by a corresponding loss on the surface lines. It is unlikely that such an increase in the elevated and subway traffic will be maintained for more than a few years at the most, it merely represents a change from one system to another. The more nearly correct conditions will be shown in the increase in traffic on all lines. Moreover, since Manhattan and The Bronx are interconnected by both the elevated and subway lines, it will be desirable to consider these two boroughs together in arriving at any conclusion relative to the traffic on these two systems.

The population of Manhattan and The Bronx has been estimated at 2,456,002 for the fiscal year 1906. It will probably be about 2,740,000 in 1911, and 3,170,000 in 1916. The total paid traffic for the last five fiscal years has increased about 41 per cent., to 818,273,413 per year, or an average of about 2,242,000 per day. The number of rides per capita is now about 333. The above total paid passengers are distributed as follows: Surface lines, 422,567,025; Elevated lines, 257,786,756; Subway, 137,919,632. The surface lines carry about 52 per cent. of the total traffic, and the elevated and subway lines together the remaining 48 per cent. It appears therefore, that at present in Manhattan and The Bronx the traffic is about equally divided between the surface roads in one case and the elevated and subway in the other, while in Brooklyn and Queens only about one-third of all passengers were carried on the elevated lines.

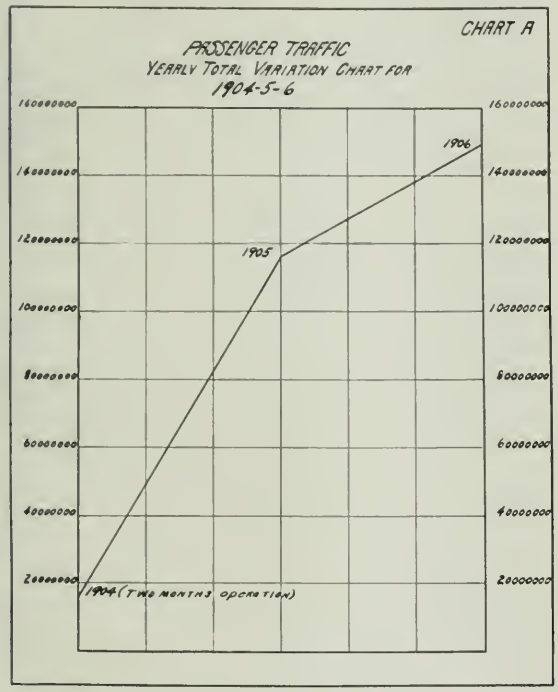


Fig. 4.

At the 41 per cent. rate of increase for five-year periods the total traffic in Manhattan and The Bronx will be about 1,153,000,000 in 1911 and 1,626,000,000 in 1916, daily averages of 3,131,000 and 4,454,800. Transportation must be provided for the rush hour conditions, or maximum number carried in one hour in one direction. The capacity of the existing elevated and subway roads, based on such conditions, if all passengers are to have seats, is not far from 200,000,000 per year; if moderate crawding is to be permitted, about 300,000,000. The estimated number of surface car riders has already been stated—for Manhattan, as 419,000,000 in 1911, and 448,000,000 in 1916; for The Bronx as 42,000,000 in 1911, and 57,000,000 in 1916. Deducting these figures and the estimated capacity of the existing elevated and subway lines from the total estimated traffic to be taken care of in 1911 and 1916, we have either, when seats are furnished, 492,000,000 and 921,000,000, or, with moderate crowding, 392,000,000 and 821,000,000 passengers, respectively, for whom transportation must be provided in new subways yet to be constructed.

Under moderate crowding two additional subways must be completed within five years and four within ten years. If seats are to be provided three additional four-track subways will have to be put in operation within the next five years and three more within a decade in order that the inhabitants of Manhattan and The Bronx may be transported to and from their daily business in comfort and decency.

The Railroads of Mexico.*

BY ERDIS G. ROBINSON, C.E.,
Formerly of the Engineering Department of the Mexican Central.

V

(Concluded.)

OPERATION.

As the railroads of Mexico have been located and built by American engineers and contractors, so have they been managed by men who have been thoroughly schooled in the services of the large companies of the United States. In Mexico, however, they have found problems and conditions not encountered in their previous experience, at least not in equal degree; and this was to have been expected when is considered the different national, natural and racial conditions. In the following table is given an analysis of the operating expenses of the roads of the two countries by means of which a comparison may be made. The figures for the Mexican roads are obtained by averaging data taken from the reports of the Mexican International, the National of Mexico, the Mexican Central Ry., and the Mexican Railway. The figures in the second column are taken from reports of roads operating in the western part of the United States through regions where prevail conditions most closely resembling those of Mexico. The third column gives figures (taken from Mr. Wellington's well known book written many years ago) to represent the railroads of the entire United States.

TABLE II.—*Operating Expenses of Mexican and American Roads.*

Percentages due to different accounts.

Account.			Mexico.	Pacific roads (U.S.).	U. S. (A.M.W.)
Locomotive expenses:	Fuel		26.3	11.0	7.6
" "	Water		1.3	0.6	0.1
" "	Oil and waste		0.8	0.8	0.8
" "	Repairs		7.4	8.0	9.2
Total locomotive expenses			35.8	20.4	18.0
Car expenses:	Supplies		1.0	1.6	0.5
" "	Repairs		8.6	7.5	10.0
" "	Mileage		0.4	2.0	2.0
Total car expenses			10.0	11.1	12.5
Wages account:	Locomotive		8.0	10.0	6.4
" "	Cars		5.4	8.0	8.5
" "	Switching		1.8	2.5	1.6
Total wages account			15.2	20.5	16.5
Track expenses:	Rails		1.2	3.0	2.0
" "	Adjusting		6.3	9.5	10.0
" "	Ties		5.0	5.0	3.0
Total track expenses			12.5	17.5	15.0
Miscellaneous and general			26.5	30.5	38.0
			100.0	100.0	100.0

Referring to this table (Table II.) it will be seen that the locomotive account for the Mexican roads shows 75 per cent. heavier than for the Pacific roads and double that for the roads of the entire country. The figures for oil, waste, repairs, etc., are almost identical for the three columns, the difference being in the water and fuel accounts.

The high cost of locomotive fuel is due to the scarcity of coal lands in Mexico. Aside from the fields adjacent to the line of the Mexican International in northeastern Mexico the roads must rely on coal imported from England and the United States, the cost of which is necessarily high, due to foreign costs and long haul. During the early years of the operation of the Mexican Central its coal was hauled from El Paso, a distance of 1,220 miles from its southern terminus. This not only added very materially to the cost of coal but affected the hauling capacity of the road. Many locomotives are equipped for burning wood, though this source of fuel is rapidly diminishing so that branch lines are built and extended to tap new timber areas. The Mexican Central following the exploitation of the oil fields located on its San Luis division, is operating some of its locomotives with this fuel and will add to their number as future developments may seem to justify. For the year ended June 30, 1905, this road expended for fuel amounts distributed as follows:

For coal	3,851,043	pesos.
" wood	765,868	"
" oil	998	"

During this time the use of oil was in the experimental stage, but

*The first article was published in the *Railroad Gazette* of July 12, 1907; the second, in the issue of Aug. 9; the third in the issue of Aug. 30; the fourth in the issue of Sept. 6.

the figures give an idea of the proportion of coal and wood used by that road.

The table gives the part of the operating expenses due to locomotive fuel. To consider the matter in a different light we find that on the Mexican roads the receipts for each dollar spent for locomotive fuel is $6.35 while for the roads in the United States the receipts are $12 for each dollar.

Likewise the high water account indicated a scarcity of water along the lines of the Mexican roads. In truth this matter of water supply is one of the vexatious problems. Long stretches of roads cross arid areas where rain falls at intervals possibly of several years, and though ever increasing efforts are being made to provide wells, reservoirs and pipe lines, still there are sections of roads where water stations cannot be provided, and it becomes necessary to haul water in tank cars, not only for locomotive use, but also to supply the stations and section-houses along the lines. Since every car thus hauled means one car less of revenue freight, the operating capacity of the road is at once affected as with long haul on coal cars. It is true that this condition is not uncommon on some of the roads in the southwestern states, but it is believed does not prevail so generally, as one will be led to think from noting the proportion of water service cars in use in the different cases.

These conditions, which cause such high locomotive fuel and water expenses, bring the total locomotive account on the Mexican roads to the high figure already noted. It will be noticed that costs of locomotive oil and repairs show almost no difference, as would be expected.

Passing to the second part of the table, car expenses, it will be of interest to observe the difference in car mileage, the ratio of these accounts being 1:5, and this comparison includes only the standard gage lines of the Mexican roads.

The third division offers an interesting comparison but is difficult to analyze, since the figures depend upon so many contributing influences. It will be noticed that on the American roads this item totals 25 per cent. above that for the Mexican roads, and that the car wages are 33 per cent. higher, while locomotive wages are but 20 per cent. above the Mexican charges. It would seem that the lower wage rate prevailing in Mexico would account for this difference, all the more since there is a larger proportion of natives employed in the car service. These facts are stated more in detail in the following tabulation:

TABLE III.—*Analysis of Wage Account.*

Class of wages.	Per cent. Tot'l operat'g expenses. Mexico.	U. S.	Per cent. Wage account. Mexico.	U. S.
Wages of locomotives	8.0	10.0	52.5	48.8
Wages of car service	5.4	8.0	35.5	39.0
Wages of switching act	1.8	2.5	12.0	12.2
	15.2	20.5	100.0	100.0

However, the amount in the wage account does not vary uniformly with the wage rate, since the efficiency of the labor must be considered, nor with the tonnage hauled. These points and others may be gathered from the few miscellaneous figures tabulated in Table IV., as well as the futility of attempting to discover a general rule involving these figures.

In the subdivision giving track expenses there will be noticed a considerable difference in the cost of adjusting track, due again to the lower wage rate in Mexico where all the section men and foremen and many of the roadmasters are Mexicans, and to the lighter tonnage of traffic over the Mexican roads.

TABLE IV. *Miscellaneous Data.*

	Mex. Ry.	Nat. of Mex.	Mex. Inter.	Mex. Central.	U. S. roads.
Average haul, freight-miles	116	165	210	237	..
Train load, tons	93	240	202	282	335
Employees, per mile	..	333	273	407	637
Per cent. Mexicans	..	93.3	77.8	88.3	..

It is believed that the differences shown in the table (Table II.) are typical although equal differences may be noted between roads in different parts of the United States. It should be added that the figures for general and miscellaneous expenses include items which if strictly classified would come under some of the special headings and that it has been the intention to note differences between certain well defined accounts.

The reports as made by railroads usually give a summary of operating expenses classed under four headings, namely, Maintenance of Way, Maintenance of Equipment, Conducting Transportation and General Expenses. In the following list this classification has been followed, and it will be noted that there is no very vast difference indicated in the table.

	Roads Mexican	U. S.
Maintenance of way	15.8	19.8
Maintenance of equipment	19.2	20.7
Conducting transportation	57.5	53.5
General	7.5	4.0

It would be expected that the various conditions noted would tend to increase operating expenses of the Mexican roads. It has been shown that the locomotive expense is greatly in excess of the same account on roads in this country and would more than counterbalance the evident saving in wages and maintenance expenses. There are other factors which would tend to cause heavy operating expense: The topography of much of the country is such as to lead to heavy construction expense and consequently to a high interest account, and this notwithstanding the liberal subsidy payments provided by the Mexican Government amounting at times to 10 per cent. of the total national expenditures; and also in past years the effect of the fluctuating currency on the earning capacity of the roads. It would seem then that these factors tending to increase the operating expenses of the roads would result in higher freight or passenger rates if the operating ratio is to be maintained at a figure approximating that prevailing in this country. The degree of approximation is shown in the following list:

	Mex. Ry.	Nat. of Mex.	Mex. Inter.	Mex. Central.	U.S. roads.
Ratio operating expenses to earnings	61.4	64.9	58.7	67.4	66.8

This leads naturally to a brief discussion of the matter of rates charged on the Mexican roads as compared to rates charged on roads in this or other countries, and the following figures are taken from such reports as are accessible:

	Receipts—Freight, per ton-mile, cents.	Pass'g'r, per pass.-mile cents.		Receipts—Freight, per ton-mile, cents.	Pass'g'r. per pass.-mile cents.
Mex. Inter.	1.09	1.85	United States	0.77	1.96
Nat'l of Mexico	1.48	1.85	France	1.31	....
Mexican Ry.	2.18	1.60	Germany	1.2	....
Mexican Central	1.11	....	Austria	1.3	....

From this tabulation it will appear that the freight rates in Mexico are very high as compared to the passenger rates of that country, being more per ton per mile than passenger per mile; that freight rates are somewhat higher than freight rates in this country, though comparing not unfavorably with western roads, and those rates prevailing in European countries; and that the passenger rates are much lower on the Mexican roads. The low passenger rate is mainly due to the large proportion of third class passengers for which service the rates are not more than one-half those charged for first class passage, although the charge probably covers all that the service is worth. On the Mexican International, whose report covers this matter, the third class coaches carry 65 per cent. of the total number of passengers; while on the Mexican Railway the percentage is 76, and on the Mexican Central 73.

It must not be forgotten in this connection that the rates charged by the Mexican roads are subject to the approval of the Government and are fixed only after an agreement between the Government and the railroad companies.

When considering the railroads of Mexico many are inclined to think of them as being dependent upon their business relations with the United States. This is true to the extent that we are always dependent upon our neighbors either as individuals or as nations, and is equally true as to the United States. It is a fact, however, that those Mexican roads built to develop the resources of that country are the most prosperous properties, as the following figures may seem to indicate. The table gives the classification of freight traffic on four of the Mexican roads.

Classification.	Mex. Ry.	Mex. Central.	Nat. of Mex.	Mex. Inter.
Forest products	5.2	11.0	16.0	6.1
Agricultural products	41.5	21.9	22.4	11.0
Animal products	1.9	3.8	2.9	2.1
Mineral products	26.3	54.0	46.3	75.5
Manufacturing, mdse, etc.	25.1	9.3	12.4	5.3
International freight	27.1	34.8	....	....

As a side remark it may be added that an examination of the figures forming the foundation of this table discloses some interesting facts. It will be noticed that the Mexican Railway (Vera Cruz line) handles the greatest proportion of agricultural tonnage. This will be explained by the fact that the largest maguey fields of the republic lie adjacent to this road, and that the pulque, that great national tipple produced from this plant, makes up 42 per cent. of the total agricultural tonnage. It follows from this that there would result a shrinkage of 17 per cent. in the total freight business of the road if the country were to enforce a prohibition law—a contingency however, let us hasten to add, which is in no immediate danger of coming to pass. Another very noticeable figure in the table is that giving proportion of mineral tonnage on the Mexican International. Seventy-six per cent. of the mineral tonnage of that road is made up of product of coal mines, coal amounting to 57 per cent. of the total tonnage of the road.

A commission appointed by the Swiss Government to determine the amount of power which would have to be generated to operate all of the railroads in Switzerland by electricity has reported that the maximum daily consumption at the wheels would be 1,200,000 h.p. hours. This would be equivalent to 3,000,000 h.p. hours generated at the turbines, or a continuous mean output of 125,000 h.p., with 10 per cent. efficiency of transmission. The ratio of mean to maximum load is estimated at 1 to 5 so that an installation of 625,000 h.p. would be required. The State Railroads and the St. Gotthard, operating 1,690 miles, would consume 90 per cent. of the total energy generated.

GENERAL NEWS SECTION

NOTES.

A press despatch from Knoxville, Tenn., says that the Southern Railway is to lay off 1,000 men from its shops, 400 of these being at shops in that city.

In Hinds county, Mississippi, the Illinois Central has been indicted by the Grand Jury for issuing passes to persons not entitled to them in violation of a law of 1884.

At Little Rock, Ark., September 9, a fine of $10,000 was imposed on the St. Louis Iron Mountain & Southern for illegally issuing free transportation to members of the legislature two years ago.

The Attorney-General of Wisconsin holds that chapter 102 of the laws of 1907, the "Full-Crew law," requires that there shall be two brakemen on every passenger train of more than three cars.

The State Railroad Commission of Oregon has issued an order requiring the Southern Pacific to run an extra train in place of No. 12, from Roseburg to Portland, 198 miles, whenever No. 12 is two hours or more behind time. A similar order has been issued in relation to certain trains between Portland and Pendleton, 231 miles.

The Waverly (N. J.) Transfer of the Pennsylvania Railroad (near Newark) sorts package freight into 250 cars daily which are despatched to 121 different points west and south. All this is fast freight. As each train from New York or the East is switched into Waverly a small army of 210 loaders transfer its contents piece by piece to the 200 cars drawn up along the platform. A force of 199 clerks is kept busy all the time on this work and that of the full car lots which also go through Waverly.

Charles Alfred Johnson, a fireman on the Bradford division of the Erie Railroad, has received from General Manager J. C. Stuart a complimentary letter, accompanied by a handsome gold watch and chain, sent in recognition of Mr. Johnson's courage and coolness in the management of a runaway freight train one night last March. The train, which was a long one, became uncontrollable on a steep descending grade and the engineman, finding that the air-brakes did not hold, jumped off. He advised the fireman to follow, but Johnson concluded to stick to the train. He reversed the engine and then went back and assisted the brakemen in setting hand-brakes for 2½ miles. The train was wrecked at a derailing switch and Johnson was buried under the wreckage for four hours, but came out only slightly injured.

Governor Warfield on the Southern Situation.

Governor Warfield, of Maryland, in a recent address at the Jamestown exposition, took a conservative position with regard to legislative activities in the South. He said, in part:

Baltimore has contributed of her capital and her enterprising men to this great development of the South, and has invested over $200,000,000 in southern railroads, southern cotton mills, southern street railways, southern coal mines, timber lands, and factories. Her financiers and capitalists have had faith in the integrity and credit of the South. The question confronting us to-day is, shall that confidence be destroyed? Has it been shaken by the recent attitude of some of the people of the South toward corporations and corporate interests?

If the South is sure of herself, and will need in the future no outside capital—if she has resources of her own sufficient for her further development—then the course these people are pursuing may prove all right, though it seems to me that your local capital needs exactly the same protection that outside capital requires, and that without this it will not seek investment in the development of your matchless resources. But if she does need outside financial aid, then they are doing their best to kill the goose that has been laying the golden eggs.

Don't forget that the bonds and mortgage securities of the South to-day represent actual money. There is very little fictitious valuation. I can say from personal knowledge and experience in connection with these investments, and on the testimony of our most conservative financiers, that the water has been squeezed out and we have now the substance.

And these bonds and securities are held by your people and by our people, by your institutions and by our institutions, and by capitalists who have supplied to the South the means by which it has wrought its new prosperity. So it follows that you cannot touch the securities without at once affecting your own people and your own best interests, and the favor and steadfastness of those who have helped you through all the years.

It happens that I belong to the political party which is dominant throughout the South, and that I believe firmly in its tenets, but I do not believe in the antagonism which has arisen in some sections to capital and laws calculated to make harder the future of our beautiful South in its efforts to realize the destiny that belongs to its people and its extraordinary natural wealth. And when I say this, I do not want to be understood as referring, in any sense, to the state executives who have fearlessly taken care that the laws of their respective states are obeyed. By all means let us see that the laws are enforced and that the guilty are punished, be they rich or poor, high or low. But let us not be unmindful of the dangers that come from mere crusades that appeal to public clamor and take no thought of the morrow.

I take no stock in the idea that great organizations of capital are manned by bands of criminals. I believe that with but few exceptions their executive officers are loyal citizens who are anxious to correct mistakes in methods and to do what is right and obey the laws.

Entertainment Committee, 1908, M. C. B. and M. M. Conventions.

At a meeting of the Executive Committee of the Railway Supply Manufacturers' Association at Atlantic City in June last, the General Chairmen for the several committees for the 1908 M. C. B. and M. M. conventions were appointed. Chas. P. Storrs, of the Storrs Mica Co., Owego, N. Y., was named as General Chairman of the Entertainment Committee. As it is necessary for this committee to do much of its work prior to the meeting in June next, Mr. Storrs has already selected his staff, which will consist of the following: Herbert Self, Crandall Packing Co.; E. H. Walker, Standard Coupler Co.; J. Will Johnson, Pyle-National Electric Headlight Co.; S. W. Midgley, National Car Coupler Co.; Bertram Berry, Heywood Bros. & Wakefield Co.; Cornell S. Hawley, Consolidated Car Heating Co.; F. O. Brazier, Murphy Varnish Co.; A. G. Langstron, Jenkins Bros.; Ross F. Hayes, Curtain Supply Co.; C. M. Garrett, Farlow Draft Gear Co.; J. L. Connors, Ralston Steel Car Co.; Geo. H. Forsyth, Forsyth Brothers Co.; W. J. Walsh, Galena-Signal Oil Co.; H. E. Oesterreich, Wendell & MacBuffie; John M. Stayman, Gold Car Heating & Lighting Co.; Philip J. Mitchell, Philip S. Justice & Co.; Leonard J. Hibbard, American Brake Shoe & Foundry Co.; J. S. Seabury, Massachusetts Mohair Plush Co.; E. V. Stebbins, General Storage Battery Co.; T. C. DeRosset, The T. H. Symington Co.; Edw. D. Welles, Chas. H. Besley & Co.; J. C. Younglove, H. W. Johns-Manville Co.; Richard S. Chisolm, *Railroad Gazette*, and Clayton W. Old, American Blower Co.

Education of Apprentices on the Santa Fe.

The Atchison, Topeka & Santa Fe has established a system of instruction and training for apprentices along the lines of the system which has been so successful on the New York Central Lines. F. W. Thomas, hitherto Engineer of Tests, has been placed in charge, with the title of Supervisor of Apprentices. There will be established at each shop on the system a regular course of instruction with an apprentice foreman or instructor in charge, who will devote his entire time to the apprentices. Careful and regular instruction in all of the practical work essential to a proper mechanical training will be given the boys. Also they are to receive instruction in shop arithmetic and the rudiments of mechanics and mechanical drawing. The company will provide the lesson papers, reference books, drawing instruments, boards, sketch books, etc., free of charge. The school sessions will be held three times a week, for the first two hours of the day, wages being paid the same as while at work. The system is now being established at the Topeka shops, the largest on the Santa Fe, and will be extended to the others as fast as practicable.

Care will be exercised in the selection of the apprentices. They must be physically and morally acceptable. They will be taken on six months' probation. If at the end of that period they appear possessed of the necessary qualifications they will be permitted to proceed. If they appear to be suited better for some other branch of the service they will be transferred. If unsuited to railroad work of any character, they will be dropped.

New Testing Laboratory.

Gulick-Henderson & Co., Inspecting Engineers, Pittsburgh, Pa., have established at 439 Third avenue, Pittsburgh, a laboratory for chemical and physical tests of metals, coal, coke, clay, etc., using methods similar to those of the United States fuel testing plant. In a circular recently issued, the firm emphasizes its policy of personally supervising the manufacture of the product to be inspected and also supervising the work of their own inspector while the manufacture is going on. J. W. Henderson began work in the iron and steel business in 1887 in the laboratory of the North Chicago

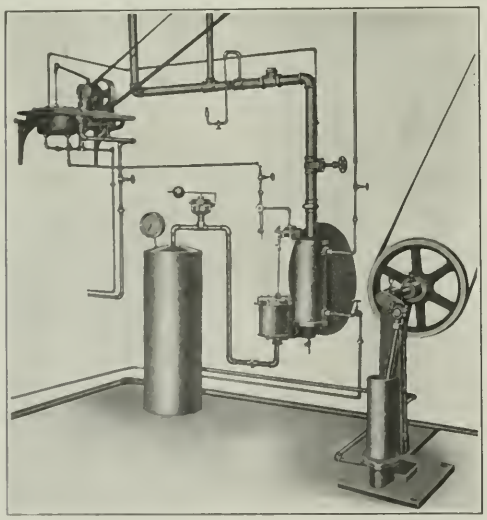
Rolling Mill Company. He was for some time Superintendent of the Cleveland Car Wheel Co., McKees Rocks, Pa., and then became Manager of the Butler Car Wheel Company's plant at Butler, Pa., where he remained until going into business for himself. Henry Gulick, Jr., has for the last six years been in charge of the inspection of railroad equipment near Pittsburgh for Robert W. Hunt & Co., Chicago.

Fines Railroads for Not Watering Stock.

The foregoing headline, taken from a daily paper, does not refer to action taken by the New York State Public Service Commission in connection with the Wall street operations of the New York-Chicago All-Electric Air Line; neither has it any connection with the fattening of stock (or bonds) alleged to have been perpetrated by Mr. Harriman; it is the action of Judge Hazel in the United States Circuit Court in the cases brought by the Government against the Lake Shore & Michigan Southern and the New York, Chicago & St. Louis for violating the law providing that cattle shall be fed and watered and given a rest every 28 hours. The railroads pleaded guilty and were fined $2,000 and $800 respectively. On the next day Judge Hazel imposed fines of $800 on the Grand Trunk, $200 on the Erie, and $200 on the Wabash for violation of the same law.

The United States Gas Machine.

An efficient individual gas plant for factory and shop use is shown herewith. It is designed to use without waste or residuum either crude distillate or gasolene of 58 to 65 deg. specific gravity, yielding a high degree of heat under any pressure desired. The gasolene is stored in a tank of 100 to 500 gals. capacity buried in the ground, and is pumped to the small tank shown in the illustration. The pump is automatic, permitting only 2 qts. of gasolene inside the building at one time. Exhaust steam is used in vaporizing the fluid and a perfect bunsen flame is delivered by the burners without the use of air mixers on them. The machines are made in sizes capable of supplying 250 to 2,000 ft. of gas an hour. They have been approved by the National Board of Insurance Underwriters.

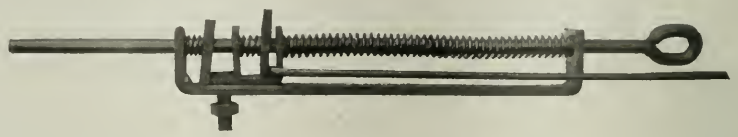


United States Gas Machine.

The plant may be installed in any building, or on a car for portability, and delivers gas at any pressure desired through a single line of pipe or hose. Three machines of the type shown are in use at the Hicks Locomotive & Car Works, Chicago Heights, Ill., with satisfactory results. Three locomotive tires can be expanded and removed in four minutes without disturbing wheels or trucks. Welding and forging are also done more quickly and cheaper than by methods previously used. The machines are made by the United States Gas Machine Co., Muskegon, Mich., successor to the Garland-Vila Manufacturing Co., and have been perfected within the past two years.

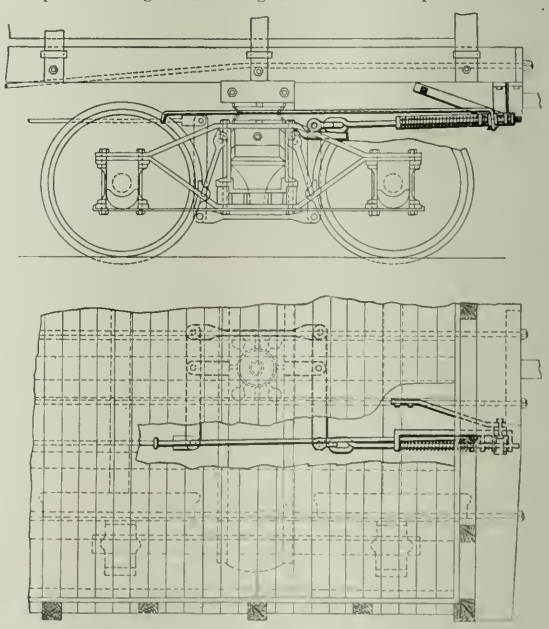
The Atlas Slack Adjuster.

The Atlas slack adjuster, shown in the accompanying engravings, is designed to be positive in action, simply made of few parts, easily maintained and of low first cost. It works on an entirely different principle from most of the slack adjusters now in use, one adjuster being attached to the car body near each end and connected by a take-up rod with the free end of the truck dead lever. This take-up rod passes through a single holding clutch composed of a perforated case-hardened steel dog, fulcrumed on the head of a bolt and automatically forcing the take-up rod through this clutch as the brake shoes wear down, so as to take up slack and shorten up the connection to the dead lever. This take-up operation is accomplished by a second friction clutch sliding on the take-up rod, and



The Atlas Slack Adjuster.

normally held in one position by a strong spring. This take-up clutch has a lost motion connection through a reach rod to the live lever or top rod. When the live lever moves beyond a predetermined maximum distance at any brake application it exceeds the limits of lost motion in the reach rod connection and pulls the take-up clutch along the take-up rod, compressing the spring. When brakes are released, the spring expands and the take-up clutch, gripping the take-up rod, is carried back to its original position, forcing the take-up rod through the holding clutch to a new position of adjustment. The holding clutch holds the rod and the connected dead lever in this new position, which is the correct one to preserve the standard brake-shoe clearance and piston travel, until the shoes wear down more, when the adjuster again comes into action to take up the slack.



Application of Atlas Slack Adjuster to Pennsylvania Railroad Stock Car.

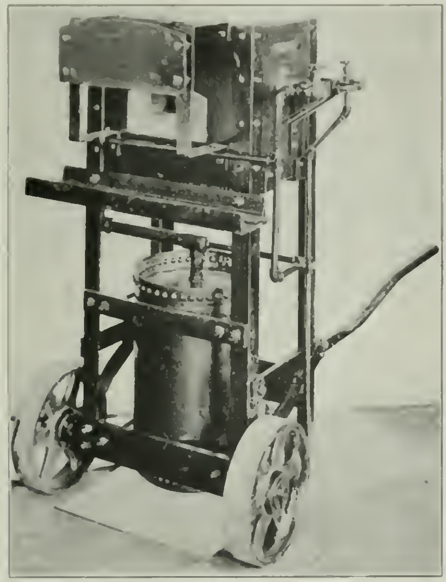
The principal advantages claimed for the device over other types of ratchet adjusters attached to the piston rod or brake cylinder are: It takes up slack on the truck where the slack appears without disturbing any other part of the brake rigging. It maintains running piston and hand brake travel at the adjustment made when the car is standing still. Exactly the right amount of slack is taken up, whether large or small, whereas ratchet adjusters do not take up until an excess of travel equal to more than one tooth is reached. The truck brake-levers "float," and there is no tendency to twist the truck out of square when brakes are applied, due to the eccentric pull of the top rod, amounting to

4,000 lbs. or more with a lever arm of 20 in. from the center pin. The pull of the top rod is taken back to the car body with the Atlas slack adjuster. New brake shoes may be applied without adjusting piston travel, the proper adjustment being automatically attained with the first brake application. It maintains an efficient hand brake at all times and also maintains more uniform braking pressure throughout a train of cars equipped with it, because the piston travel and cylinder pressures are more nearly equalized.

The device is the invention of W. H. Sauvage and is sold by the Sauvage Safety Brake Co., sole licensees, 20 Broad street, New York.

A New Portable Oil Furnace.

A new style of portable oil furnace for heating rivets is shown herewith. It was produced in response to a demand for a small oil furnace which was really portable. It can be wheeled about easily by one man and quickly attached to the shop compressed air line at any point. Also it can be run out of doors to any part of the steel car repair yard, where compressed air is available, and made ready at once for rivet work. It takes up little floor space,



A New Portable Oil Furnace.

and can be put in such places as the top of a locomotive tender, thus bringing it right to the work. It is mounted on three wheels, one of which is swiveled, making it easy to handle. Two handles are provided for use where it is to be rolled some distance; ordinarily one man can move it about, much like a wheelbarrow. The weight is so distributed that in the trucking position none is carried by the operator, the load being balanced on the axle.

The furnace is designed so that the lining may be renewed easily. Standard shapes of brick are used and the furnace dimensions are such that any standard fire brick will fit into place without chipping; therefore no special tiles have to be carried in stock.

Deflector plates are placed across the front of the furnace to protect the operator from the heat. Also the door is placed at a convenient height above the floor. The burner is designed to economize in both air and oil; also that the combustion will be practically noiseless, thus doing away with an annoying feature of high-pressure burners. With the tank full of oil, which is one day's supply, the furnace weighs about 400 lbs. It is made by The Railway Materials Co., Chicago.

New Haven Stockholders.

According to a recent statement, the New York, New Haven & Hartford Railroad, on May 1 last, had 14,220 stockholders. Of this number 14,000 stockholders own less than 400 shares each, while 84 have 1,000 shares and over. The largest individual holder is the New England Navigation Co., with 55,558 shares. The directors of the company own approximately 15,589 shares, the largest holder being J. P. Morgan, with 5,077 shares.

Exports of Locomotives.

The foreign demand for American made locomotives continues to increase. During the seven months of the current year up to July 31 the exports of them were valued at $4,813,418 compared with $3,024,491 for a similar period of 1906, and $2,486,281 in 1905. The following table shows the distribution of these exports:

Exports to	1907	1906
Europe	[illegible]	$6,[illegible]
British North America	1,184,100	[illegible]
Cent. Am. and Brit. Honduras	[illegible]	[illegible]
Mexico	[illegible]	[illegible]
Cuba	270,795	154,061
Other West Indies and Bermuda	[illegible]	[illegible]
Argentina	100,766	172,165
Brazil	529,106	[illegible]
Other South America	516,330	482,856
China	5,925	[illegible]
British Australasia	[illegible]	[illegible]
Philippines	[illegible]	
Other Asia and Oceania	291,354	106,500
Total	$4,813,418	$3,024,491

The average price paid was slightly over $9,000. The shipments to British North America show the largest gain. The equipment exports to this section of North America have been particularly heavy in the last few years due to the railroad development there. But the greater part of the movement is over for a time at least. This is shown by the steel rail exports, which have fallen off considerably. Naturally, locomotives would be the last to show this decline, for the rolling stock would be the last cared for and the requirements of the Canadian West are not yet quite satisfied in this respect. The Far East, especially Japan, has been making increased demands on American manufacturers. The railroad development of Central and South America has been steady throughout this period.—*Wall Street Journal.*

174 Hours from London to Milwaukee.

According to a Milwaukee paper some passengers arrived in that city at 11 a.m., August 23d, in exactly one week from London; or, allowing for the difference of six hours in time, in 174 hours. The party left London on Friday, August 16th at 11 a.m., going by way of Southampton and across the Channel to Cherbourg, whence they sailed at 6 p.m. on the "Deutschland" for New York. The time to New York harbor was 5 days, 18 hours. Landed at Hoboken on the 22d at 3.04 p.m.; carriage to Jersey City; left Jersey City by Pennsylvania Railroad, 4.14 p.m.; arrived Chicago 8.55 a.m. on the 23d (Union Station of the Pennsylvania and the Chicago, Milwaukee & St. Paul); left Chicago by the C., M. & St. P. 9 a.m.; arrived Milwaukee 11 a.m.

TRADE CATALOGUES.

Electric Motors.—The Sprague Electric Company, New York, has published three bulletins devoted to electric motors for driving machinery. Bulletin No. 229 goes into the advantages of motor drive for printing shops and illustrates and describes motors and auxiliary equipment suitable for this work. It gives a list of plants of this kind equipped with the company's motors. Bulletin No. 230 describes the electric equipment of the plant of the W. Wesel Manufacturing Company at Brooklyn, N. Y. It has two d.c. Sprague generators and 192 round-type motors. The numerous illustrations show the application of the motors to different tools. Bulletin No. 231 describes Sprague motor equipment for linotype machines. Bulletin No. 108 takes up the Sprague dynamometer for testing gasolene engines.

Injectors.—The Hayden & Derby Manufacturing Company, New York, has published a catalogue devoted to Metropolitan injectors, H-D attachments, H-D noiseless water heaters, strainers and drip funnels and Hancock swing check valves. The catalogue is unusually full. It gives all the dimensions and capacities as well as prices of the different sizes and types of injectors and directions for connecting and operating them, including suggested remedies for difficulties. Similar information is given for the other specialties described. The catalogue is fully illustrated with half-tones and line drawings.

Electric Heating Devices.—Catalogue No. 4523 of the General Electric Company, Schenectady, N. Y., describes some interesting heating and cooking devices for marine use. These include stateroom heaters, water heaters, cooking and laundering utensils, soldering irons, etc. The two forms of heating units used are illustrated and described.

Data for Reinforced Concrete Design.—The Trussed Concrete Steel Co., Detroit, Mich., has prepared a limited edition of a handbook of tables and information for use in designing reinforced concrete structures. The preface states that the data given represents a large amount of careful and exhaustive work by the engineers

compiling it, and is based on extensive experience in the design and construction of work of this character. The book, which is 4¾ in. x 7⅝ in., contains 106 pages and an index and is carefully illustrated. It bears the title, "Kahn System Standards."

Valves.—Catalogue No. 9 of the Golden-Anderson Valve Specialty Company, Pittsburgh, Pa., describes and illustrates Anderson cushioned non-return valves of different types and sizes; Anderson reducing valves; "clean seat" valves, blow-offs and check and hand stop valves; also Golden tilting steam traps and Anderson counterbalanced valves and other specialties.

Graphite.—The September number of *Graphite*, published by the Joseph Dixon Crucible Company, Jersey City, N. J. contains the first instalment of an article on power transmission by manila fibre rope. The article takes up the advantages of this form of transmission as compared with belt drive and other methods.

Car Heating.—The Gold Car Heating & Lighting Company, New York, has published a pamphlet describing its temperature regulator. The workings and advantages of this device are fully described and illustrated by line drawings.

Wheel-Truing Brake Shoes.—A circular being distributed by the Wheel-Truing Brake Shoe Co., Detroit, Mich., is in the shape of a disk of cardboard, on which is concisely set forth the advantages of the wheel-truing shoe.

MANUFACTURING AND BUSINESS.

The Commonwealth Steel Company, St. Louis, Mo., has moved into its new offices on the sixteenth floor of the Pierce building.

The American Car & Foundry Company, New York, shipped 10,347 cars during August, the largest number ever shipped by the company in any one month.

The Railway Equipment Corporation, Philadelphia, Pa., has declared the regular monthly dividend of 1½ per cent. on its $1,375,000 capital stock and an extra dividend of 3 per cent.

The Schoen Steel Wheel Company, Pittsburgh, Pa., is said to be preparing plans for an open hearth steel plant and finishing and blooming mill, to cost about $1,500,000, at McKees Rocks, Pa.

W. T. Clark, Assistant Mechanical Superintendent of the General Electric Company, Schenectady, N. Y., has resigned to become Superintendent at Beloit, Wis., of Fairbanks, Morse & Co., Chicago.

Theodore H. Bailey, Assistant General Manager of the General Electric Company, Schenectady, N. Y., has gone to the St. Louis Car Company, St. Louis, Mo., to take charge of the automobile department of that company.

At the annual meeting of the stockholders of the Westinghouse Air-Brake Company, Pittsburgh, Pa., on October 1, action is to be taken on the proposed increase of the capital stock from $11,000,000 to $14,000,000.

We are informed that the Railway Steel-Spring Co., New York, has decided to build in the neighborhood of Chicago one of the largest and best equipped spring works in the country. The company has not yet decided on the exact location.

H. N. Pendleton, Superintendent of the Republic Iron Works, Pittsburgh, Pa., of the National Tube Co., Pittsburgh, has been appointed Superintendent of the National Rolling Mills of the same company at McKeesport, Pa., succeeding J. B. Ayres, resigned.

The fire at the works of the Falls Hollow Staybolt Co., Cuyahoga Falls, Ohio, on September 13, which destroyed the greater part of the building of the rolling mill, did not do any great damage to the principal machinery. The company expected to be able to fill all orders as usual within a few days.

C. Dickens Sternfels, for the past three years in charge of the Publicity Department of the Arthur Koppel Company, Pittsburgh, Pa., has resigned to assume charge of the Publicity Department of the Standard Roller Bearing Company, Philadelphia, Pa. He has been succeeded in the Arthur Koppel Company by John T. Cawley.

Contracts are reported let for the electrical equipment of the Fruitvale, Cal., power house to be built by the Southern Pacific as follows: Boilers, Parker Boiler Co. of Philadelphia; condensers and steam auxiliaries, H. R. Worthington; turbines and generators, Westinghouse Machine Co.; and for motors and other car equipment, General Electric Co.

Charles H. Merz, of London, a highly distinguished electrical engineer who has had charge of the most important railroad electrifications in Great Britain, is in New York at the Holland House, for about 10 days to September 30, when he will continue his journey to Australia. He has been commissioned by Thomas Tait, Chief Commissioner of the Victorian Government Railways, to investigate and report on the possible electrification of Melbourne's suburban lines, where the traffic is greatly congested.

Iron and Steel.

About 23,000 tons of steel will be required for two proposed bridges to be put up at St. Louis, Mo.

The Carnegie Steel Company is said to have recent orders for 60,000 tons of rails for delivery in 1908.

The Delaware & Hudson has ordered 500 tons of steel bridge material from the American Bridge Co.

Contracts will shortly be given for steel for bridges to be built at Philadelphia, as described under Railroad Structures.

The New York Central, the Chicago, Milwaukee & St. Paul and the Erie, it is understood, are in the market for a large amount of steel for bridges, for which contracts will be let shortly.

It is authoritatively stated that the Baltimore & Ohio has not given an order for rails, but has a 60-day option from the United States Steel Corporation, under which the road can give its orders this fall.

Recent quotations for pig iron, billets and iron and steel products as compared with those of the corresponding date of last year are as follows:

	1907.	1906.
Foundry No. 2, Cincinnati	$21.25	$18.75
Bessemer, Pittsburg	22.90	19.60
Bessemer billets, Pittsburg	29.50	28.00
Forging billets, Pittsburg	33.00	34.00
Open hearth billets, Philadelphia	31.00	30.50
Wire rods, Pittsburg	36.00	34.00
Rails, East	28.00	28.00
Iron bars, Pittsburg	1.70	1.60
Steel bars, Pittsburg	1.60	1.50
Tank plates, Pittsburg	1.70	1.60
Beams, Pittsburg	1.70	1.70
Angles, Pittsburg	1.70	1.70
Sheets, Pittsburg	2.50	2.40

OBITUARY NOTICES.

George A. Ingersoll, formerly Secretary and Treasurer of the Cleveland & Pittsburgh, died last week, after an operation, at the age of 80 years.

Ferman J. Stout, General Manager of the Lake Shore Electric, died at Toledo, Ohio, on September 14, after a short illness. Mr. Stout was born in 1858 at Deerfield, Mich., and began railroad work in 1873 as a brakeman on the Lake Shore & Michigan Southern. After serving successively as freight conductor, passenger conductor, car distributor and Trainmaster, he was, in 1891, made general yardmaster at Toledo, Ohio. In 1893 he was appointed Superintendent of Transportation of the Lake Erie & Western and of the Toledo Belt. He was made General Superintendent of these roads in 1895, and in 1900 left steam railroad work to become General Manager of the Toledo, Fremont & Norwalk Electric, being later appointed to the position he held at the time of his death.

M. Dewitt Woodford, formerly President of the Cincinnati, Hamilton & Dayton, died a few days ago at Kalamazoo, Mich. Mr. Woodford was born in 1838 at Fredonia, N. Y., and began railroad work in 1853 as a telegraph operator on the Erie. After a few years he went to the Michigan Central, where he served for five years as chief train despatcher and then was made also Superintendent of Telegraph. In 1872 he went to the Great Western of Canada, now part of the Grand Trunk, as Assistant General Superintendent. Three years later he returned to this country as Assistant Treasurer of the Chicago & Michigan Lake Shore, now part of the Pere Marquette. The next year he was made Superintendent of the United States division of the Canada Southern, and in 1880 was appointed General Superintendent of the Fort Wayne & Jackson, now part of the Lake Shore. The next year he was also General Manager of the Toledo, Ann Arbor & Grand Trunk, now part of the Ann Arbor, and in 1882 resigned from both positions to go to the Wheeling & Lake Erie as General Superintendent. He was made Vice-President and General Manager of this road in 1883, and was Receiver of the property from 1884 to 1886; he was then given his former title, and in 1889 was made President and General Manager. During part of his early years of service on the Wheeling & Lake Erie, he was also General Superintendent of the Cleveland & Marietta, and later Vice-President and General Manager of that road and General Manager of the Toledo Belt. In 1899 he was made Vice-President and General Manager of the Cincinnati, Hamilton & Dayton, of which he was elected President in 1890. From 1893 to 1899 he was also President of the Cleveland, Loraln & Wheeling. He resigned from the Cincinnati, Hamilton & Dayton in 1904.

MEETINGS AND ANNOUNCEMENTS.

[illegible]

Engineers' Club of Philadelphia.

At a meeting of this club to be held September 20, a paper is to be presented with the title "A Recent Visit to the Quebec Bridge," illustrated with lantern slides, by Silas G. Comfort.

Street Railway Association.

At the meeting of the American Street and Interurban Railway Association to be held on the steel pier at Atlantic City, N. J., October 14-18, papers will be presented as follows:

"Technically Trained Men and the Electric Railway Profession," by Prof. H. H. Norris, Cornell University.

"National Fire Protection Association," by Ralph Sweetland, Boston.

"Influence of Design of Structures on Economy of Operation," by H. L. Crampton and William McClellan, New York.

"Package Express Business," by P. P. Crafts, Clinton, Iowa.

"Freight Interchange with Steam Railroads," by H. H. Polk, Des Moines, Iowa.

"A Department of Publicity," by J. Harvey White, Boston, Mass.

"Advertising," by A. W. Warnock, Minneapolis.

"Problems of a Small Road," by H. S. Cooper, Galveston.

"Use of Tee Rail in Cities," by C. Gordon Reel, Kingston, N. Y.

"Public Policies of the Past and Future," by C. Loomis Allen, Utica.

"Interurban Fares," by Theodore Stebbins, New York.

There will also be a discussion on the "Reduced Fare Agitation," and on "Depreciation from the Financial and Managerial Standpoints."

There will also be interesting papers and reports at the meetings to be held the same week of the American Street and Interurban Railway Accountants' Association, which meets in the Chalfonte Hotel; at the American Street and Interurban Railway Engineering Association, which meets on the steel pier, and at the American Street and Interurban Railway Claim Agents' Association in the St. Charles Hotel.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Intercolonial.—Hon. George P. Graham has been appointed Minister of Railways and Canals.

New Jersey Railroad Commission.—The members of this commission are: Joseph W. Congdon, President, Edmond Wilson and Borden D. Whiting. James Maybury, Jr., is Acting Secretary.

Rhode Island Railroad Commission.—Joseph P. Burlingame, Providence, is Railroad Commissioner. David J. White, Pawtucket, is Deputy Railroad Commissioner.

Operating Officers.

Chicago, Rock Island & Pacific.—W. M. Whitenton, Superintendent at Trenton, Mo., has been appointed General Superintendent of the Choctaw district, with office at Little Rock, Ark., succeeding H. M. Hallock, resigned.

Great Northern.—S. A. Walker, Assistant Superintendent of the Montana division, has been appointed Superintendent of that division, with office at Havre, Mont., succeeding J. McNaught, resigned. F. E. Gerrish succeeds Mr. Walker, with office at Havre. F. S. Elliott, Assistant Superintendent of the Kalispell division, has been appointed Assistant Superintendent of the Spokane division, with office at Spokane, Wash., succeeding W. Willerton, resigned. W. R. Smith, Assistant Superintendent of the Spokane Falls & Northern, succeeds Mr. Elliott, with office at Whitefish, Mont. J. M. Doyle succeeds Mr. Smith, with office at Spokane.

Louisiana Western.—C. F. Davis has been appointed Trainmaster of Terminals at Lake Charles, La.

Missouri, Kansas & Texas of Texas.—George Stoner, Trainmaster at Denison, Tex., has been appointed Acting Superintendent at Greenville, Tex., during R. J. Sullivan's leave of absence on account of ill health.

New York Central & Hudson River.—I. H. McEwen has been appointed Assistant Superintendent of the Mohawk division.

St. Louis & San Francisco.—J. H. Jackson, Trainmaster at Newburg, Mo., has been appointed Trainmaster at Springfield, Mo., succeeding J. A. Frates, promoted. F. G. Faulkner, chief train despatcher, succeeds Mr. Jackson.

Robert Sidell has been appointed Trainmaster at Sherman, Tex.

Wabash.—A. F. Heim, Trainmaster at Decatur, Ill., has been appointed Trainmaster of the Ninth and Thirteenth districts, with office at Decatur, succeeding C. F. Handshey, resigned to go to another company. Arthur K[illegible] succeeds Mr. Heim as Trainmaster of the Sixth, Seventh and Eighth districts.

Traffic Officers.

Buffalo & Susquehanna.—See New Orleans Great Northern.

Chicago Great Western.—J. H. Sayl[illegible] has been appointed General Agent at Milwaukee, Wis., succeeding W. H. Lord, resigned to go into other business. C. J. Longw[illegible]am has been appointed General Agent at Duluth, Minn., succeeding C. D. Thompson, resigned to go into other business.

Colorado Midland.—Morel[illegible] Law, General Agent at Kansas City, Mo., has resigned to go to another company.

New Orleans Great Northern.—Edward A. Niel, Traffic Manager of the Buffalo & Susquehanna, has been appointed also Traffic Manager of the New Orleans Great Northern. G. B. Auburtin has been appointed Assistant General Freight and Passenger Agent, with office at New Orleans, La.

Northern Central.—See Pennsylvania.

Pennsylvania.—George D. Dixon, Freight Traffic Manager, has been appointed to the new office of General Traffic Manager. George D. Ogden, Assistant General Freight Agent, has been appointed General Freight Agent. G. H. Cobb, division freight agent of the Northern Central at Baltimore, Md., succeeds Mr. Ogden. The offices of all are at Philadelphia, Pa.

Tampa Northern.—J. H. McWilliams, formerly Traffic Manager of the Georgia, Florida & Alabama, has been appointed General Freight and Passenger Agent of the Tampa Northern, with office at Tampa, Fla.

Engineering and Rolling Stock Officers.

Atchison, Topeka & Santa Fe.—T. E. Layden, Assistant Engineer of Tests, with office at San Bernardino, Cal., has been appointed Engineer of Tests, with office at Topeka, Kan., succeeding F. W. Thomas, transferred.

Baltimore & Ohio.—S. A. Jordan, Division Engineer of the Cleveland division, with office at Cleveland, Ohio, has been appointed Division Engineer of the Philadelphia division, succeeding A. A. Miller, resigned to go to another company. E. V. Smith, Assistant Division Engineer at Cleveland, succeeds Mr. Jordan. J. B. Myers, Division Engineer of the Shenandoah division, has been appointed Division Engineer of the Cumberland division, with office at Cumberland, Md., succeeding J. R. Leighty, resigned to go to another company. P. H. Petri, Assistant Division Engineer at Newark, Ohio, succeeds Mr. Myers.

Central of Georgia.—R. L. Doolittle has been appointed Assistant Master Mechanic at Macon, Ga.

Chicago & Alton.—W. E. Emery, roadmaster of the Chicago & North-Western at West Chicago, Ill., has been appointed Engineer of Maintenance of Way of the Western division of the Chicago & Alton, with headquarters at Kansas City, Mo., succeeding C. G. Delo, promoted.

Chicago, Lake Shore & Eastern.—M. S. Monroe, general foreman of locomotive repairs, has been appointed to the new office of Master Mechanic, with headquarters at Joliet, Ill., and his former position has been abolished.

Denver & Rio Grande.—See Rio Grande Western.

Illinois Southern.—Thomas Yeager has been appointed Master Mechanic, with office at Sparta, Ill., succeeding M. W. Fitzgerald, assigned to other duties.

Mexican Central.—R. D. Gibbons, Master Mechanic at Monterey, has been appointed Master Mechanic at Aguascalientes, succeeding J. M. Fulton, resigned to go to the El Paso & Southwestern. J. A. Lewis succeeds Mr. Gibbons.

Mobile, Jackson & Kansas City.—B. H. Gray, Master Mechanic of the New Oreans Terminal, has been appointed Superintendent of Motive Power of the Mobile, Jackson & Kansas City, with office at Mobile, Ala.

New Orleans Terminal.—See Mobile, Jackson & Kansas City.

Oregon Short Line.—See Union Pacific.

Pere Marquette.—J. F. Deimling, formerly Chief Engineer, has been reappointed to that office, succeeding E. K. Woodward, resigned.

Rio Grande Western.—A. H. Gairns, Master Mechanic of the Denver & Rio Grande at Denver, Colo., has been appointed Master Mechanic of the Rio Grande Western at Salt Lake City, Utah, succeeding E. G. Haskins, transferred.

Union Pacific.—H. J. Harris has been appointed Division Engineer of the Utah division and the Wyoming district of this road and of the Oregon Short Line, with office at Salt Lake City, Utah, succeeding R. B. Robinson, resigned.

Wabash.—H. C. Ettinger has been appointed Master Mechanic of the

Decatur and Springfield divisions, with office at Springfield, Ill., succeeding E. F. Needham, promoted.

LOCOMOTIVE BUILDING.

The Harriman Lines have ordered 125 locomotives from the American Locomotive Company.

The Morristown & Erie has ordered one consolidation locomotive from the American Locomotive Company.

The Chekiang Railroad, China, has ordered four mogul locomotives from the American Locomotive Company.

The Hanyang Iron Company, China, has ordered an additional four-wheel locomotive from the American Locomotive Company.

The Northwestern Pacific, as reported in the *Railroad Gazette* of August 30, has ordered four 10-wheel and two eight-wheel locomotives from the American Locomotive Company.

CAR BUILDING.

The New York Central Lines are understood to be figuring on 15,000 cars.

The Baltimore & Ohio, it is said, will soon be in the market for 5,000 steel cars.

The St. Louis Southwestern has ordered 15 tank cars of 80,000 lbs. capacity from the American Car & Foundry Co.

The Grand Trunk, as reported in the *Railroad Gazette* of September 6, has ordered 25 coaches from the Pullman Company.

The Emlenton Refining Company, Emlenton, Pa., is said to have ordered 20 steel tank cars from the Pressed Steel Car Company.

The Carnegie Steel Company, it is said, has ordered nine gondola cars and five flat cars from the Pressed Steel Car Company.

The San Antonio & Aransas Pass, as reported in the *Railroad Gazette* of July 26, has ordered 10 coaches from the Pullman Company.

The Brooklyn Rapid Transit is in the market for 200 cars. They will be like those ordered last spring, the specifications for which were published in the *Railroad Gazette* of March 29.

The Standard Oil Company, it is said, has ordered 500 steel tank cars of 80,000 lbs. capacity. The order is divided among the Standard Steel Car Company, the Pressed Steel Car Company and the American Car & Foundry Company.

The Boston & Maine, as reported in the *Railroad Gazette* of August 30, has ordered 1,000 box cars of 80,000 lbs. capacity from the Pressed Steel Car Company for December, 1907, delivery. These cars will weigh 39,000 lbs. and will measure 36 ft. long, 8 ft. 6 in. wide and 8 ft. ½ in. high, inside measurements. Bodies will be of wood and underframes of metal. The special equipment includes:

Bolsters	Pressed steel
Brake-beams	I-beam, 15-lb. section
Brake-shoes	Steel back, Am. Brake-Shoe & Foundry Co.
Brakes	Westinghouse
Couplers	Gould (steel)
Doors	Security
Drsft rigging	Miner on 500 cars; Westinghouse friction on 250 cars; Gould friction on 250 cars
Dust guards	Flexible
Journal boxes	Symington on 500 cars; Franklin on 500 cars
Paint	B. & M. standard
Roofs	Murphy
Springs	Coil, M. C. B. standard
Trucks	Fox pedestal

RAILROAD STRUCTURES.

Buffalo, N. Y.—Local reports say that the New York Central will enlarge the waiting room at the Exchange street station, and construct subways for passenger travel, to replace the overhead bridges.

Caldwell, Idaho.—The San Francisco, Idaho & Montana will ask bids this month for a 750-ft. bridge over the Snake river. F. H. Richardson, Chief Engineer, Caldwell.

Defiance, Ohio.—Negotiations are pending between the Indiana, Columbus & Eastern Traction Company and the Defiance County Commissioners to put up a new concrete bridge 80 ft. wide consisting of four spans to replace the steel bridge over the Auglaize river, which the traction company claims is not strong enough to carry its cars.

Ensley, Ala.—The Atlanta, Birmingham & Atlantic, it is said, has bought a large plot of ground near this place as a site for yards.

Fort William, Ont.—The Canadian Pacific, it is said, intends erecting a great dock, six new freight sheds, a large cleaning elevator and other necessary accommodations to build up a great shipping trade on the lakes.

Contracts are reported let to Wylie & Balfour for masonry work, and to the Canadian Bridge Co. for the steel superstructure of a bridge to be built over the Kaministiquia river for the Grand Trunk Pacific.

Mobile, Ala.—The Mobile & Ohio has decided to spend $200,000 for wharves and improvement of dock facilities.

Philadelphia, Pa.—Bids are in for four bridges, one over the Pennsylvania tracks at Belmont and Girard avenues to cost $85,000, of which the city is to pay $65,000 and the railroad $20,000; another at Thirty-first street and Columbia avenue over the Pennsylvania tracks to cost $54,000, of which the railroad is to pay $36,600; and two along the Torresdale boulevard; one over the Newton branch of the Philadelphia & Reading, and the other over Tacony creek.

Springfield, Ill.—The Illinois Traction Company has leased the ground now occupied by the Springfield Consolidated Railway Company's car barns. Large barns and a passenger station are to be built on the site.

Washington, D. C.—The Baltimore & Ohio expects to occupy the new union station October 1.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

Alaska Home (Electric).—Organized with a capital of $200,000 to build an electric line from Valdez, Alaska, north into the copper country, about 180 miles. Work, it is said, is now under way, and it is expected to finish the first 34 miles this year. Henry D. Reynolds, of Valdez and of Seattle, Wash., is interested.

Arkansas, Louisiana & Gulf.—This company, projected from Pine Bluff, Ark., south to Monroe, La., 133 miles, for which grading contracts were let this spring, will begin track-laying about the first of next month, it is said. (July 5, p. 27.)

Atlanta, Birmingham & Atlantic.—According to a statement of an official of this road, the Alabama division has been extended from Roanoke, Ala., west to Wadley, 13 miles, and this section is now open for traffic.

Bainbridge Northeastern.—This company, incorporated in Georgia with a capital of $200,000 is said to have started work on a line from Bainbridge, in Decatur county, northeast to Pelham, in Mitchell county, 35 miles. The company also proposes eventually to build through the counties of Thomas and Grady in Georgia, and through Florida to a point on the Gulf coast. Incorporators include: E. Swindell, E. J. Willis, R. O. Allen, L. H. Tonge and B. B. Lane, all of Bainbridge, Ga. G. W. Saxon, of Tallahassee, Fla.; M. P. Flinn, of Chattanooga, Tenn., and L. E. Gellersstedt, of Troy, Ala.

Boston & Providence Interurban.—The Massachusetts Railroad Commission recommends that a certificate of public exigencies to build railroads be issued to this company. The applications for certificates of the New York & Boston, the Boston, Lowell & Lawrence and the Boston & Eastern have been denied.

Brooklyn Rapid Transit.—Vice-President T. S. Williams announces that plans are about finished for the Flatbush avenue extension to the Manhattan bridge. This work, including third and fourth tracking of other lines, is to cost $8,600,000. Permission to build the extension will be asked for at once. About $600,000 is to be spent to re-enforce the elevated structure, and $400,000 to finish the Brighton Beach line.

Canadian Pacific.—The report of this company for the year ending June 30, 1907, gives the total length of all lines as 10,239 miles, including 823 miles under construction. An agreement has been made with the Northern Colonization Railway Company to build an extension of this road from Nominingue, Que., west to Rapide de L'Original, in Wright district, 34 miles, and to take a lease of it; also with the St. Mary's & Western Ontario to lease that company's line on its completion from St. Marys, Ont., to a connection near the village of Embro, with the proposed extension of the Tilsonburg, Lake Erie & Pacific Railway, about 15.25 miles. The work authorized in 1904 to build a line from Sudbury, Ont., south to Bolton, 226 miles, to provide a route between Toronto and the main line is to be opened for freight traffic this year. The company has authorized a branch from Moose Jaw, Sask., on the main line, northwest 50 miles, and it is probable that this branch will be extended an additional 100 miles; another branch is to be built from Regina, Sask., on the main line to a point near Saskatoon, 165 miles.

Considerable progress has been made with the work west of Lake Superior, where 747 miles are under construction; two-thirds of the grading has been finished and 270 miles of track laid; rails and fastenings for the balance are on hand. It is expected that about 200 miles of the double-track work between Winnipeg, Man., and Fort Williams, Ont., will be ready for use this year, and the entire work finished in 1908. During this year in eastern Canada the Guelph & Goderich branch in Ontario, 80 miles, was finished and is now in operation. About 20 miles of grading on the Walker-

ton & Lucknow Railway, which is to be 38 miles long, has been finished. It is expected that 50 miles of the second track that is being laid will be ready for operation between Ste. Anne and Smith Falls, and the rest of the 108 miles is to be finished in 1908.

CENTRAL OF GEORGIA.—The company during the year ending June 30, 1907, added to its road new side and spur tracks aggregating 51.05 miles, and the length of side and spur tracks is reduced 3.5 miles by remeasurement or by abandonment. The company also during the year made improvements to its yards at Albany, Athens and Savannah, Ga., and similar work is now under way at Industry, Macon and Columbus, also on new passing tracks on the Atlanta division, including a new yard at Griffin. Steel bridges were put in, including one over the Tallapoosa river consisting of five deck truss spans each 150 ft. long, one over the Coosa river with three spans each 149½ ft. and one 200 ft. long, of through steel trusses. A bridge was built over the Cahaba river 168 ft. long; and one 55 ft. long over White Sulphur Springs creek is yet to be erected. The company laid new 70-lb. rails on 9.64 miles and 80-lb. rails on 95.25 miles.

CHICAGO, MILWAUKEE & ST. PAUL.—The report of this company for the year ending June 30, 1907, shows that the second track on the La Crosse division from Watertown Junction, Wis., north to Portage, about 45 miles, has been finished. Similar work is under way on the River division from River Junction, Minn., north to Richmond, 10 miles; and from Lake City, Minn., south to Wabasha, 12½ miles. Work is also under way at various points revising the grades and improving the alinement. President A. J. Earling announces that the companies, which were organized under the laws of South Dakota, Montana, Idaho and Washington, are now building the line from the Missouri river in South Dakota west to Seattle and Tacoma. Money has been advanced by the C., M. & St. P. to aid these companies, and work is progressing satisfactorily. It is expected to have the entire line to the Pacific coast finished during 1909.

COWETA, FRANKLIN & TROUP.—Incorporated in Georgia with $300,000 capital to build about 50 miles of railroad from a point either on the Central of Georgia or the Atlanta & West Point, in Cowet county, west via Franklin to a point on the Atlanta, Birmingham & Atlantic, in Heard county. The incorporators include: T. C. Lane, J. W. Daniel, R. M. Litford, R. G. Grain, F. S. Loftin, J. W. Ray and D. B. Whitaker, of Franklin; J. E. Dunson, of La Grange; W. C. Wright and W. H. Brannon, of Newnan.

DANVILLE & SOUTHEASTERN.—See Illinois Traction.

DENVER & GULF.—This company, incorporated in Oklahoma last spring to build a line from Denver, Colo., southeast to Snyder, Okla., 500 miles, has let contracts, it is said, for building 100 miles from Texhoma, Okla., north towards Denver. (May 10, p. 663.)

DENVER, NORTHWESTERN & PACIFIC.—This road is now in operation from Denver, Colo., west to Kremmling, 126 miles. According to a reported statement of President D. H. Moffat, work is to be pushed to completion. Contracts have been let for extending the line west to Steamboat Springs, and work is under way on a tunnel through the mountain. The extension is to run west to Salt Lake City. (March 15, p. 383.)

ELKINS LIGHT & POWER COMPANY (ELECTRIC).—Incorporated in West Virginia to build a north and south electric line in that state through Taylor, Barbour and Randolph counties, touching the cities of Grafton and Elkins. The cost of the proposed line is said to be about $1,000,000. The incorporators include: United States Senator S. B. Elkins, R. O. Kerns and H. G. Davis. The office of the company is to be at Elkins.

ERIE.—A contract is reported let to the Patterson Co., of Pittsburg, Pa., for grading three miles of the Genesee River Railroad. The work involves the excavation of about 1,000,000 cu. yds. (June 21, p. 917.)

FAIRMONT & SOUTHERN.—This company, recently incorporated in Pennsylvania to build a line from Bellington, W. Va., north to Pittsburgh, Pa., 125 miles, is said to have secured all the necessary right of way as well as money to carry out the project. The United States Steel Corporation is said to be back of the project. (Sept. 6, p. 277.)

FINDLAY-MARION RAILWAY & LIGHT COMPANY.—At a recent special meeting of this company, the proposition to sell the right-of-way, franchises and other property of the company was rejected. All the engineering work and other preliminaries have been finished and financial arrangements made to build a 17-mile electric line over a private right-of-way, with easy grades and curves. Construction work is to begin in the spring. G. W. Meeker, Secretary, Columbus, Ohio.

FORT WORTH & RIO GRANDE.—See St. Louis & San Francisco.

ILLINOIS TRACTION.—This company, it is said, controls the Danville & Southeastern, incorporated in Illinois, with a capital of $10,000, and office at Danville. The company proposes to build a line from Danville to a point in the southeastern corner of Georgetown township, Vermilion county. The incorporators include: W. H. Carnahan, G. M. Mann, C. Zelly, H. E. Bramble and C. E. Cox all of Champaign.

JOPLIN & PITTSBURG (ELECTRIC).—An officer writes that the general contract for building an extension of this road has been let to A. L. Register & Co. of Philadelphia, Pa. The road is in operation from Columbus, Kan., north via Scammon, Wier, Chicopee and Pittsburg to Frontenac, 12 miles. One extension is being built from Frontenac north to Curranville, five miles; one from Pittsburg southeast to Joplin, Mo., 25 miles, and another, from Scammon west to Mineral, 5½ miles. About five miles of the extensions have been finished. Maximum grades 1.4 per cent and maximum curves 4 deg. There will be four steel bridges for which contracts are let. Joseph J. Hein, President, Kansas City, Mo., W. W. Calhoon, Vice-President, Carthage, Mo.; J. A. Prescott, Secretary and Treasurer, R. E. Richardson, Chief Engineer, Kansas City, and D. L. Robinson, Assistant Secretary and Treasurer, Buffalo, N. Y.

LEHIGH & LAKE ERIE.—See Lehigh Valley.

LEHIGH VALLEY.—The report of this company for the year ending June 30, 1907, shows that this company operates 1,440.22 miles of railroad, of which 579.14 miles is second track, 56.18 miles three track, and 20.47 miles four-track. There is also 1,067.29 miles of yard tracks and sidings. There was a decrease of 4.74 miles of first track due to the removal of colliery branches, and a change of the old main line at Allentown to third and fourth tracks. During the year 44.65 miles of company's sidings were added, and 5.84 miles of private sidings. About 20,000 tons of new 90-lb. rails were laid. Eleven steel bridges to replace lighter metal structures, and 17 replacing wooden structures and trestles were also added. An additional cold storage building and dock, with machinery at Milwaukee, Wis., was authorized and this work is now under way. The Lehigh & Lake Erie, a 10-mile double-track terminal line in Buffalo, N. Y., is expected to be put in operation this month. The new double-track 1,800-ft. steel bridge over the Susquehanna river and the reduction of grades and change of alinement from Wysox, Pa., to west of Towanda has been put in service. Work is now under way on three new transfer bridges and a freight yard to have a capacity of 1,000 cars at the National Docks at Communipaw to relieve the congestion at the Jersey City terminal. The cost of this improvement will be $350,000.

MILWAUKEE NORTHERN (ELECTRIC).—This company was incorporated in Wisconsin to build an electric line from Milwaukee north via Cedarburg, Grafton and Port Washington to Sheboygan, with a line from Cedarburg northwest via Westbend to Fond du Lac, a total of 100 miles. About 15 miles built. An issue of bonds was recently authorized to pay for the line from Cedarburg to Fond du Lac, also to make other extensions, and for double-tracking work. (Aug. 1, p. 137.)

MISSOURI, KANSAS & TEXAS.—This company during the year ending June 30, 1907, according to its annual report, improved its lines by replacing old rails with new 85-lb. rails on 179 miles of road. The work of reducing grades is being pushed from Atoka, Ind. T., south to the Red river; and clearing and masonry work has been finished on this section. The construction of permanent track has been begun and it is expected to have rails laid this year. From Atoka northeast to McAlester work is under way reducing the grades at Springtown and at Limestone Gap, also north of that place at Crowder. Surveys for grade reduction will soon be finished as far north as Parsons, Kan.

NEW YORK CENTRAL & HUDSON RIVER.—The New York State Public Service Commission (Second district) has ordered the elimination of the Main street crossing at Tuckahoe, on the Harlem division. The cost of this proposed work will be about $130,200; also the crossings at Mount Vernon avenue, Oak street and Fleetwood avenue of the same division in Mount Vernon to cost about $357,000.

NORFOLK & WESTERN.—The report of this company for the year ending June 30, 1907, shows that work was started on an extension of the Tug Fork branch, 2.13 miles up the right fork of Sand Lick, in West Virginia; also an extension above Pageton, 4.03 miles. A short spur track from this branch has been built to the United States Coal & Coke Company's Works. The Dry Fork branch, formerly the Iaeger & Southern, has been extended 1.32 miles. The Superior branch has been built from Davy up Davy creek to the works of the Superior Pocahontas Coal Company, 0.75 miles. An extension of the Honaker branch to Blacks Ford, on Clinch river, is being built 1.12 miles. An agreement has been made with the Lynchburg (Virginia) Belt Line & Connecting Railway Company for trackage rights. The line is expected to be finished this year and will be 22.12 miles long with branches 2.07 miles.

The Big Stony Railway has made improvements to many of its bridges, including the one over New river and to its roadbed. An extension is being built from Interior, Va., to the line between

Giles county, Va., and Monroe county, W. Va., 6.21 miles, where connection is to be made with the Interior & West Virginia Railroad. This latter company is building a line from the proposed connection with the Big Stony through Monroe county, W. Va., to the Craig county, Va., line, 17.55 miles, where connection is to be made with the Virginia & Potts Creek Railroad. The V. & P. C. is building a line from the proposed connection with the Interior & West Virginia through Craig county to Potts creek in Alleghany county, 11.15 miles, on which work is under way as far as Paint Bank, 4.2 miles.

The Pocahontas & Western has track laid for 3.12 miles and began operation in May on 2.90 miles to the Boissevain Works of the Pocahontas Consolidated Collieries. Grading is under way on 3.81 miles from the present end of the track to the Thorn works of the same company. The Guayandotte & Tug River has secured nearly all the right of way for its main line, to be 62.27 miles long, between Clarks Gap, W. Va., and Wharncliffe. It has also located the Barker Creek branch, 10.7 miles long, from the mouth of Pinnacle creek up Guyandotte river, and secured most of the right of way. An extension of this branch has been located to a point on Guyandotte river above the mouth of Slab Fork, 3.03 miles. Branches have also been located as follows: Pinnacle Creek branch, 7.35 miles, and Still Run branch, 3.56 miles.

During the year 67.50 miles of main track were relaid with 85-lb. rails and 10.19 miles of the Winston-Salem district were laid with re-sawed 85-lb. rails. The work authorized and under construction includes second-track between Forest Va., and Montvale, which has been put in operation with the exception of a small section to be finished this year; tunnel work and roadbed for second track west of Vivian, W. Va., 2.7 miles, for which right of way is being secured; similar work east of Welch, W. Va., 1.5 miles, on which grading is under way; second track, including two tunnels from Davy, W. Va., to Claren, three miles; tunnel work and roadbed for second track from Claren to Wilmore, seven miles, on which tunnel work is to be finished next year; second track from Wilmore to Iaeger, 4.1 miles, of which 3.34 is now in operation, the rest to be finished this year; second track work west of Iaeger siding, 2.3 miles; between Devon and the present east end of second track at Lick Fork, 8.3 miles; between East Ironton, Ohio, and Hanging Rock, 5.6 miles, and between Valley crossing and Joyce avenue, Columbus, eight miles, of which 4.69 miles is in operation.

Ohio Roads (Electric).—The Ohio State Board of Public Works recommends that the abandoned tow path of the Hocking canal from Lancaster southeast to Nelsonville, 33 miles, be leased to the Logan & Athens Construction Company. This company agrees to begin work in six months on a railroad over this route.

Peoples Railway Construction Company.—This company, which was recently organized in Texas to build a line from Dallas, Tex., southeast via Canton and Tyler to Leesville, La., about 225 miles, has surveys made from Canton to Tyler, 38 miles, and expects to let contracts for some of the work about the first of next month. (July 26, p. 111.)

Port O'Connor, Rio Grande & Northern.—More than 100 miles of grade on this line has been finished and track-laying will soon begin. The first division to be finished will be from Port O'Connor, Tex., north to Yoakum, 90 miles. The main line is to run from Port O'Connor, on the Gulf, north to San Antonio, 190 miles. Branch lines are to be built from Gonzales north to Smithville, 50 miles; from Yoakum north to La Grange, 61 miles, and from Seguin northwest to New Braunfels, 15 miles. At Port O'Connor, the Gulf terminus of the line, it is planned to lay out a city and to develop it into an important deepwater port. W. S. Hipps & Co., Houston, are the contractors. L. A. Gueringer, Chief Engineer, Victoria. (See Texas Railway, March 15, p. 393.)

Rochester, Scottsville & Caledonia (Electric).—Surveys, it is said, are being made by this company for an electric line from Rochester, N. Y., southwest over a private right of way via Scottsville, Caledonia and Le Roy to Pavilion, from which place branches are to be run to Warsaw, Rockglen, Perry and Glen Iris, a total of about 100 miles. E. Strathy, Chief Engineer, Rochester.

Russellville & Ozark Mountain Traction.—Surveys reported made and rights of way secured for building this proposed electric line from Russellville, Ark., north to Dover, 10½ miles. A. J. Robinson, President, Pine Bluff, Ark.

St. Louis & San Francisco.—Work, it is said, is soon to be started on the proposed extension of the Fort Worth & Rio Grande from Brady, Tex., southeast to San Antonio, 150 miles. (Aug. 16, p. 189.)

Shawnee Central.—This company was incorporated last spring with $10,000,000 to build a line from Muskogee, Ind. T., via Shawnee to Childress, with an 80-mile branch from Shawnee to Tulsa. According to a reported statement of President J. M. Aydelotte, of Shawnee, contracts for building the line, over surveys already made, are to be let at once. Dr. W. S. Woods, of the National Bank of Commerce, Kansas City, Mo., is the chief promoter of the project. (July 12, p. 54.)

Southern Pacific.—Contracts are said to have been given by this company for a power house to be built at Fruitvale, Cal., aggregating between $800,000 and $900,000. This seems to mean that the company has decided to electrify its bay lines. This central station will serve the Oakland, Berkeley, Alameda and Fruitvale lines. The cost of carrying out these plans is in the neighborhood of $2,000,000. The Alameda lines will be the first to be electrified.

Tanana Valley.—An officer writes that this company, which operates a road 26 miles long, is building an extension of about 20 miles. When this work is finished the road will run from Chena, Alaska, to Chatanika, 41 miles, with a branch to Fairbanks, five miles. Ten miles of track has been laid on the extension. The maximum grade is 2.4 per cent. and the maximum curve 20 deg.

Taylor, Somerville & Gulf.—Surveys made and rights of way reported secured by this company for building its proposed line from Taylor, Tex., east to Somerville, 60 miles. (July 19, p. 83.)

Toledo Junction.—Incorporated in Ohio with $100,000 capital to build a line about eight miles long from near Waterville to Acorn. A new station is to be established on the Wabash and the Toledo, St. Louis & Western. C. B. Wagner, H. C. A. Ehlert, E. C. Snyder, M. I. Brown and C. F. Ferron, all or Toledo, are incorporators.

Wheeling & Lake Erie.—The annual report of this company for the year ending June 30, 1907, shows that on the Toledo-Pittsburg division, 4.32 miles of 90-lb. rails were laid from the west end of the Norwalk, Ohio, yard to Huron Junction and at various points between New Cumberland and Leesville. On the Cleveland division 17 miles were also laid with 90-lb. rails between Twinsburg and Middle Branch. On the River division 70-lb. rails were laid on 4.1 miles to replace 56-lb. rails. There were 19 industrial tracks added aggregating about 4.5 miles, eight passing tracks aggregating four miles, and over 23 miles of new yard tracks laid at various points of the line. In addition there were over five miles of loading and team tracks put in at various points.

RAILROAD CORPORATION NEWS.

Aurora, Elgin & Chicago.—An initial quarterly dividend of three-fourths of 1 per cent. on the common stock has been declared, payable October 7.

Chicago, Burlington & Quincy.—The stockholders at the annual meeting on November 6 are to be asked to approve the purchase of the company's leased lines in Nebraska, Kansas, Colorado and Wyoming.

Chicago, Milwaukee & St. Paul.—This company is reported to have bought the Washington, Idaho & Montana, which runs from Palouse, Wash., to Harvard, Idaho, 20 miles, and is being extended through Bovill to Collins, where it will connect with the St. Paul's Pacific extension.

Erie.—It is said that this company intends to retire its $5,000,000 one-year notes issued last spring with its cash surplus on hand, part of which was made available by paying its dividends in scrip. (Aug. 30, p. 248; May 24, p. 728.)

Interborough-Metropolitan.—It is said that this company has offered to sell to New York city the Belmont tunnel under the East river, which is being built by a subsidiary company, for a price said to be $8,000,000. If the city buys the tunnel the Interborough-Metropolitan offers to operate it. The north tube of the tunnel is ready for experimental operation and the south tube is nearly finished.

Minneapolis, St. Paul & Sault Ste. Marie.—The stockholders have authorized the issue of $14,000,000 additional common and $7,000,000 additional preferred stock. Of this amount, $4,300,500 will be offered to shareholders for subscription at par during the coming year.

New Orleans Railway & Light.—A dividend of five-eighths of 1 per cent. on the $10,000,000 five per cent. non-cumulative preferred stock has been declared, payable October 15. Hitherto, beginning with 1906, the full dividends have been paid, quarterly. The company controls all the street railways in New Orleans, 52 miles, as well as all the lighting interests.

Toledo, Peoria & Western.—The annual report for the year ended June 30, 1907, shows gross earnings of $1,300,216, an increase of $6,822; net earnings, $212,148, an increase of $35,578. Net income, after interest charges and rentals, was $1,672, which compares with a deficit of $21,642 in the previous year.

Trinity & Brazos Valley.—The directors have voted to increase the capital stock from $300,000 to $500,000.

Washington, Idaho & Montana.—See Chicago, Milwaukee & St. Paul

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EDITORIAL ANNOUNCEMENTS.

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CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.

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CONTENTS

VOL. XLIII., No. 13. FRIDAY, SEPTEMBER 27, 1907

President Mellen, of the New York, New Haven & Hartford, has announced that in the matter of the pending merger of his corporation with the Boston & Maine he will "stand pat" and not press the merger until Massachusetts sentiment upon the subject undergoes a change. His statement throws into the foreground of the Massachusetts field where state politics and the merger are now in high ebullition, a situation that is at once suggestive and amusing rather than practical and concrete. The New Haven Company now holds hard and fast through its trustees some 120,000 shares or about two-fifths of the outstanding Boston & Maine stock. Not many single blocks of the stock of size and importance remain outside the 120,000 shares and of the holders of the shares not in that big "bunch" a large majority undoubtedly want the merger and yearn for the addition of one per cent. in dividends in the proposed share for share exchange. The New Haven has not formal and legal control of the Boston & Maine. But "standing pat" it has moral and, in a very large sense, practical control present and prospective; it has drawn an impassable dead-line against any outside and rival control of the Boston & Maine; it is saving some $180,000 a year in dividend payments on the remainder shares; and, in times of general fiscal stress, it is postponing the cares of Boston & Maine operation and direct responsibility for improvements. So placed on his battlements of vision it is hardly strange that President Mellen is willing to put forth his gentle placebos as he watches the surging railroad politics of the Bay State sure to subside at about the date of the next meeting of the state legislature into passionless levels of common sense.

There was a discussion at the September meeting of the New York Railroad Club about the comparative merits of the electric and steam locomotive that, in its general tone, indicated a coming together of the interests represented by the two rival powers. It was recognized by both sides that the ill-advised claims of ill-informed advocates should be given scant consideration. One electrical engineer came forward with the broad admissions that it would cost much to electrify any road and that for existing traffic it was doubtful if that cost would be warranted by the savings that would be effected. There are, however, other important advantages, possibilities of greater train frequency, absence of smoke, more rapid acceleration, high speeds possible on adverse grades and the like; all of which would tend to attract traffic. On the other hand figures were given in which it was shown that the cost of operating and maintaining electric locomotives was far in excess of that required for the steam machine, and this was supplemented by the usual claims as to the advantages of a multiplicity of units, and the flexibility of operation that would be thus obtained. Yet with these two opposite positions there came from each an acknowledgment that the other possessed advantages that would force its consideration and adoption in certain places to which the rival power was not well adopted. In all this discussion it must be remembered that there is much of surmise. Locomotive statistics at best are elusive and unsatisfactory, and when it comes to electric operation there has not yet been enough of it to afford facts for valuable comparisons. The cost of operation and maintenance of the electric locomotive are for the most part based on the estimates of car operation costs, and that this is a sound basis is by no means sure. This will be evident from statistics of various locomotive costs on roads using different types of engines. For example, to take extreme cases, no one would think of basing the probable costs of the heavy Pennsylvania consolidations on the statistics of the New York elevated roads when they were operated by steam, and it seems equally unreasonable to base the probable performance of heavy locomotives on what is now done in the subway. It is coming to be generally felt that the electric locomotive has a field of usefulness which will be constantly widening, but that this field is not yet large enough to include the whole realm of railroad operation. We hope and believe that this fair-minded discussion at the New York Railroad Club marks the end of hysterical claims and counter claims as to the advantages and disadvantages of the electric locomotive. The course to be pursued is to pay close attention to details, watch the results of every development and then make use of such advantages as may be developed by experience.

THE GROWTH OF TRAFFIC.

The preliminary statistical report of the Interstate Commerce Commission for the year ending with June, 1906, shows one fact of great significance, which deserves more attention than it has received. The increase in freight traffic during that year was altogether unprecedented, and equal to the aggregate increase for the three years next preceding.

For five years this traffic has been:

Years.	Millions of ton-miles — Total.	Over previous year.	Per cent. of increase.
1902	157,289	10,212	7.0
1903	173,221	15,932	10.1
1904	174,522	1,301	0.9
1905	186,463	11,941	7.4
1906	215,878	29,415	15.9

The increase of traffic which had been 29,174 millions of ton-

miles for the three years from 1902 to 1905, was thus 29,415 millions in the one year from 1905 to 1906. This alone is sufficient to account for the traffic blockade of the last year. We had had great and sudden increases theretofore, but none like this. The largest increase in any one year had been 18,939 millions of ton-miles, from 1897 to 1898. From 1893-94, the year of lightest traffic for a number of years, to 1898, the increase was 38 per cent.; from 1902 to 1905, 42 per cent.; from 1898 to 1902, 18½ per cent. It certainly seemed unreasonable that in a single year after 1905, when traffic was already much larger than ever before, there should be a further increase of 16 per cent.

Of course this is a rate of growth which cannot be maintained. It would mean that traffic, and approximately production, should more than double every five years; and in a country where the growth of population is not more than 2 per cent. a year this is, of course, impossible.

Actually, however, the growth of traffic in this country is one of the marvels of the world's industrial history.

The 80,335 millions of ton-miles in 1894 has become 215,878 millions in 1906, an increase of 144 per cent. in 12 years, which is an average of nearly 10 per cent. yearly. This has been possible only by the development of mineral resources, in which the production per man employed is great in weight, distant from markets, giving many ton-miles per ton produced. The number of ton-miles per inhabitant in 1906 must have been approximately 2,540. There is nothing comparable to this in any other country.

While there has been some growth in traffic in every year but one since 1894, the fluctuations have been great. Aside from a trifling decrease from 1896 to 1897, we have gains (in millions) of 18,939, followed by 9,590, 17,932, 5,478, in the years from 1898 to 1901. To make accurate provision for a growth so fluctuating is not possible. Facilities increased at the rate of 10 per cent. a year would have been superfluous in 1901 and 1904 and inadequate in 1898 and 1906. The programs for tremendous increases in facilities made by a very large number of companies two years or less ago, if they could have been executed in the shortest possible time, as was intended in many cases, would most probably have exceeded the requirements of traffic. Inability to secure all the capital needed has postponed many of these enterprises, and if the money could have been secured it is hardly probable that the men and materials could have been had. It is true that a large part of the improvements were needed for the prompt and economical conduct of the traffic as it was. But we may be pretty sure that provision for an annual growth of 16 per cent., like that of 1906, would be excessive.

Passenger traffic has never grown in this country like freight traffic. It was lighter in 1895 than in 1891; and not quite 14 per cent. greater in 1899 than in 1891. But since 1899 the growth, if not so great as that in freight traffic, has been much greater than that in population. The 25,176 millions of passenger miles in 1906 were more than twice as great as the travel in 1897; and in these years the growth of trolley travel has probably been greater in proportion. The steam railroad travel in 1906 was at the rate, approximately, 296 miles per inhabitant, which is not equaled in any other country for which we have statistics. Since 1901 this travel has been

	—Millions of pass'g'r-miles—		
Year.	Total.	Over previous year.	Per cent of increase.
1902	19,690	2,336	13.4
1903	20,916	1,226	6.2
1904	21,923	1,007	4.8
1905	23,800	1,877	8.6
1906	25,176	1,376	5.8

The growth is constant and rapid, but not equal to that in freight. Since 1895 the gain has been 106½ per cent. in passengers and 153 per cent. in freight; since 1901, 45 per cent. in passengers and 47 per cent. in freight. In the census year the travel was 211 miles per inhabitant; in 1906, as we have said, about 296 miles.

THE DIFFUSION OF RAILROAD SHARES

A somewhat cheering symptom of the past year of stress in American railroad securities has been the repeated reference to the increased number of separate holdings of shares in railroad corporations. Not infrequently nowadays railroad presidents in interviews for publication or in their annual reports "point with pride" to their waxing number of shareholders. Sometimes the fact is illusory or even negative in its meanings. A big holder of shares in a conservative railroad—say an insurance or trust company—decides to split up its block for disposal in the market and does so successfully; or, again, a big speculative holder of intrinsically speculative railroad stocks decides to subdivide and "unload." That means, usually, the substitution of a lot of small speculators for one big one, an enlarged area of speculation, the raising—and shearing—of a new flock of Wall street lambs, and a positive evil. But, taking the railroads as a body, diffusion of shares is a wholesome sign. It is of special import in such a period as the present one of collision of railroads with the constituted authorities; and, as one branch of railroad science, hereafter it is to be hoped that the statistics of share distribution will be fuller, more accurate and detailed and brought down closer to date than heretofore.

There is difficulty in securing such returns. In some large railroad companies the changes are few and slow, in others very rapid. Many shifts of actual ownership take place without transfer on the books of the company, or with transfer considerably delayed. A trustee may hold, for a time at least, an undivided block of shares for a number of beneficiaries. A broker may do the same for a considerable number of customers. A single stock owner may hold shares in 20 roads, and his individuality is thus multiplied by 20—the flaw of the official returns of the number of depositors in our savings banks thus repeating itself. Some of the blanks of state railroad commissions exact returns of the number of stockholders in the independent railroad corporations. But they generally omit the enumeration for shareholders of component, subsidiary and leased properties, who often far exceed those of the parent company. Yet, even with these limitations, it ought not to be hard to obtain significant returns. Some errors will remain, but they will be in the nature of constants not affecting very seriously the absolute variations of ownership, upward or downward, from year to year, which will tell their own story.

The last and most trustworthy official statement of the number or railroad stockholders in the country goes back three years to the year 1904. In February, 1905, at the request of the United States Senate, the Interstate Commerce Commission gave the numerical returns of railroad shareholders as of June 30, 1904. The total was 327,851. Even for that somewhat remote time the comparisons and contrasts are interesting. There were 55 companies which returned each an enumeration of 1,000 stockholders or more, headed by the Pennsylvania with 44,175 and the Atchison, Topeka & Santa Fe with 17,823, many of the 55 companies being leased lines. The contrasts between the distributive holdings of conservative properties and the centralized holdings of speculative properties are vividly indexed in those returns. One finds Boston & Albany with 8,417 stockholders, Boston & Maine with 7,402, Illinois Central with 9,123, New Haven with 10,842, Old Colony with 5,371, and Baltimore & Ohio—the original ultra-conservative road of the country, and one of the oldest—with 7,132. Contrast with these, Southern Pacific, which had but 2,424 shareholders; Louisville & Nashville with 1,672; Cincinnati, Hamilton & Dayton with 1,558; Missouri, Kansas & Texas with 1,509; Missouri Pacific with 1,861; St. Louis & San Francisco with 1,521; Erie with 4,309, and Wabash with 1,974. It is impressive to note that several of these large systems are surpassed in diffused stock by, for example, the leased Morris & Essex with 2,450 shareholders, and the old Boston & Lowell with 2,168. Some allowances in special cases must, of course, be made. The large distribution of the Atchison (17,823) dates back to original conservatism and diffused investment at Boston; Union Pacific, with stockholders numbering 14,256 in 1904, had in much earlier years its long period as a moderately conservative investment; and allowances have to be made for the effect on stock in certain cases of reorganization and receivership as well as of special Wall street conditions. But these and similar facts do not seriously impair the fact, conspicuous in 1904 though probably somewhat less conspicuous to-day, of diffused holdings in conservative roads and centralized holdings in the roads which are speculative.

During the three years since 1904 there has been, as an absolute fact, a vast increase in distribution. The holders of New Haven stock have increased by several thousand. During the first quarter of the present year the holders of New York Central increased about 2,200 and of Pennsylvania by over 5,000. When the November, 1906, dividend was paid, the Pennsylvania had 40,409 shareholders. The May, 1907, dividend went to 45,496 holders of record. Between May and August 1, there was a further increase of 2,000, bringing the number of stockholders to 47,500, the highest point in the company's history and also probably the largest number of shareholders ever possessed by any American railroad. Of these, 25,100 were men and 22,400, or over 47 per cent., were women. The following table, from the *Wall Street Journal*, shows the rate and

amount of dividends and the number of shareholders of the Pennsylvania during each of the last ten years

Year	An. rate	Dividends	No. of shareholders
1897	5 per cent.	$6,402,170	22,015
1898	5	6,465,230	23,725
1899	5	6,855,260	24,920
1900	6	8,781,170	26,032
1901	6	10,857,072	26,305
1902	6	12,252,491	28,675
1903	6	14,792,031	41,474
1904	6	17,938,031	44,360
1905	6	18,117,927	44,030
1906	6½	19,869,261	40,490
1907, May	7	10,906,784	45,496
1907, August	7		47,500

To some extent, doubtless, these increases in the number of shareholders of standard railroads during the recent era of low prices, were transitory, but they show a strong trend toward a wider distribution of railroad ownership among small investors. Other causes working in the same direction have been active and forceful. Railroad investment and reinvestment during the two earlier years of the three were extensive, even if affected somewhat by competitive investment in street railways and industrials. Surplus capital during that period was fairly abundant. During the three years, roads for many years speculative have become dividend payers and with enough promise of dividend continuance to attract steady investment. Moreover, there have been large issues of new stock and sales of rights and the convertible bond has been another distributive factor which will not grow less as the periods of convertibility mature. The result is an increase in the number of railroad stockholders of large but undetermined magnitude and not, apparently, much affected by popular and governmental attack on the roads; which, in fact, has probably been a good deal offset by the attraction to investors of low prices and high dividend returns of good railroad shares. As a rough guess, the 327,851 railroad stockholders of 1904 in this mid-year of 1907 probably have risen to about 500,000. Banking houses and trust companies that hold stocks for foreign holders, and the savings banks that, as trustees, hold an immense mass of railroad securities for the poor, enlarge what may be called the "popular" distribution of railroad holdings much further.

Excluding railroad bonds and senior securities, and limiting the subject to shareholders alone, one finds in the half million or more of them in this country a distributed interest so large that it becomes a popular interest also. Shareholders are not all voters, and the "widow and orphan" plea has of late been overworked. But the great and growing size of the stock-owning railroad interest suggests the larger question why there cannot be in the future a closer and more sympathetic relation between the railroads and the people. Cannot the railroads, without any threat even of state ownership, be set before the people as a kind of heritage, a part of their own wealth and heirship, subject only to the conditions of honest financing on the one hand and efficient public service on the other? Is such a view of the future too idealistic after the present fret and fume of the "railroad question" has ended and pasaion subsided into sense? Perhaps so; but at least the ideal is one to be toiled for. It will not be reached or even approached so long as demagogism foams at one extreme and the selfish craft of the railroad speculator burrows at the other. Radicalism and selfishness never yet have solved such a great public problem and never will. Its real solution must work out through the slow processes of time and experience. Among those processes the constant extension of railroad ownership must be welcomed as one of the most promising. A wide public ownership of its securities gives the American railroad system more basic strength. It accents the contrast—in the long run if not at once—between individual and quasi-popular ownership. It emphasizes the adjective in the trite phrase "public service" as strongly as it does integrity and judgment blended with tact in railroad administration. It reserves final control to the stockholder as a safeguard against abuse, and makes for the publicity that is the most resonant keyword of corporate betterment. That such expansion of railroad stock-ownings begins to be cited now by railroad authority itself adds official tribute to its value.

THE STATION AGENT.

One of the newspaper cartoonists has depicted a station agent, endowed with three pairs of arms, sitting in the middle of his office, the picture of distraction and anxiety, trying to do a half dozen things at once; answering the telephone, filling switch lamps, holding the train-order signal, reporting a train on the telegraph wire, delivering a mail bag and attending to passengers desiring to buy tickets or to have questions answered, and in addition he is using his toes, checking baggage with one foot and marking a dry goods box with the other. This last is the only express-agent function dealt with in the picture. This is by no means all fiction. With only pardonable exaggeration the picture man gives quite a fair notion of the multiplicity of duties that often presses upon the single attendant at a small station, within the five minutes preceding the departure of a train. If quick witted, energetic and ambitious, a man in such a situation often performs a variety of functions in a way that would do credit to an expert prestidigitator. Yet even the most phenomenally active clerk often has to neglect some of his customers from lack of time, while the "average" station agent, almost necessarily deficient in training, nearly every day leaves some of his patrons dissatisfied. The demands on his time are so numerous and various that only the most agile mind and best trained hands could meet them; and, admittedly, the country agent's mind is agile in only a few directions. From the causes here suggested the service at small stations is everywhere imperfect, and our cartoonist has only reminded us of what has been a common sight for half a century. Can anything be done about it?

We have taken up a subject on which it seems impossible to say anything new, because, we are glad to see, a few railroad officers are doing something new. No enterprising superintendent would be at a loss how to make a forward move in the improvement of his station service, if only he dared to spend twice as much money on it as he now does; but possibly it will be helpful to look again at some of the elements other than money. That is an important one; and nobody can expect to work any great improvement in station service without increasing its cost; but, given the money, how should it be expended? A simple increase in salary is a very crude measure, for the most that can be expected from it is to get better men, who will all the more quickly resign and find jobs paying higher salaries.

In view of the irresistible tendency among all intelligent country people to migrate to a city, it would seem far better to do everything possible to improve the agents now at country stations than to try to improve the service there by filling agencies with higher priced men who have had better training elsewhere; for "elsewhere" usually means a city or a large town. Every added year that an agent stays at a small station there is an added prospect that domestic ties will help to keep him there; and an added reason for educating him.

The education of a station agent is a complicated process, but we may perhaps divide it into three stages: the elementary things that he learns by doing them, as assistant agent, under the supervision of his boss; the "advanced" instruction in the same line, which he receives from the traveling auditor or other outside man, or by reading suitable books and adjusting his acts to his increased knowledge; and education in politeness and tact, which is likely to be a comparatively slow growth, for it comes from dealing with men, and the country agent does not have a large or an inspiring variety of men to deal with.

Certain recent measures to improve station agents will be recalled by the reader. One road has put on an increased force of district freight agents and arranged to have them travel more; visit each station oftener. It seems likely that this will afford proportionately too much benefit to the moderately large points and too little to the one-man station; but the principle is good. One or two roads have had frequent profitable meetings of 50 or 100 agents, the meetings being addressed by officers of the Freight Traffic and Passenger Traffic departments. One road did a good thing by more liberally supplying small stations with helpers, thus encouraging the agents to make themselves better. But what has called our attention to this matter at this time is a brief notice in a Missouri paper telling of what has been done by Mr. W. M. Whitenton, Superintendent of the Missouri division of the Chicago, Rock Island & Pacific at Trenton, Mo., who has had a meeting of station agents to "talk shop." Like others before him, Mr. Whitenton seems to be giving undue attention to stations other than the smallest, but we will trust that he may get down to the lower level later. The public, especially the traveling public, wants good service at the smallest stations.

Mr. Whitenton has had several similar meetings before. He says that it will be his policy to foster this frequent exchange of ideas. He holds, rightly, that the agent is a molder of public sentiment toward railroads. "It is he who meets the seeker of informa-

tion about routes and schedules with either polite accommodation or surly indifference. It is from his treatment that the patron takes on a mood of satisfaction or hot resentment. The patron goes back home and, the next day, is called as a juror in a damage case; and his feelings govern his action." Mr. Whitenton intends to have all small claims against the railroad promptly settled, and is looking after the practice of his agents in this respect. This is a feature of Rock Island policy concerning which *Railroad Gazette* readers have already been informed. This superintendent aims to make the agent at the small station see that he can make of himself an important personage, by treating the public with the same politeness that is practiced by the storekeeper or the banker.

Two things are noticeable in this movement. First, it is the superintendent who is managing it, and, second, he is taking for his model, not the experienced ticket seller or freight clerk at some large station, but the local storekeeper or banker. Local agents on American railroads have been instructed too exclusively by traffic men and traveling auditors. We have not the slightest word to say against these men, for their work is invaluable; but the superintendent ought to be able to better their instruction in some directions. He is or should be more thoroughly acquainted with local conditions; and, probably, in most cases the division superintendent is a man who has had a larger all-round experience. He ought to be by far the biggest man whom the station agent regularly sees.

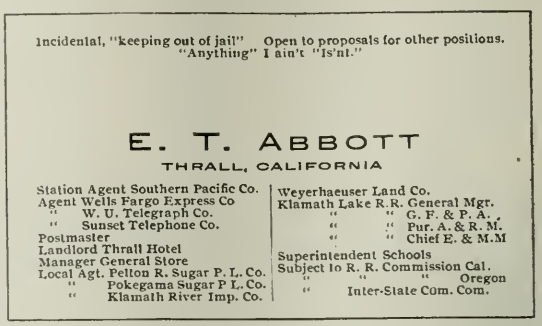
In taking the local retail merchant as a type to be imitated this superintendent recognizes an essential principle. This merchant may not dress so well, or keep books so well as the station agent, and he may know far less; but he has a more powerful incentive to please his customers; and that is where railroad agents lack. As one of the Chicago & North-Western agents has said, the grocer puts on his smile with his clothes the first thing in the morning; and he keeps it on all day. Another reason for emulating the storekeeper is that he is nearby. An agent who tries to take lessons from a better agent may see him only once in three months. The storekeeper who is also postmaster is a useful man to study. He might not be worth ten dollars a month on a railroad; but he "aims to please." Probably he has been selected as postmaster largely for that reason.

The superintendent who sets out to raise the quality of his agents must recognize his obstacles. The bank clerk or store clerk learns to be a successful banker or merchant because he has for teacher the proprietor, constantly "on the job." The railroad superintendent, coming around only once a month, must try in some way to make up for the infrequency of his visits. One reason why conductors manifest a more uniform degree of efficiency than agents is because conductors are thrown together where they can more effectively learn from each other.

Again, it is to be borne in mind that learning from each other is not an ideal educational process for agents, or for conductors, either; though it should be diligently carried out where nothing better is available. Essays by agents, telling other agents how they do certain things, have accomplished a great deal of good; but in view of the fact that the third course in the station agent's education—training in affability and alert anticipation of customers' wishes—is the one which is now engaging attention, and of the fact that these qualities are not likely to be described in instructive detail and with enthusiasm by a modest person who exercises them, it will be much more effectual to educate in some other way. The superintendent, as teacher, should show to his agents vivid word-pictures of actual men who have achieved excellence in the diplomatic art. If the superintendent is not himself a good lecturer let him hire a man who is. Follow the teaching theory to the further extent of requiring the pupils to show in writing how well they have grasped what has been told them.

The young country station agent is susceptible, probably in a large majority of instances, of a tolerably satisfactory polish; the question is whether a strong railroad, employing brilliant men for general officers can afford to continue to let such agents educate themselves, and as a result reap two-cent fare laws, passed by disgruntled legislators whom nobody has ever tried rationally to placate.

The most difficult agent to deal with is the one who does his work well but is usually so cold-mannered or weary as to be classed by passengers as "cross." It is inexcusable to appoint such a man. The best way to test a candidate in this respect is to see how well his sense of humor is developed. We have no form of test examination to offer, but by way of illustrating the point we will mention an agent who evidently has this sense—Mr. E. T. Abbott, of the Southern Pacific. Our opinion of Mr. Abbott's fitness is based on his card, a copy of which reads:


Incidental, "keeping out of jail" "Anything"

Open to proposals for other positions. I ain't "Is'nt."

E. T. ABBOTT

THRALL, CALIFORNIA

Station Agent Southern Pacific Co.
Agent Wells Fargo Express Co
" W. U. Telegraph Co.
" Sunset Telephone Co.
Postmaster
Landlord Thrall Hotel
Manager General Store
Local Agt. Pelton R. Sugar P. L. Co.
" Pokegama Sugar P. L. Co.
" Klamath River Imp. Co.

Weyerhaeuser Land Co.
Klamath Lake R.R. General Mgr.
" " G. F. & P. A.
" " Pur. A. & R. M.
" " Chief E. & M.M
Superintendent Schools
Subject to R. R. Commission Cal.
" " " Oregon
" Inter-State Com. Com.

Mr. Abbott, we venture to guess, would make a good lecturer for station agents' meetings.

Car Efficiency for Three Months.

The Car Efficiency Committee of the American Railway Association has issued a statement for the three months to April 1, 1907, showing freight car performance, and car balances, and giving some comparisons with the records for the last six months of 1906 (which were noticed in the *Railroad Gazette* of August 30). The average ton miles per car per day for the three months were: Group 1, 164; group 2, 364; group 3, 363; group 4, 226; group 5, 341; group 6, 307; group 7, 531; group 8, 368; group 9, 252; group 10, 350. (The groups correspond to those of the Interstate Commerce Commission.) We quote the principal explanatory paragraphs of the report:

"This bulletin is the first general compilation covering a period subsequent to the increase in the per diem rate which was made effective on certain roads December 1, 1906, and is therefore of interest for purposes of comparison tending to show the effect of the increase on the car movement. Although the weather conditions during the period covered by this report were not favorable to a high car mileage, the general average shows a decrease of but seven-tenths miles per day as compared with the last six months of 1906. The heaviest decreases in mileage occurred on the roads which were not parties to the car hire agreement, while the car hire roads, with but few exceptions, about held their own. The decrease on all car hire roads averaged but .64 per cent., while the non-car hire roads show an average decrease equal to 5.53 per cent.

"These results would seem to indicate that the increase in the per diem rate to 50 cents, which was made effective July 1, 1907, on all roads in the Association should bring about a general improvement in the movement of cars.

"The generally accepted unit of car performance is the 'average miles per car per day,' but in considering this item, the 'per cent of loaded mileage' and the 'average loading' should not be lost sight of. An increase in the average miles per car will not benefit a road individually if the increase is made by empty mileage, although such an increase tends toward an improvement in the general efficiency when the movement is made for the purpose of delivering empties to a connection. Neither is there anything gained by an increased per cent. of loaded mileage if the loading of the individual car is decreased proportionately, unless the light loading is in lieu of empty mileage and is made with a view to stimulating movement toward connecting lines and thus facilitating the general interchange of cars. For these reasons, it is equally unsatisfactory to consider the per cent. of loaded mileage aside from the other units.

"For the purpose of combining these various factors and securing a unit which will take them all into consideration, we show an 'average ton-miles per car per day.' This, we believe, provides a very good unit of performance for individual roads, although it is not claimed that it will be useful in comparing one road with another, there being many things entering into this figure which vary according to the operating conditions on the several roads, such as length of haul, capacity of equipment used, class of freight handled, etc.

"By comparing the 'average ton-miles per car per day' for the period of this report, with the figures for the last six months of 1906, it is noted that there was a decrease of only three ton-miles per car per day, or .91 per cent., which is a very satisfactory showing for three winter months. An improvement will also be noted in the 'per cent. of cars in shop' which decreased from 5.48 to 5.02, indicating the efforts which were being made by the railroads to increase the efficiency of their cars.

"There is little change in the figures under 'per cent. of cars on line.' Only about 54 per cent. of the business handled by the

railroads of the country is done with 'home' cars which confirms the oft repeated assertion that there already exists a virtual freight car pool, comprising practically all the freight cars in the country albeit such 'pool' is without regulation other than that provided by the per diem rules. That this general interchange will from time to time be extended rather than restricted, is inevitable, and that this condition is conducive to a higher efficiency and a consequent economy in operation, than would be possible under a less flexible system of interchange, can hardly be controverted. To be entirely equitable, however, such a system should be regulated by rules which would safeguard the rights of car owners and insure to them the use of their proportion of the equipment, or adequate compensation for any loss they may sustain by reason of an unequal interchange of cars. This principle has been twice affirmed by the American Railway Association."

The New York, New Haven & Hartford, which threatens to withdraw from the per diem agreement because of the cost of borrowed cars, owns 19,970 cars, has an average of 15,712 of these cars on its own lines, and has an average of 20,661 foreign cars on its lines. In other words, it owns about four-sevenths as many cars as are needed to do its business. It is to receive within the next six months 17,000 new cars. An interesting freight car item not shown in this report, but received from another source (a daily newspaper) is that in the month of June the Baltimore & Ohio, moving cars about 67 million miles, made them average 30.5 miles a day. In May, with a still larger movement, the average was 31.7 miles. These averages show about 10 per cent increase over the Baltimore & Ohio figures shown in the above-mentioned report.

More Railroad Agitation.

Minnesota is the last state to bid for notoriety in the regulation of railroads, and North Carolina, Alabama and Georgia will have to find some new thing with which to attract attention. In Minnesota, last week, Governor Johnson felt called upon to express his condemnation of Judge Lochren of the Federal court for lecturing the legislature. It appears that the Judge, in granting a temporary injunction against the enforcement of the freight rate reductions ordered by the legislature, gave pretty free expression to his opinion of the intelligence and judgment of the legislators, declaring that "such legislation is vicious, and a disgrace to the civilization of the age." What effect the Governor's utterances may have had on the public mind we do not know; but on Monday of this week, Judge Bunn, in a state court, the Ramsey County District Court (St. Paul), issued a writ of mandamus against the Northern Pacific to compel that road to put into effect the freight rate law which Judge Lochren had ordered suspended. Judge Bunn's writ is made returnable October 5. The latest move in Alabama is the sending of a circular by the Montgomery freight bureau asking shippers to give preference to railroads which have not resisted the enforcement of the state laws reducing rates—though Alabama has a law forbidding boycotts. In Texas the Attorney General on Saturday last entered suits against ten different railroads for failure to provide sufficient equipment and neglect in keeping track in order; for alleged failure to operate passenger trains on schedule time; for alleged refusal to receive a loaded car from a connecting line; for alleged failure to maintain a train starter at Fort Worth; for alleged refusal to furnish the commission with a statement of legal expenses; for alleged refusal to turn over a loaded car to a connecting line, and for alleged failure to provide passenger depot accommodations at Denison. In South Dakota the State Railroad Commission, at a meeting held September 20, voted to order all passenger rates in that state reduced October 15 to 2½ cents a mile.

The Public Service Commission of the Second District of the State of New York has issued a code of regulations for the reporting of railroad accidents, which, like the rules for the inspection of steam boilers heretofore noticed, are in the main highly commendable. In making its rules and its classification of accidents as nearly as practicable like that already in use by the Interstate Commerce Commission, the New York Commission has been considerate of the railroad superintendent who has to report accidents to a number of different authorities and whose work is much simplified if he is able to use the same report for all of the different persons or boards to which he must send the information. But in the list of accidents which must be reported by telegraph the New York Board has called for much more than will ever be used. To require telegraphic reports of all collisions involving freight trains will be to burden the telegraph wires to no purpose, for the great majority of the collisions do not demand the attention of a State Board—or, at any rate, they are so numerous that a State Board cannot afford to give attention to them in detail. In the last quarterly bulletin issued by the Interstate Commerce Commission the total number of collisions was 2,078; but more than half of these were classed as miscellaneous, meaning, in most cases, slight accident in yards; and of the 817 rear and butting collisions only 23 were considered of enough prominence to have their causes explained in the bulletin. If the list of 23 prominent cases were expanded to include ten times as many it would still contain only about one-fiftieth of all the collisions and would almost certainly include every case which could be instructively dealt with by a Government board. And it is to be remembered that the Government record excludes all collisions in which the damage to cars, etc., is less than $[illegible]. Telegraphing to Albany all minor accidents resulting in serious injury to any person would also seem to be in large measure superfluous. To be scalded by escaping steam from a broken gage glass is a serious injury; but a report of the accident by mail the next day would seem to be sufficient for all practical purposes.

Officers of the Pennsylvania Railroad who have been trying to arouse municipal officers and other authorities to do their duty in relation to the tramp nuisance, have succeeded in starting up a considerable public interest, if we may judge by editorial expressions which are quoted from prominent papers in Philadelphia, Pittsburgh, Buffalo, Rochester, Cincinnati, Chicago and other cities. These newspaper utterances evince a uniformly sensible attitude. The editors see clearly that the railroads deserve better treatment from the cities and towns. Also, they condemn the unfair practice, common among local officials everywhere, of sending tramps to the next town. Gifts of money for railroad fare and freedom from merited punishment are fully granted to almost any kind of a vagrant on condition that he leave town. This usually aggravates the difficulty which the railroads have to deal with, and does nothing to improve the situation.

Missouri, Kansas & Texas.

The annual report of this company is usually a more interesting document for general reading than that of most railroads, for it is the custom for the officers to discuss the most important facts bearing on the prosperity of the company in some detail instead of giving merely the bare record of the financial and operating results of the year. This custom has not been affected by the important changes in the executive heads of the road during the past two years. Henry C. Rouse, Chairman of the Board, died on April 30, 1906, and was succeeded by Adrian H. Joline, previously Counsel to the company at New York. In November of the same year F. N. Finney, President of the road, resigned, and Mr. Joline succeeded also to his office, becoming Chairman of the Board and President. In the annual report of the company for the year ended June 30, 1907, Mr. Joline, with the viewpoint of the trained lawyer, discusses the present problems which are confronting railroad managers the country over.

In the first place, he frankly admits that notwithstanding the large amounts of new equipment which have been bought during the last five years by the Missouri, Kansas & Texas, the company has found it impossible to keep up its equipment with the increase of its traffic. He then discusses the railroad legislation of the first half of 1907 in the various states and territories through which the road runs. Three new laws in Missouri—one reducing freight rates, one passenger rates and one abolishing bridge arbitraries—are likely, if finally put in effect, to reduce gross earnings of the road by $250,000. In Kansas freight rate reductions will cost the road about $100,000 a year, and a general reduction in passenger rates to 2 cents a mile is probable. In the Territory of Oklahoma freight rates have been reduced and the constitution of the new State of Oklahoma just adopted fixes 2 cents a mile as the maximum passenger rate. Texas has passed a number of laws increasing the expense of railroad operation and giving the railroad commission larger powers over rates, and has also changed the tax laws in such a way that the company's taxes will probably be increased by $200,000 a year. These laws directly affect the company. There is also an interesting example of the indirect effect of railroad legislation. Arkansas has passed a 2-cent-a-mile law, and although the Missouri, Kansas & Texas has not a mile of road in that state, the establishment of the 2-cent rate in Arkansas compels it to reduce through rates from the north to Texas in order to meet the rates of its competitors which operate through Missouri and Arkansas to Texas. As Mr. Joline well says in summing up the railroad legislation of the year, the rate reductions not only deplete the company's revenues from traffic moving wholly within each state, but also those from interstate traffic, the rates on which usually have to be reduced to correspond with the intrastate rate.

The following is an interesting summary by Mr. Joline of the general railroad situation as it affects both the road of which he is the head and other railroads:

"The condition of the crops along your system, although backward, is satisfactory, and promises a large yield. An increased acreage has been planted in cotton, which is expected to offset any decrease in production, which might otherwise have resulted from unfavorable weather conditions during the season of planting and growth. Harvesting, and consequently the movement of the crops, is later than usual. The outlook for the coal business is better than it has been for several years past. The failure of the wheat crop in Texas, and the great damage to that crop in Oklahoma, are factors rather to

your company's advantage than otherwise, as comparatively little wheat is produced along your road, and Texas mills must now draw their supplies from districts where your company is able to compete for the tonnage on most favorable terms. The movement of live stock promises to be fully up to our ability to take care of it. Commercial activity continues unabated throughout the communities served by your railroad; in fact, the industrial development of the territory tributary to your line is advancing with such vigor that only great disaster may check its growth. While the year under review has been one of remarkable prosperity, still, all things considered, it is confidently expected that the earnings will be as satisfactory during the current fiscal year.

"Yet, in spite of the increasing gross earnings and the bright outlook for continued prosperity, the situation of the railroads in the United States is not especially a happy one. We find ourselves without facilities adequate to handle all the traffic offered for shipment, and in an endeavor to meet the requirements, tracks and terminals become congested, motive power and equipment run down, roadway is impaired, men are overworked and other evils ensue tending to make transportation more difficult and vastly more costly for the railroads, as well as unsatisfactory to the public. The remedy for these evils lies in enlarging facilities and increasing equipment, but strange to say, the public, so vitally interested in the question of transportation, has assumed an attitude of hostility towards railroad corporations which has manifested itself in so many forms of oppressive and restrictive legislation as almost entirely to destroy the credit of railroads so far as obtaining new capital for improvements is concerned. At the same time it is impossible for the average railroad company to make extensive betterments from its current earnings, in view of the tremendous increase in the cost of labor, material and supplies. The policy of increasing the burdens on railroads and at the same time diminishing their earning power is neither just nor reasonable. Operating expenses are necessarily inflated to such an extent as to leave little or no balance after the payment of fixed charges and constantly increasing taxes. The legislatures of the several states demand impossibilities and require a reduction of rates, already the lowest in any country, without recognizing the fact that they are depriving the railroads of their income which in most cases would be expended in payment for betterments absolutely necessary for the safe, economical and expeditious movement of traffic. They call for expenditures while refusing to let the railroads earn the money to meet them.

The people of this country are not hostile to railroads; it is the greed and ambition of politicians which are responsible for the unjust requirements imposed. It is gratifying to observe that in Texas the press has, in the main, exhibited a due sense of the right, recognizing the necessity of railroad development in that great state and contributing to the defeat of the two-cent rate bill introduced in the Texas legislature.

"The law-makers have been aided in their assaults by the labor unions. The generous increase in pay and the shortening of the hours of labor have not been productive of increased efficiency. A spirit of unrest, discontent, and almost insubordination has permeated the ranks in nearly all the branches of the railroad service all over the country, and offers a problem for which we can suggest no satisfactory solution, principally because of the scarcity of labor, and especially of the experienced labor required for the safe and efficient operation of railroads. It is a source of gratification to know that these troubles are less serious with your company than with others. Our men are, in the main, loyal and faithful, and if they were left to themselves, without interference from ambitious and self-seeking outsiders, would readily admit that they receive fair treatment and are accorded their just rights.

"Railroad managers have good reason to view the future without optimism. They feel misgivings as to their ability to maintain the present standard of efficiency or to produce net returns as large as those of former years. Statistics show that while so far in 1907 there has been a substantial increase in the gross earnings of railroads as a whole, the net earnings have not gained proportionately.

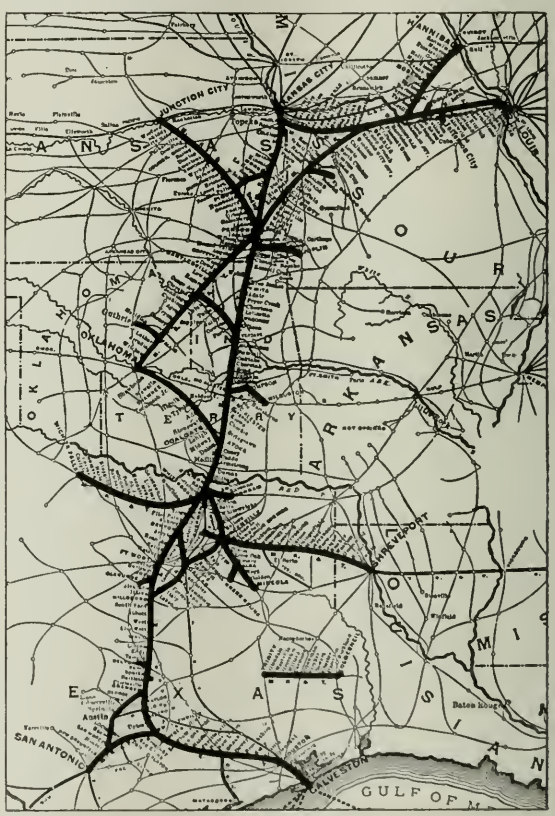
"The general conditions seriously affect your company, but it is believed that the exceptional development of the country tributary to your railroad will be reflected in future substantial increases in gross earnings; and that on completion of improvements now under way and such others as your company will doubtless find the means of undertaking, such economies in operation may be effected as will offset and perhaps overcome the adverse influences now so prevalent. There are hopeful signs of a growing realization in the mind of the public and of public officials of the true attitude of the railroads, evidenced by a more conservative tone in the recent utterances of the press and of representatives of the government who have hitherto proclaimed radical opinions on this subject; their modified views being the result, doubtless, of the extraordinary depreciation in the value of securities and the consequent uneasiness respecting the future prosperity of our country resulting from the indiscriminate agitation against railroads and the attacks on corporations in general. We believe that the American people are too intelligent and too thrifty to allow themselves to be misled by demagogues into a continuance of a policy which cannot fail to do incalculable injury to the general business of the nation."

When the actual results of the year for the Missouri, Kansas & Texas are considered, it is seen that it was exceptionally fortunate as compared with most other railroad companies. Gross earnings increased over $5,000,000, or 24 per cent., while net earnings increased over $2,700,000, or 48 per cent. This in a year when operating expenses were eating up most or all of the gains in gross earnings made by many other roads. It is apparent, however, from the monthly statements that the same tendencies which have been increasing operating expenses on other roads—in particular the high cost of labor and material—began to show themselves on the Missouri, Kansas & Texas before the end of the year. The road earned 4 per cent on its common stock after fixed charges and preferred stock dividends in the first six months of the fiscal year and only 5 per cent. in the whole 12 months.

Freight earnings increased $3,400,000, or 23 per cent., as a result of the largely increased movement of cotton, live stock, coal, ore, lumber and merchandise. The only commodity which showed material decrease in tonnage was grain, which, however, had nearly doubled in 1906 over 1905. Even in the case of this commodity the reduction in tonnage is less than one-half of 1 per cent.; though grain furnished only 9 per cent. of the total tonnage as against 11 per cent. in 1906.

Passenger earnings showed a gain of $1,120,000, or 22 per cent., due principally to two causes; the rapid growth of the country through which the road runs, and the popularity of the "Katy's" passenger service. Passenger earnings in 1905, the year of the St. Louis Exposition, were $4,900,000. They rose last year to $6,200,000. In February, 1906, a fast mail train was put in service between Parsons, Kan., and Denison, Tex., in connection with the St. Louis & San Francisco. Largely as a result of this service, during the last fiscal year the mail earnings have increased $148,000, or 39 per cent.

Operating expenses were larger by $2,250,000, or 15 per cent., yet in spite of all the unfavorable conditions mentioned, the ratio of operating expenses and taxes to gross earnings was 68 per cent., as against 73 per cent. in 1906 and 75 per cent. in 1905. Operating expenses include over $500,000 spent on betterments to the lines in Texas where the State does not allow improvements to be capi-



Missouri, Kansas & Texas.

talized. The proportion of conducting transportation to gross earnings—for years the weakest point in the operation of the road—has been slightly reduced. It was 40 per cent. in 1905, 39 per cent. in 1906, and 38 per cent. last year. The cost of conducting transportation was 20 per cent. larger than in 1906.

Maintenance of way cost less in total and per mile operated. The cost per mile was $1,129 against $1,231 in 1906. The road leases its entrances to Kansas City, San Antonio and Galveston and several stretches of track on its branch lines, including a new connection from Austin, Tex., to San Marcos, 30 miles, owned by the International & Great Northern which it began to use July 1, 1906. Therefore the unit maintenance of way figures are probably too low, for the M., K. & T.'s share of the maintenance of some of the leased lines is likely to be included in the rental. The total payments for rentals for the year were $478,500. Unit figures for maintenance of equipment cannot be worked out as detailed figures for the operating accounts are not given in the report.

One of the great weaknesses of the road has been its heavy grades in the southern part of Indian Territory, which have greatly hindered efficient operation. Work is now under way on the reduc-

tion of both north and southbound maximum gradients to 0.4 of 1 per cent compensated between Atoka, Ind. T., and the Red river, the Texas boundary. The clearing and concrete work has been finished and providing it is possible to get the necessary labor, the lack of which has been one of the greatest difficulties throughout the undertaking, all the grading will be finished this fall. Certain sections of the new line are already nearly ready for operation and it is expected that heavier trains can be run over this part of the road by the end of the year. North of Atoka, between that point and McAlester, Ind. T., the cutting down of the two largest southbound and a northbound grade has been begun. This part of the road also, as improved, it is hoped to put in service before the end of the year. Surveys for grade reductions as far north as Parsons, Kan., are under way and nearly finished. When all these grade reductions are finished there is to be a 0.4 of 1 per cent grade from the Red river north to Muskogee, Ind. T., and a 0.3 of 1 per cent grade from Muskogee north to Parsons, Kan. It is expected that on the new grades an engine will be able to haul double the freight tonnage which it can pull at present over this part of the road.

The principal results of operation are given below for the last three years—a fine record of progress:

	1907	1906	1905
Mileage worked	3,072	3,043	3,043
Freight earnings	$18,102,825	$14,968,831	$14,131,335
Passenger earnings	6,278,608	5,157,881	4,935,592
Gross earnings ...	26,183,959	21,159,145	20,041,095
Maint. of way and structures	3,467,910	3,740,211	3,643,201
Maint. of equipment	2,914,953	2,044,313	1,925,195
Conducting transportation	9,903,801	8,224,348	8,114,061
Operating expenses	17,249,134	14,990,298	14,568,436
Net earnings	8,934,825	6,168,847	5,472,659
Net income	3,682,311	1,653,088	1,267,191
Year's surplus	3,162,311	798,124	29,049

Chicago & North-Western.

The most noticeable fact in the record of the Chicago & North-Western this year is that there was no appropriation from income for construction, improvements and permanent additions, as there has been for years past. For the last seven years such annual applications of income to the betterment of the property have averaged over $4,000,000 a year, and in 1906 there was $6,000,000 thus set aside. The failure to make any such appropriation last year is a striking change in policy, for the company has long been notable for the large improvements to its property made out of surplus income year by year. The change may have been due to the difficulty of raising railroad funds in the present market and the consequent desirability of having as large an amount of surplus funds on hand as possible, or it may be connected with the new system of stock available for future issue. There is no likelihood at the present time, when the cost of labor and materials is at a maximum and when new stock could be sold only at a minimum figure, that a further extension of one of the company's western lines to the Pacific coast will be undertaken. But as long as there is this large amount of stock in the treasury the possibility of a through line to the coast by a company which already covers two-thirds of this distance, but which now gets an average haul of only 144 miles on all its freight traffic, will be a live one.

The year's gross earnings were thoroughly satisfactory. They increased $5,400,000, or 8 per cent, over 1906, but operating expenses were $5,000,000 larger, leaving a nominal gain of only about $400,000 in net earnings. Passenger earnings increased more proportionately than freight earnings, 12 per cent for the former against 7 per cent for the latter. The largest increase was in earnings from first class passengers, the smallest in earnings from commutation passengers. There was a slight reduction of the passenger-mile rate during the year, due probably to the reduction of fare to $2\frac{1}{2}$ cents a mile early this year in Wisconsin, but in spite of this the average passenger train earnings per mile increased by 6 per cent. The earnings per ton-mile were exactly 9 mills, a slight increase over the previous year, and there was an increase of 3 per cent. in the earnings per freight-train mile. Car loading was more efficient by 6 per cent., but the trainload increased only 0.4 per cent.

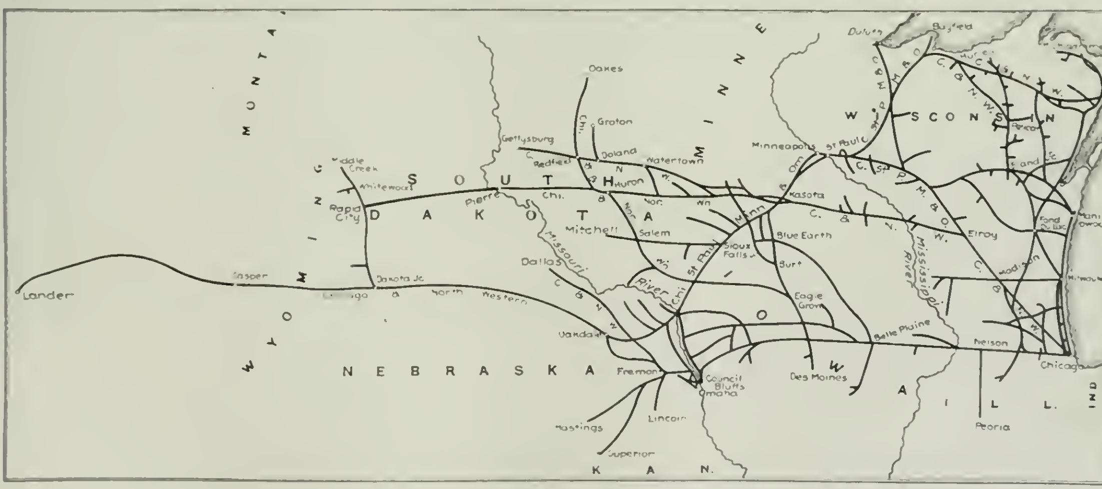
The North-Western analyzes its maintenance expenditures in considerable detail, perhaps because they have long been so low that frankness is essential. It is one of the few roads which gives separate figures for renewals and repairs of equipment. From these we learn that nothing was spent on replacement of passenger cars during either of the last two years, and nothing on new locomotives purchased for replacements in 1907, while between $2,000,000 and $3,000,000 was spent on renewal of freight cars in each year. The following table gives in some detail the unit maintenance charges for way and equipment during the last two years.

Unit Maintenance Expenditures.

	1907	1906
Maintenance of roadway and track per mile*.	$866	$678
Maintenance of way and structures, per mile.*	1,185	929
General repairs of locomotives, per locomotive.	1,684	1,559
Reprs and renwls locomotives, per locomotive.	1,684	2,340
Of passenger cars, per passenger car.....	475	455
General repairs, freight and work cars, per car.	46	35
Reprs and renwls, freight and work cars, pr car	84	83
Of freight cars, per car.†	84	84

*Not including trackage.
†Not including work cars.

These equipment figures are low, lower than would seem possible for a road like the North-Western, if it were not that it has been



Chicago & North-Western.

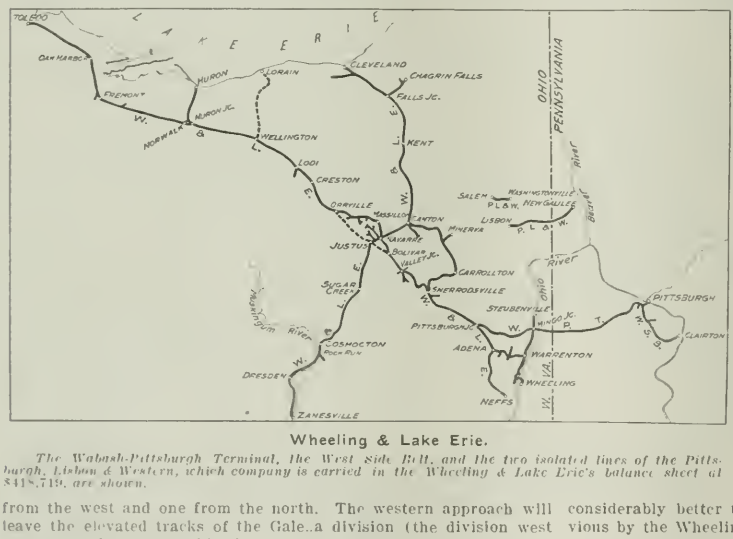
depreciation accounting prescribed by the Interstate Commerce Commission for use in the fiscal year now under way.

Not having any such ambitious plan on hand—openly, at least—as its neighbor and competitor, the Chicago, Milwaukee & St. Paul, the North-Western has not during the year, expanded its capital to any such extent as the St. Paul. In fact, more new stock was issued in the 1906 than in the 1907 fiscal year. In February, 1907, an issue of $24,400,000 common stock was made, bringing up the total capital outstanding to $124,000,350, of which $22,400,000 is preferred and $101,950,000 common. At the annual meeting on October 18, 1906, however, additional common stock sufficient to bring the aggregate capital of the company to $200,000,000 was authorized, so that the North-Western has nearly $75,000,000 common spending so little for years. The appropriation of $2,200,000 for freight and work car renewals is all that saves that item from being entirely too small in this day of high costs, to keep the freight equipment intact. Last year, for the first time in the history of the road, there was over $1,000 per mile spent on maintenance of way. This includes all charges under that account, that is, repairs and renewals of interlocking plants, block signals, bridges and culverts, buildings and fixtures, docks and wharves, fences, road crossings, signs and cattle guards and sundry miscellaneous charges, besides the direct charges for roadway and track which, as shown in the table, amounted even last year to only $866 per mile. As in the case of the St. Paul, which spends even less per mile on maintenance of way, the large proportion of branch line mileage and the

long stretches of road in prairie regions where for most of the year the traffic is light, goes far to explain this fact; yet in comparison with other high grade properties, the amount spent by the North-Western in maintaining its permanent property is astonishingly low.

Three new lines have been opened for traffic during the fiscal year: the extension from Casper, Wyo., west to Lander, 148 miles, bringing the westernmost terminus to within 200 miles of Pocatello, Idaho, on the Oregon Short Line; a relief and connecting line 123 miles long, north and west of Manitowoc, Wis., and a parallel double-track line 50 miles long from Milwaukee south to a connection with a similar line previously built extending north from Chicago, this last piece of construction giving the North-Western four main tracks between Chicago and Milwaukee. The extension from Pierre, S. Dak., on the Missouri river, west to Rapid City, 164 miles, has been opened for traffic since the close of the fiscal year. It is not, however, yet connected with the eastern lines because the bridge across the Missouri river at Pierre is not yet finished. This bridge is being built by the Pierre & Fort Pierre Bridge Railway Company. Its substructure of seven masonry piers is finished. The steel superstructure consists of four fixed spans each 350 ft. long and a draw span 445 ft. long. It is expected that the bridge will be opened for freight traffic by the end of next week. One or two other short extensions, which will be found listed in the Railroad Construction column, have also been undertaken.

Plans for the new passenger terminal in Chicago are indicated in the report. The new terminal is to have 16 tracks elevated above the plane of the street, with two elevated four-track approaches, one from the west and one from the north. The western approach will leave the elevated tracks of the Galena division (the division west toward Omaha) near Ashland avenue and run eastwardly 1.12 miles to Jefferson street. The northern approach will leave the elevated tracks of the Wisconsin division (comprising the lines running northwest and north from Chicago) near Carpenter street and run 0.90 miles southerly to Jefferson street, from which the combined tracks of the two approaches will run 0.3 miles to the terminal at Lake street. There was charged to construction in capital account during the year $196,640 on account of the new terminal, and the balance sheet shows a further item of $4,900,000, "Real estate in suspense and advances on account of the new Chicago passenger terminal."



Wheeling & Lake Erie.

The Wabash-Pittsburgh Terminal, the West Side Belt, and the two isolated lines of the Pittsburgh, Lisbon & Western, which company is carried in the Wheeling & Lake Erie's balance sheet at $418,719, are shown.

Various miscellaneous improvements were made during the year, including new freight terminal buildings at Omaha and an overhead highway bridge 1,757 ft. long across the new Proviso freight yard at Melrose Park, just out of Chicago on the Galena division. After the close of navigation this year a new iron ore dock 1,461 ft. long and 50 ft. wide is to be built at Ashland, Wis. There was an increase of $312,000, or over 600 per cent., in the item "repairs and renewals of docks and wharves" under operating expenses, due largely to extension of the company's coal dock at Ashland, Wis., and other similar improvements there.

Two purchases made during the year suggest the trend of the times in eliminating subsidiary companies dealing with the smaller and sometimes independent parts of railroad operation. At Milwaukee the railroad bought two grain elevators with a total capacity of 1,500,000 bu., which adjoin the North Western terminal in that city. The bridge company which has owned the railroad bridge across the Mississippi river at Clinton, Iowa, heretofore operated under lease, was also purchased.

The Chicago, St. Paul, Minneapolis & Omaha, which operates 1,700 miles of the North-Western system, had gross earnings of $11,000,000, net earnings of $5,000,000, net income of $2,800,000 and surplus for the year, after paying 7 per cent. on both its common and preferred stock, of $756,000. The Chicago & North-Western received $1,029,000 in dividends from its subsidiary.

The principal results of the last two years' operation of the Chicago & North-Western Railway are summed up in the following table:

	1907.	1906.
Mileage operated	7,551	7,429
Passenger earnings	$16,111,789	$14,441,415
Freight earnings	49,083,246	45,802,853
Gross earnings	68,878,931	63,481,578
Maint. way and structures.	8,904,941	6,864,898
Maint. of equipment	8,713,026	9,032,135
Conducting transportation	25,990,596	22,786,687
Operating expenses	44,789,025	39,789,009
Net earnings	24,089,906	23,692,479
Net income	15,740,566	14,800,553
Dividends	7,910,178	6,483,914
Betterments and additions		6,000,000
Year's surplus	7,830,388	2,316,639

Wheeling & Lake Erie.

It was in June, 1905, that B. A. Worthington, now First Vice-President and General Manager of the Wheeling & Lake Erie and the Wabash Pittsburgh Terminal, came to these properties. The Wheeling & Lake Erie, therefore, has now been two full fiscal years under the new management. The operating results obtained have been strikingly successful. The road's great handicap has been, and still is even more at present, lack of funds. The problem is not one of getting traffic but of taking care economically of business that can be obtained.

A year ago important improvement projects were under way. A new issue of $35,000,000 fifty-year, 4 per cent. bonds had been created and $12,000,000 of this issue used to secure $8,000,000 three-year, 5 per cent. notes which were sold in August, 1905, at 95. Part of the $7,600,000 cash thus obtained was used in paying off floating debts, the rest in putting under way various improvements. The most important of these were a cut-off from Bolivar, Ohio, northwest to Orrville, 22 miles, which was to reduce the distance between these points by 6.6 miles, maximum curvature from 9 to 3 deg. and maximum grade from 1 per cent. to 0.4 per cent.; and also a branch, 35 miles long, from the main line to Lorain, on Lake Erie. According to the annual report of a year ago, it was expected that both these new lines would be finished by the end of 1906. A good deal was done on each of them but some time ago work was abruptly stopped because of lack of funds. Not only was it still impossible to sell bonds, but the strongest railroads in the country had to give considerably better terms than those secured less than a year previous by the Wheeling & Lake Erie to place any of their short-term notes.

The balance sheet shows how much the Wheeling & Lake Erie is now in need of money. Cash on hand stood at $2,500,000 on June 30, 1906, against $659,000 a year later. Current liabilities on June 30, 1907, exceeded current assets by over $1,500,000. Although there is probably not a railroad in the country which could not at once profitably use new funds in improving its property, the Wheeling & Lake Erie is a conspicuous example of the handicap of lack of ready capital. The main line between Pittsburgh Junction and Huron Junction can scarcely carry any more traffic than it does, until it is double-tracked. During the busy months of the past year the traffic density on this stretch of single-track was at the annual rate of over 7,000,000 ton-miles per mile of road. The profitable economy of double-tracking this section has been conclusively proved by the records of the operating department, yet there seems to be no immediate probability that this work, the important grade reduction in the neighborhood of Massillon already referred to, or the completion of the Lorain branch where much profitable traffic awaits the road, can soon be carried out. With roads like the Pennsylvania and the New York Central postponing improvements because they cannot get funds, the Wheeling & Lake Erie has no chance at present of making satisfactory borrowings.

In spite of handicaps to economical operation, the operating results for the year were exceedingly satisfactory. In the year previous even with the loss of traffic due to the coal strike, gross earnings increased 15 per cent. and net earnings 63 per cent.; last year gross earnings again increased 15 per cent. and net earnings 28 per cent. Of the increase of $1,528,600 in the gross earnings of 1907 over those of 1905, 32 per cent., or less than one-third, was spent

for operating expenses notwithstanding increased costs for labor and materials, while 68 per cent. was saved for net earnings. As a result, net earnings per mile of road were $1,522 in 1907 against $2,164 in 1905, a gain of 109 per cent., while the operating ratio was reduced from 79 per cent. in 1905 to 71 per cent. in 1906, and 67 per cent. last year.

Such favorable results were brought about largely by that most important operating economy, increase in train and car loading. The average train carried 422 tons of revenue freight in 1905, 508 tons in 1906 and 605 tons last year, a remarkably high figure for a road with considerable branch-line mileage. Including company freight, the average trainload last year was 643 tons. The average loaded car-load has increased from 26 tons in 1905 to 31 tons last year. At the same time earnings per freight train mile have increased 78 cents in the past two years, while the cost of running a train one mile is larger by only 27 cents. The ton mileage increased 17 per cent. in 1907 over 1906, although only 4 per cent. more freight train miles were run. Compared with 1905, tons hauled one mile increased 49 per cent. last year, with an increase of only 4 per cent. in train mileage.

The passenger results show the effect of the two-cent passenger law in Ohio. While the volume of passenger traffic in 1907 was about the same as in 1905, there was a decrease of $46,366, or 7 per cent., in the passenger train earnings in the two years. The average receipts per passenger-mile were $1.81 in 1905, $1.81 in 1906, and $1.66 in 1907.

Detailed figures for the four principal operating expense accounts are given this year for the first time. There was somewhat less spent on maintenance of way than in the previous year. Maintenance of equipment on the other hand was larger by 19 per cent., due, according to Mr. Worthington, "to the large increase in volume of traffic handled and increased equipment to be taken care of with little increase in facilities for keeping it in repair." From the tables given in this year's report it is possible to work out the amounts spent by the Wheeling & Lake Erie for maintenance per unit of track and of equipment during the last four years. These figures are given in the following table:

Unit Maintenance Expenditures 1904 to 1907.

	1907.	1906.	1905.	1904.
Maintenance of way per mile	$1,618	$1,793	$1,657	$1,555
Repairs and renewals				
Per locomotive	2,007	1,595	1,662	2,091
Per passenger car	435	735	612	721
Per freight car	35	31	26	28

Interest in this table centers in the equipment maintenance. It is evident that, taking the last four years as a whole, the equipment has been undermaintained, particularly the freight cars. The inventory of freight equipment seems to prove this point as, instead of the expected increase in number of freight cars which so busy a year as 1907 would be likely to demand, there are 147 less freight cars listed. There is, however, a discrepancy between this table and a statement in the first part of the report that during the year 2,009 new gondola cars of 100,000 lbs. capacity were added to the equipment. These are not shown in the inventory. They appear to be cars leased from the Wabash, for which $195,000 is included in the income account as rental. It is not likely that this item of rental includes the ordinary maintenance of these cars, therefore they have been added to the total freight car equipment as of June 30, 1907 shown in the inventory to get the total figure used in working out the figure for maintenance per freight car in 1907. If these 2,009 cars had not been included—and perhaps as they were new cars and may have come to the Wheeling & Lake Erie late in the fiscal year, it would have been equally fair not to include them—repairs and renewals per freight car for 1907 would have amounted to $41 instead of $35 as shown in the table. This does not affect the general conclusion, however, that the road has been and is spending less for maintenance than is necessary to keep its equipment in proper condition.

A statement of classified tonnage is also given for the first time in this year's report. This shows that products of mines make up 70 per cent. and manufactures and merchandise 23 per cent. of the road's total tonnage. There was a particularly large increase last year in the tonnage of bituminous coal and bar and sheet metal carried. The total revenue tonnage was 9,608,590 tons, against 8,571,240 tons in 1906. An unusual figure included in the report is the percentage of "unbalanced" traffic, that is business moving in one direction for which no equivalent traffic was moved in the opposite direction, a class of traffic which tends to reduce train loading and economy of operation. This was 32 per cent. of the total traffic in 1905, 38 per cent. in 1906 and 41 per cent. last year. With this increasing difficulty to contend with, the showing of the operating department appears even more satisfactory. The average net tonnage per locomotive-mile was 571 tons against 633 tons per train-mile. Gross tonnage per train-mile—a figure not often given—was 1,298 tons and gross tonnage per locomotive-mile 1,169 tons.

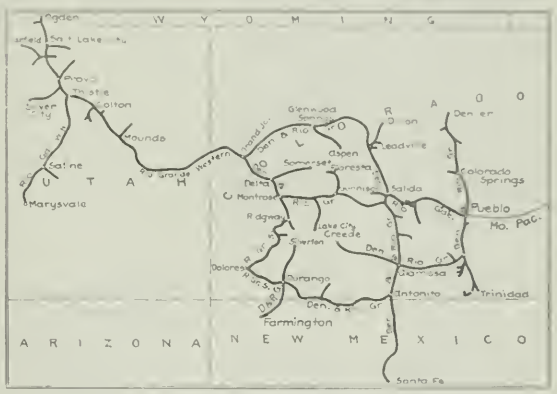
The showing of the Wheeling & Lake Erie is particularly interesting because its operations are not so large as to obscure a comprehensive view of the happenings of the year. With something like microscopic clearness, it represents in many ways the situation of the other railroads of the country. It has plenty of [illegible] and is well operated but suffers a severe [illegible] because its traffic has outgrown its facilities and it cannot borrow money to make improvements which would soon pay for themselves in greater efficiency of operation.

The following table sums up the growth of the property during the last three years:

	1907.	1906.	1905.
Mileage worked	442	442	442
Gross freight earnings	$[illegible]	$[illegible]	$[illegible]
Gross passenger earnings	[illegible]	[illegible]	[illegible]
Passenger per mile	[illegible]	[illegible]	[illegible]
Gross earnings	[illegible]	[illegible]	[illegible]
Maint. of way and [illegible]	[illegible]	[illegible]	[illegible]
Maint. of equipment	[illegible]	[illegible]	[illegible]
Conducting transportation	[illegible]	[illegible]	[illegible]
Operating expenses	[illegible]	[illegible]	[illegible]
Net earnings	[illegible]	[illegible]	[illegible]
Net income	[illegible]	[illegible]	[illegible]

Denver & Rio Grande.

The Denver & Rio Grande this year presents a strong showing. Both Colorado and Utah enjoyed general prosperity. Labor was peacefully employed at good wages and the mining industries from which the road gets 80 per cent. of its tonnage and 50 per cent. of its revenue, were prosperous. At the same time there was a large movement of general traffic; manufactures, merchandise and general merchandise furnishing together 11 per cent. of the tonnage and 53 per cent. of the revenue, against 9 per cent. of the tonnage and 30 per cent. of the revenue in 1906. Instead of cutting down appropriations for betterments and new equipment, as several other roads did last year, the Denver & Rio Grande increased its appropriations for these purposes by $375,000, with a total of $1,525,000 devoted



Denver & Rio Grande.

to such purposes. The use of most of the net income in this way is justified by President Jeffery for two reasons; first, because securities cannot be sold except at great sacrifice, and, second, because the authorized bond issues are not far from used up. The total of unissued bonds available for additions and improvements is about $3,100,000—$2,100,000 Denver & Rio Grande first-mortgage 4 per cents. and $1,000,000 Rio Grande Western first consolidated mortgage 4 per cents.

Comparison is made between the condition of the property last year and in 1896, 11 years earlier. The reason for selecting 1896 for comparison is because that year marked the resumption of dividends on the preferred shares (at the rate of 2 per cent. instead of at the present rate of 5 per cent. a year) after the trying period from 1893 to 1895. During the 11 years, improvements and additions have been made from income at a cost of over $12,000,000, an average of more than $1,000,000 a year. During this period gross earnings increased 114 per cent. and net earnings 96 per cent. With an increase of only 33 per cent. in fixed charges, 200 miles of narrow gage line were changed to standard gage and 375 miles of line added to the mileage of the road. The mileage of second track increased 121 per cent., the number of locomotives 46 per cent. and their tractive power 110 per cent.; the number of freight cars 72 per cent., and their tonnage capacity 115 per cent. This is a record of steady advancement if not of extraordinary progress.

The gross earnings last year were $21,400,000, an increase of $1,700,000 or 9 per cent. over 1906. Operating expenses increased $1,150,000, leaving net earnings of $8,150,000, an increase of $575,000 or 8 per cent. The gross earnings per mile were $8,564, nearly $4,000 a mile more than for the year ended June 30, 1896, and net earnings per mile were $3,263, or about $1,350 a mile more than 11 years earlier. Of the increase in gross earnings, $1,280,000 came from freight; $345,000 from passenger, and $99,000 from express, mail and miscellaneous earnings.

The maintenance charges were about the same as in the pre-

ceding year except that a great deal more was spent on repairs and renewals per freight car. Maintenance of way and structures per mile cost $940, against $975 in 1906 and $826 in 1905; repairs and renewals were $2,275 per locomotive, against $2,277 in 1906 and $1,970 in 1905; $500 per passenger car, against $607 in 1906 and $466 in 1905; and $76 per freight car, against $67 in 1906 and $44 in 1905. In judging the maintenance of way figure it must be remembered that 795 out of the 2,500 miles operated are narrow gage; the maintenance of equipment figures also include as large or a larger proportion than this of narrow gage equipment. Therefore, figured on standard gage line and equipment, the unit charges would probably be somewhat higher.

Conducting transportation rose from $6,600,000 to $7,400,000, an increase of 12 per cent. Every item but three under this account shows an increase. The largest of the three decreases is in "injuries to persons," due to the large increase in this item in the previous year because of the disastrous collision at Adobe, Colo., on March 16, 1906; the other two decreases are small, one in advertising, the other in "other expenses." The principal increases were in engineers and firemen, fuel for locomotives, roundhouse men, freight train service, passenger train service, station service, and switchmen, flagmen and watchmen. Per diem payments rose from $204,000 in 1906 to $308,000 last year, an increase of 51 per cent.

Apparently the Denver & Rio Grande is one of the roads on which the recent car shortages have fallen most heavily. "Clearing wrecks" rose from $39,000 in 1906 to $69,000 last year, an increase of 77 per cent., which suggests the increasing laxity of railroad operating labor.

Two new extensions in the Bingham district, Utah, to the newly developed mines and smelters in that region were finished during the year and are now in operation. Already it has been necessary to improve them because the tonnage of low-grade ores to be moved from the mines to the smelters has rapidly increased. The two branches are together 28 miles long, and about $245,000 Rio Grande Western 4 per cent consolidated mortgage bonds were issued during the year on their account.

In regard to the Western Pacific, President Jeffery says that work has been delayed by the general scarcity of labor, a difficulty accentuated in its case by the demand for men in San Francisco following the earthquake and fire of April, 1906. On June 30 there were 177 miles of track laid and grading was being done faster than it had been during the preceding 10 months or a year. There has been slow progress at certain important tunnels which must be finished before the through line can be opened. As these threaten to delay the whole work, especial attention is now being given to hurrying this branch of the work and the contractors have been pressed as strongly as possible to make more satisfactory progress. It is hoped and believed that the Western Pacific will have a continuous line of rails from Salt Lake City, Utah, to Oakland, Cal., by September 1, 1908, or very soon thereafter.

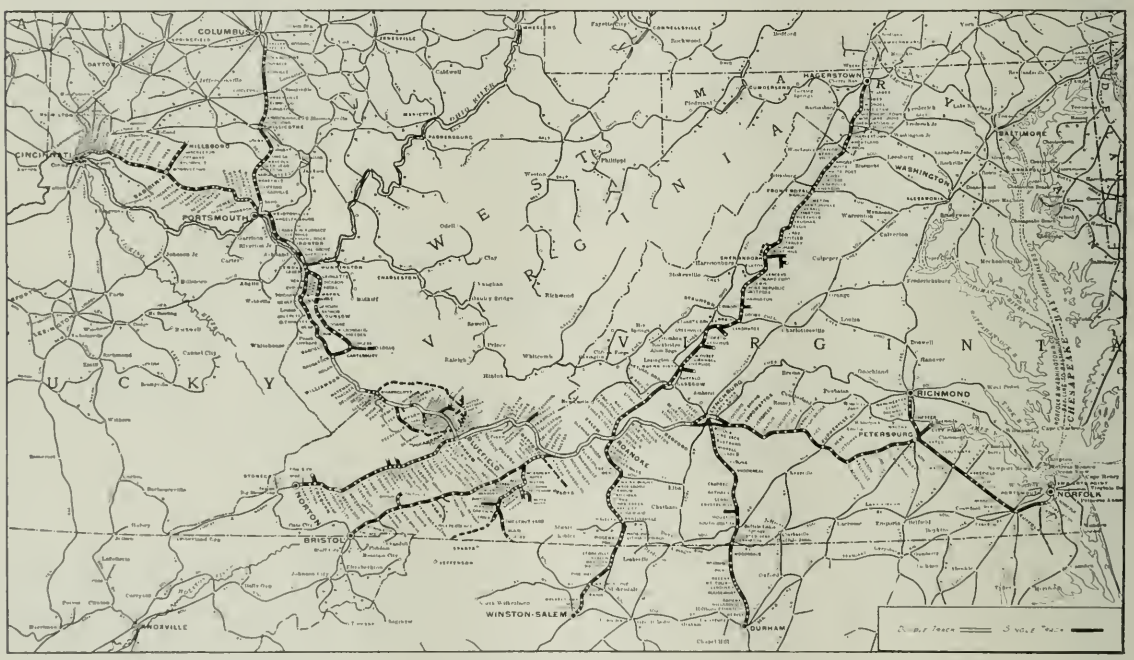
The results of the last two years' operation are summarized below:

	1907.	1906.
Mileage worked	2,500	2,477
Passenger earnings	$4,954,159	$4,609,428
Freight earnings	15,223,165	13,943,556
Gross earnings	21,409,042	19,686,115
Maint. way and structures.	2,349,841	2,415,353
Maint. of equipment	2,940,743	2,566,411
Conducting transportation.	7,418,699	6,621,986
Operating expenses	13,252,142	12,104,172
Net earnings	8,156,929	7,581,943
Net income	4,176,797	3,712,474
For betterments, etc.	1,645,000	1,270,000
Year's surplus.	244,944	156,839

Norfolk & Western.

During the past year the dividend rate on Norfolk & Western common stock was again increased, so that now 5 per cent. annually is being paid instead of 4 per cent. as in the year before and 3 per cent. in 1905. The road's statement, however, shows a distinct recognition of the present strained condition of the market for railroad funds and of the general uncertainty as to the future of the financial and industrial situation. Extension projects which were spoken of in the report of a year ago as "important improvements yet to be undertaken" are not mentioned at all this year. Smaller appropriations are made out of the surplus income of the year for betterments and equipment than in the year previous. The company is evidently holding cash and postponing improvements. As a result of this policy, the cash on hand stands at $4,400,000, against $4,150,000 on June 30 of the year before and $6,300,000 in 1905. The cash item for 1907, however, will be almost doubled on receipt of $4,076,000 in deferred instalments of payments on the new convertible bonds which were issued during the year.

Last fall the stockholders authorized $34,000,000 convertible 4 per cent. bonds. Of this amount $14,576,000 was offered to stockholders at par last December. Not all was taken by them, but as the issue was underwritten, the company obtained cash for the whole amount, less the underwriter's commission. Stockholders' payments for the bonds were to be made, 10 per cent. on January 31, and 60 per cent. on May 31. From the item shown on the balance sheet, of $4,076,000 deferred instalments on these bonds, it appears that part of the underwriting agreement must have been the postponement of part of the underwriters' payments until some date later than June 30. The $10,000,000 which was earlier paid in had apparently already been used by that date. It is reflected in an increase of $18,000,000 in the assets of the company over June 30, 1906. The Norfolk & Western, like all the other railroads which secured new funds at the end of 1906 on terms which then seemed



Norfolk & Western.

liberal, was fortunate to have made its arrangements at that time, for it could hardly have obtained money three months or six months later, and the record shows that the whole amount of these funds was urgently needed to care for the needs of the property, which were expanding with or faster than the earnings.

Gross earnings in 1907 were $31,200,000, against $28,500,000 in 1906, an increase of 9 per cent. Operating expenses, however, increased 15 per cent., the actual increase being almost as much as the increase in gross earnings. In consequence, net earnings were $11,650,000, a gain of only $227,000 or 2 per cent. over the previous year. There was an increase of 15 per cent. in fixed charges, which included taxes heavier by 35 per cent. than in 1906, and, as a result, net income was only $7,000,000, against nearly $7,500,000 in 1906. Common stock dividends were larger by over $600,000 than in 1906, but the betterment appropriation was only $250,000, as against $2,250,000 in the year before, the equipment appropriation, however, being $996,652, as against $700,000 in 1906. These appropriations together were smaller by $1,703,348 than in 1906. In this way in spite of an increase of nearly $500,000 in the amount charged against income for discount on bonds, final surplus for the year was kept at about the same figure as in 1906. If the management could have foreseen the present state of the railroad financial market and the tremendous increases which were to come in the cost of railroad operation, it is probable that they would not have increased the rate of distribution on the common stock as they did, although, thus far at least, the Norfolk & Western is clearly able to pay that amount, having earned 7 per cent. on the common stock last year after appropriations for betterments and other miscellaneous charges, and 9 per cent. if these deductions are included in the surplus after preferred dividends.

There was an increase of 16 per cent. in passenger earnings, due to an increase in number of passengers carried and slight increases in the passenger haul and passenger-mile rate. Freight earnings increased 8 per cent. owing to the same three causes in similar proportions. For the first time in a number of years there was a decrease in the trainload, which fell from 579 to 569 tons.

There was a small decrease in coal shipments and in shipments of pig and bloom iron, while coke tonnage showed a small increase and ore tonnage an increase of 11 per cent. The largest other tonnage increases during the year were in grain; stone, sand, etc.; lumber; cement, brick and lime, and merchandise.

The principal cause for the large increase in operating expenses was the much greater cost of conducting transportation, which increased from $8,400,000 to $9,800,000, a gain of 17 per cent. Some of the comparative figures for the two years under the operation branch of this account were as follows: Station service (freight), $627,000, against $493,000 in 1906; yardmen, $438,000, against $347,000 in 1906; passenger trainmen, $203,000, against $177,000; road enginemen and firemen (freight), $1,691,000, against $1,413,000; other supplies for locomotives, $101,000, against $74,000; elevator and longshore labor, $175,000, against $133,000; loss and damage, $366,000, against $208,000; clearing wrecks, $121,000, against $99,000. Here are clearly shown the large cost of supplies, the greater cost and smaller efficiency of labor, and the general decreased efficiency of operation which is likely to come with great increases in business.

The maintenance accounts both show increases. Maintenance of way per mile rose from $1,856 in 1906 to $2,077 last year. Besides this there was $2,194,000 spent for construction betterments out of the Betterment Fund which has been set aside out of the surplus earnings of this and previous years. Maintenance of equipment as a whole included $813,000 for replacements and $160,000 credited to the equipment fund, about the same total amount as was charged in the previous year. Not including replacements, repairs cost $1,921 per locomotive, against $2,203 in 1906; $690 per passenger car, against $677 in 1906, and $55 per freight car, against $51 in 1906. Considering that these include repairs only, the amounts spent are liberal.

A year ago contracts had been let for building two single-track branches which together were to furnish a new low-grade line south of the city of Lynchburg, Va., shown on the map. The company's right to apply the power of eminent domain in building this cut-off under the guise of two new branches, was questioned in the courts. The Supreme Court of Appeals of Virginia decided that the railroad did not have the power to condemn land for these two branches whose dominant purpose was to relieve traffic congestion, as construction of auxiliary sections of road for the purpose of relieving traffic congestion was not within the branching powers of the company. This decision necessitated the organization of the Lynchburg Belt Line & Connecting Railway Company to which the Norfolk & Western is to sell this cut-off line in consideration of the sum of $2,748,785—its estimated cost—which is payable February 1, 1913, with interest at 5 per cent. from February 1, 1908. A trackage agreement is to be made with the Lynchburg company for use of its tracks. The cut-off, which is to be finished about the end of this calendar year, will be about 22 miles long.

President Johnson sums up the present railroad situation as it affects his property as follows:

"The policy of your management has been to supply adequate facilities [illegible] fully employ all such facilities were they now completed and in use.

"The rapidly progressing development of the [illegible] territory tributary to your lines makes it increasingly evident that the demand on your management for transportation cannot be properly met without complete double-tracking of the line from [illegible], Va., to [illegible], Ohio, which will involve the construction of 150 miles of second track in addition to that already authorized, and such additional passing sidings and other facilities east of [illegible] and elsewhere, and such equipment as may be necessary to maintain the proper equilibrium in the carrying capacity of the system.

"This work, while important to the interests of the stockholders, is equally important to the welfare of the commonwealths traversed by your lines, and of their citizens who are striving to develop the natural wealth of their states and to broaden the market for their mineral and other products. It therefore goes without saying that any policy which hampers the development of the railroads, or by depleting their revenues lowers their credit and thus repels investors who would otherwise purchase their securities at fair prices, cannot but be fraught with disaster both to the states and to the roads. It is not believed that such a policy will commend itself to the dispassionate judgment of the communities served by your lines, or that in the effort to correct abuses that may exist, unjust treatment will be accorded to corporations that are honestly endeavoring to fulfil the purposes for which they were chartered. It is only 11 years since your railroad passed through a receivership and foreclosure and a drastic reorganization, and it certainly cannot be seriously claimed that the small dividends since paid to the shareholders have yielded even a just return on its capital. The owners of your property are entitled to the same good faith which is properly exacted from them, and no temporary prejudices or misunderstandings can excuse or justify action which would deprive a railroad shareholder of the rights and remedies which are guaranteed to all classes of the community. It was with this conviction and in the performance of a duty imposed upon your board of trustees for the shareholders, that it felt itself constrained to take the legal proceedings recently initiated in Virginia for the protection of your interests in connection with the proposed reduction of your rates on passenger traffic; and it is a matter of congratulation that with the concurrence of the representatives of the Commonwealth of Virginia, an arrangement was reached whereby a speedy determination can be had of the important questions at issue without, it is hoped, undue damage to your property."

The principal results of the last two years' operation are summed up in the following table:

	1907.	1906.
Mileage worked	1,876	1,853
Passenger earnings	$4,163,119	$3,598,558
Freight earnings	26,100,946	24,111,891
Gross earnings...............	31,164,381	28,487,706
Maint. way and structures.	3,895,548	3,439,797
Maint. of equipment	5,239,899	4,749,832
Conducting transportation .		
Traffic	537,674	441,678
Operation	9,256,228	7,913,695
Operating expenses	19,514,536	17,064,624
Net earnings	11,649,846	11,423,142
Net income	7,000,319	7,452,375
For betterments and equipment	1,246,652	2,950,000
Surplus for the year	671,552	589,926

NEW PUBLICATIONS.

Electrical Engineering. By E. Rosenberg. Translated from the German by W. W. Haldane Gee and Carl Kinzbrunner. New York: John Wiley & Sons, 347 pages; 6 in. x 9 in.; 333 illustrations; cloth. $2.00.

The book had its origin in a series of lectures delivered by the author, who is chief electrical engineer for the Messrs. Körting Bros. at Hanover, to the workmen and the staff associated with him, so that it is intended for readers of the same class who are interested in the subject but who have not had the advantages of a technical training. In accordance with this general plan the language used is exceedingly simple and readily understood, and the book is, to a great extent, free from mathematical formulae. In fact, they are only used after the theory of the subject in hand has been thoroughly explained. For this reason several matters have been dealt with very completely which, to the mathematically educated man could have been explained in a few lines. The book is exceedingly happy in its elucidation of the general principles with which it opens. It states the facts of the generation of the electric current by a simple galvanic cell, and follows it up consecutively until, if the text is followed carefully, the reader will have a clear idea of the magnetic field, of such instruments as the galvanometer, the solenoid, the ammeter, voltmeter, and of conductors and their insulation, by the end of the first chapter. Not such an idea, to be sure, as would enable a man to design any of these instruments but such that he would understand the principles of their action. Indeed this is what the book teaches. With dynamos and other electrical machines, the reader is taught the principles and mechanics of their construction, but no attempt is made to give information to enable a designer to calculate the wiring of a transformer for example. The scheme for the wiring of electrical machinery is exceedingly difficult to picture to the mind's eye, and here, as in other works of the kind, recourse is had to

diagrammatic representations of the windings and circuits, which are quite different in appearance from the actual machine, so that in this there is no attempt to make a workman, since this is not an instruction book of that sort, but the descriptions are such that an intelligent reader should be able to recognize general types at sight.

Illustrations are given throughout of types of machines made by different builders, but they are not described in detail as the author very sensibly says, in the preface, that such descriptions are readily accessible to interested parties in the business catalogues of the firms which are engaged in their exploitation.

As an example of the character of the work the method of handling the subject of alternating currents can be cited. The author shows how the alternating current is that produced by the earliest machines and cites a number of very simple experiments to illustrate its action and how in this it resembles the direct current, and yet how it differs therefrom, notably in the case of the illumination of the incandescent lamp. Then comes the effect in producing induction currents, followed by the details of the operation of these machines and that through more than a hundred pages of text with only four or five references to mathematical computations and then only after the principles of action had been fully explained. It must not be thought from this that the book is a popular discourse that utters much and says little. The text is clear, concise, consecutive in its arrangement, and requires close and concentrated attention for its proper comprehension. But, given this the careful reader will be repaid at the end by receiving a clear idea of ordinary electrical phenomena and the machinery by which those phenomena are produced and controlled.

CONTRIBUTIONS

Depreciation.

Baltimore, Md., Sept. 18, 1907.

To the Editor of the Railroad Gazette:

There are one or two points in connection with the establishment of depreciation rules for railroad property under the guidance of Mr. Henry C. Adams in charge of Statistics and Accounts for the Interstate Commerce Commission which seem eminently worthy of the widest discussion and consideration that can be given them.

So far as rules have been formulated, amounts appropriated for depreciation are not to be spent in replacing the identical property for which the amounts were appropriated but may be used to replace property of the same kind. The language of Mr. Adams' circular is "an accumulation of engines A, B, C, D and E may be expended to replace engine F and need not be kept as a reserve until engine A or B or C or D or E goes out of service." A consideration of this language makes it evident that numerical replacement is not to be a governing principle in railroad depreciation and that provided accumulated moneys are expended in replacing property of the same kind as that on which the moneys were accumulated it matters not what the product of the expenditure shall be. From this it would appear that railroad managers can argue that if they have, for instance, accumulated $800,000 and against that sum desire to retire one thousand 60,000-lb. cars from service they can spend the $800,000 in the purchase of six hundred 100,000-lb. cars and still maintain the earning capacity of the equipment; for 30 tons multiplied by 1,000 equals 30,000 tons carrying capacity and 50 tons multiplied by 600 equals 30,000 tons carrying capacity. This is all right for the interests of the railroad and the very large shipper, but it evidently neglects the growing needs of the country as a whole except on the theory that interests are to be more and more consolidated and the number of independent small shippers, including the vast farming community, is to decrease. It is questionable, however, in view of present movements in every direction whether this is a sound view to take of future developments, and if it be not then provision should be made for numerical replacement of equipment and no larger number of cars retired from service than accumulated funds will purchase at current prices. This need not prevent the purchase of cars of larger capacity provided the price per car did not exceed the limit of its

There is, however, such a thing as flogging a willing horse to death, and it may be that the establishment of renewal and depreciation funds for such items as ties and rails is going a little too far. That such funds have existed in certain directions in times past is true, but that they are absolutely necessary in the sense that they are so for the replacement of equipment is entirely dependent on the amount of money currently put into the track and included in operating expenses.

Consideration of the essential nature and properties of the articles on which accumulations are to be made seems necessary. A car is an entity complete in itself. A rail for any railroad purpose is not an entity. The track is the entity corresponding to the car. It is known from experience that a car undergoes a slow process of decline despite all the work that can be put on it until it reaches extinction and death, and at that last moment its value to the railroad vanishes, though up to that moment its value was practically as much as at the moment of its birth. Now against this catastrophe provision must be made by depreciation. But does this unavoidable process of gradual decay attach to the existence of a track? In the very nature of the case it would seem the answer must be in the negative for a gradually decaying track would put all the trains in the ditch and bring the whole machine to a standstill. Therefore it would appear that the railroads have been under the positive necessity of maintaining if not improving their tracks currently, and that being the case it seems necessary to establish a *raison d'être* for renewal and depreciation funds for ties and rails.

M. N. Wild,
Statistician, Baltimore & Ohio.

Steel Ties in Germany.

Osnabrück, Aug. 2, 1907.

To the Editor of the Railroad Gazette:

In the current volume of the *Organ für die Fortschritte des Eisenbahnwesens*, p. 190, there appeared an article on "The Behavior of Steel Crossties," giving a brief report, taken from the *Railroad Gazette*, March 1, 1907, of the derailment of a train on Feb. 22 at Mineral Point on the Pennsylvania Railroad on an experimental section of track laid with steel ties. The report concludes with the statement that the committee appointed to investigate the accident was unable to determine with certainty the cause of the derailment, but suspected that at the point at which the derailment began some object had become wedged between the flange of one of the wheels and the rail, thus producing a violent lateral blow. As it was very cold at the time and the steel ties and fastenings were rigid, this lateral blow caused a shearing of the bolts holding down the outer side of the outside rail. The committee, being of the opinion that if the ties had been of wood the resulting damage would have been less severe, it was decided to remove the 3,000 steel ties laid in that part of the track, replacing them with wooden ties.

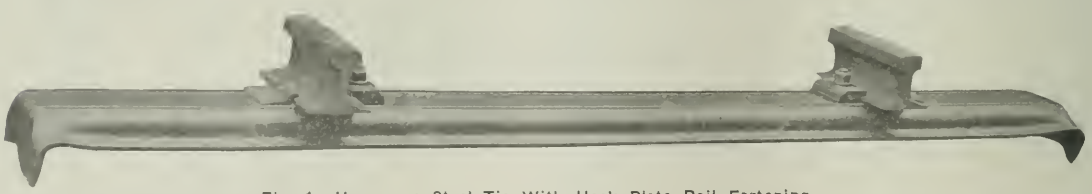


Fig. 1—Haarmann Steel Tie With Hook Plate Rail Fastening.

While it is, of course, impossible for me, without having made a personal examination of the track, to offer a definite opinion as to the cause of derailment, still, having had a long and extensive experience in connection with metal tie superstructure, I venture to submit some information on the subject which may possibly be of interest to many of your readers.

When we began to use metal superstructure in Europe, we suffered many disappointments. It is not as easy as it appears to determine the proper shapes for metal ties and their fastenings. A superstructure equipped with them should have a greater capacity and a longer life than is obtained by the use of wooden ties. It was necessary to determine gradually by means of practical experiments and from the results of operation, those conditions which a metal tie must satisfy. As such are to be considered:

1. Sufficient area in contact with the ballast in order that the pressure on the ballast may not be excessive.

2. Sufficient carrying capacity and length, so that the pressure may be equally distributed.

3. Protection of the upper surface against friction and stresses for to guard against deformation and rupture.

4. Large surfaces of contact at points of attachment, to prevent rapid wear.

5. Relieving points of attachment from secondary strains, e. g., of bolts from side pressure or shearing strains, in order that they

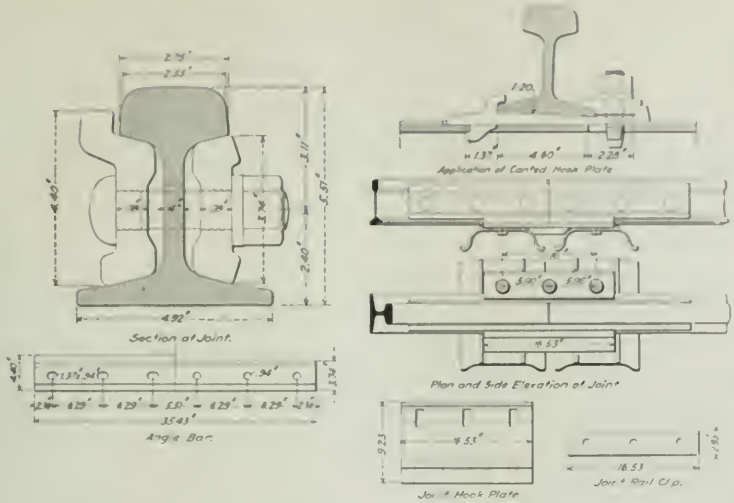


Fig. 2—Details of Standard Track; Oldenburg State Railroads.

may safely fulfill the purpose for which they were designed.

In 1893 the exhibit of our Track Museum in the transportation building at the Columbian Exposition at Chicago met with marked approval by American engineers. Even then the increasing difficulty of obtaining wooden ties, due to the rapid decimation of the forests in the United States, was already bringing into prominence the question of finding a suitable substitute for the wooden tie. The U. S. Forestry department, through Mr. Fernow, had already undertaken a careful study of all the experiments with metal ties that had been made in different countries up to that time.

The samples of many different designs of metal ties exhibited by our Track Museum were taken from tracks where they had been submitted to actual service, and were viewed with considerable interest by American railroad engineers. From the experiments that have been made in recent years by different American railroads, I think I am warranted in the conclusion that in the course of the last 14 years the introduction of some substitute for wooden ties has, in some sections, become a pressing necessity.

I can readily understand that your designers should undertake the solution of this difficult and economically important problem with a certain self-reliance. As already indicated, we in Europe have, in the course of many years, experienced many failures, the reports of which have undoubtedly reached you. Therefore the endeavor to do better is a great incentive to the American engineer. Still, I cannot believe that you will escape disappointments and failures any more than did we when, on the first introduction of metal ties, lacking all experience and without precedents for guidance, we were compelled to go ahead with boldness and self-reliance. Now, however, after years of experimenting and improving, we are happily past the apprentice stage. Whoever in Germany desires to use metal ties has now at his disposal samples of construction that have stood the test of practice. This is convincingly evidenced by the fact that the use of metal ties on German railroads increases from year to year in spite of the fact that during their development defects that had to be overcome were constantly manifesting themselves. According to official statistics there were laid

Year	Metal ties	Year	Metal ties
1902	23,696,000	1905	26,576,000
1903	24,440,000	1906	27,008,000
1904	25,272,000	1907	25,227,000

The statistics for 1906 and 1907 have not yet been published but the consumption has again increased. The so-called "hook plate" has been adopted for many years by the Prussian State Railroad as the standard attachment for metal tie superstructure. Therefore when I state that from 1882 to the end of 1905 58,000,000 of these hook plates have been used in connection with 15,000 miles of track it is evident that we in Germany are beyond the experimental stage, though, to be sure, there is no end of learning, and one must always be ready to adopt improvements. In view of these facts, it will be doubly interesting for your readers to study our newest construction of metal tie superstructure shown by the accompanying drawings of the superstructure we are at present furnishing the Oldenburg State Railroads and which is to be used on a section of 25 miles. The ties

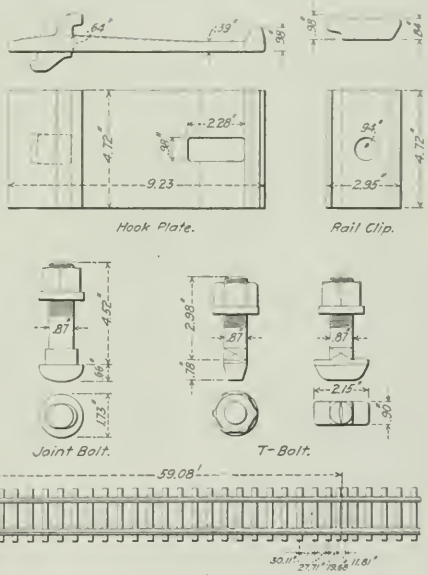


Fig. 3—Details of Standard Track; Oldenburg State Railroads.

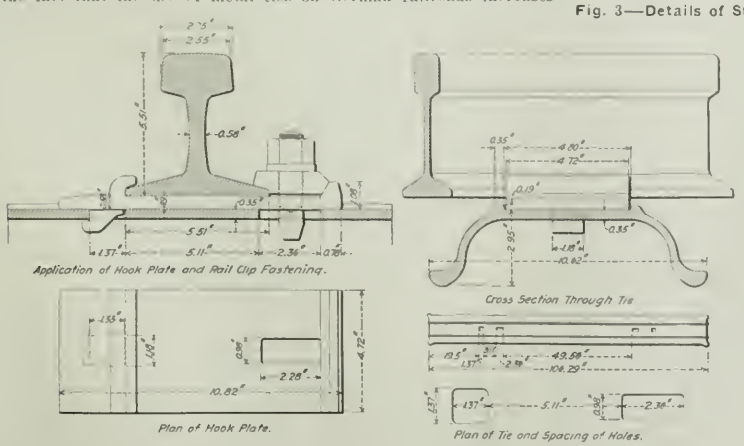


Fig. 4—Haarmann Steel Tie and Hook Adapted to American Track.

are 8 ft. 10 in. long, 10⅝ in. wide, are spaced 30 in. center to center, and weigh about 195 lbs.

The new feature of these ties are two ribs or strips "a" on the upper surface, between which the bearing plates are firmly held. The Würtemberg State Railroads have also equipped a section of road with these so-called "rib ties," as have also the Prussian State Railroads on the Elberfeld-Breslau division. These two ribs offer so great an advantage that the Prussian Railroad administration has adopted them for use on its ties, retaining, however, the width of 9⅛ in. for intermediate ties, while for supporting the joints it is proposed to introduce ties 19 in. wide. The Prussian rib ties are, however, spaced closer, about 22⅛ in., a spacing that corresponds more nearly to American practice. As a consequence of the large number of ties in the Prussian spacing, and also to the somewhat greater weight of rails, 91½ lbs. per yd., the total weight of the Prussian superstructure per yard of track is 453 to 463 lbs., while that of the Oldenburg superstructure, with rails of

86 lbs. per yd., is 411 lbs. The attachment of the rail to the tie is practically the same. Between the foot of the rail and the tie is placed the so-called hook plate or hook stud-plate mentioned above. These hook plates protect the upper surface of the tie against strains and friction, render a special securing of the outside of the rail by means of screw bolts unnecessary, and relieve the clamplate screws on the inside of the rail of all lateral stress. I should imagine that a similar construction would be of value for American conditions, with the possible change of substituting plates of uniform thickness, thus furnishing a horizontal supporting surface to suit the vertical position of the rail customary in America. This change is shown in Fig. 2. With this construction, shearing of screw bolts cannot easily occur, even from side lash occasioned by oscilylation of the engine.

DR. ING. N.C. A. HAARMANN,
Geheimer Kommerzienrat.

The Work of the Cole Superheater.

Prof. W. F. M. Goss presented a paper before the Indianapolis meeting of the American Society of Mechanical Engineers, giving, in outline, the results of tests of the Cole superheater as applied to the locomotive in the testing laboratory of Purdue University.

For the purpose of observing performance, thermometers reading to 750 deg. F. were inserted in each of the two branch pipes extending between the superheater and cylinders, in the discharge side of all loops, six in number, the length of which varied from the normal, and in the upper loop of the right-hand upper flue, which loop is of normal length. All thermometers were in wells thoroughly jacketed by a current of steam flowing from the stream, the temperature of which was sought.

The results show that the degree of superheat in the steam delivered to cylinders is largely affected by the rate of evaporation. Thus in Fig. 1 the average degree of superheat as shown by readings taken from the two branch pipes is plotted against the rate

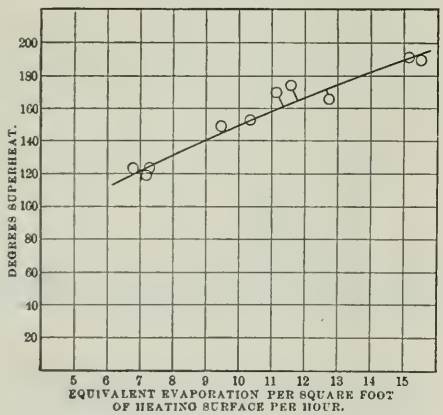


Fig. 1.

of evaporation. It shows that as the evaporation per square foot of heating surface per hour is increased from 7 lbs. to 15 lbs., the degree of superheat rises from 122 deg. to 188 deg. F., due doubtless to the fact that the superheating surface, as compared with the direct heating surface, absorbs a greater portion of the total heat as the rate of evaporation increases. For all tests represented upon this diagram each pound of steam delivered received from the direct heating surface approximately 1,160 B.t.u. and from the superheating surface from 70 to 104 B.t.u. depending upon the rate of power at which the boiler was worked.

Another expression of the fact to which attention has already been called is well set forth by Fig. 2 which shows the per cent. of the total heat taken up by the water and steam which is absorbed by the superheater, plotted in terms of smoke-box temperature. It will be seen that as the temperature of the smoke-box changes from 600 deg. F. to 800 deg. F., the heat absorbed by the superheater rises from 5.6 per cent. to 8.5 per cent. of the total taken up by the water and steam.

The degree of superheating obtained from loops of different lengths is shown graphically by Fig. 3. It will be seen that the amount of superheating obtained increases rapidly as the loop is increased in length. This results from the fact that each increment in the length of the loop carries the superheating element nearer the firebox and serves to increase the average temperature to which the whole loop is exposed. The effect therefore is twofold; first, that resulting from an increase of superheating surface, and second that resulting from an exposure of that surface to a higher average temperature. The basis for these observations (Fig. 3) was supplied by the superheating loops arranged in three flues making up a portion of the left-hand vertical row. The lower loops in those flues were, respectively, 80 in., 92 in. and 105 in., while the upper loops were, respectively, 71 in., 84 in. and 96 in. A review of the plotted points at once discloses the fact that a higher degree of superheating is obtained from the lower loop of a given length than is possible from an upper loop of the same or even greater length. Comparing results as obtained, it appears

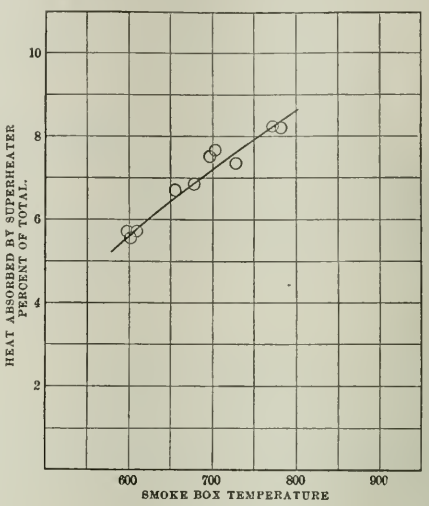


Fig. 2.

that the lower loop in a given flue, while but a few inches longer than the upper loop, gives from 25 to 30 per cent. more superheating effect. This probably is to be accepted as a measure of the advantages which come to that element of the superheating surface which is first to receive the flow of the current of moving gases, though it is not impossible that the lower loop may claim some advantages from its position in the flue.

It has been observed that the average temperature of the steam in the two branch pipes is always less than the calculated temperature, assuming all superheating loops to give the same performance as those which are under observation. A reason for this must be

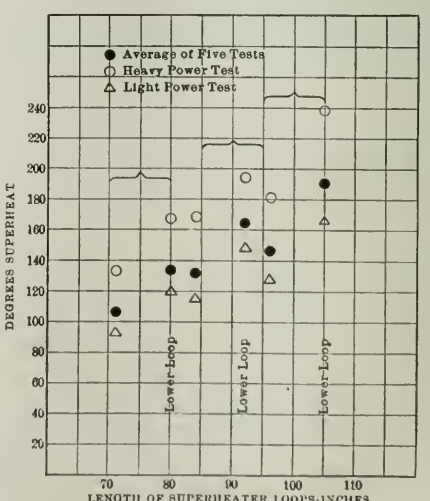


Fig. 3.

found in the difference in the volume or quality of the furnace gases transmitted by the several flues.

CYLINDER PERFORMANCE.

While a full analysis of the cylinder performance of the locomotive must be reserved for another time, it is proper here to note that when served with saturated steam (locomotive "Schenectady No. 2"), its performance under normal condition of running was represented by a range of from 24 to 27 lbs. of steam per indicated

The Use of Superheated Steam on Locomotives in the United States and Canada.*

Aside from an experimental application of a smoke-box superheater on the Chicago Burlington & Quincy, between 1870 and 1874 the first application of superheated steam in North America was made by Roger Atkinson, then mechanical superintendent of the Canadian Pacific, who applied a "Schmidt" smoke-box superheater to a 4-6-0 simple freight engine in 1901. In 1903 E. A. Williams, then mechanical superintendent of the same road, applied a "Schmidt" smoke-tube superheater to two 4-6-0 compound freight engines, and the results obtained from these installations were exceedingly satisfactory, the first engine showing a saving of 25 per cent. over corresponding simple engines and 18 per cent. over corresponding compound engines of the same class, while the latter engines showed a saving of from 15 per cent. to 20 per cent. over similar compound engines using saturated steam.

In 1904 the New York Central applied a "Cole-Field" smoke-tube superheater to a 4-4-2 passenger engine, and in the latter part of the same year the Canadian Pacific bought 41 engines, 21 of which were equipped with this type of superheater, and 20 with the "Schmidt" smoke-tube superheater. Since that date all engines, other than those in switching service, built for the Canadian Pacific have been equipped with smoke-tube superheaters of various types, and on December 31, 1906, there were in service on this road 197 engines equipped with superheaters of the following types:

Type.	Number.
Schmidt smoke-box	1
Schmidt smoke-tube	32
Cole Field tube	21
Cole return bend	55
Vaughan-Horsey return bend	88

At the present time this road has on order 175 locomotives for delivery during the present year, all of which are to be equipped with the "Vaughan-Horsey" type of superheater, which will make a total of 372 engines to which this principle has been applied.

On the railroads in the United States the progress has been far less rapid, and a reasonably complete list of the engines equipped at the end of 1906 is as follows:

Railroad.	Cole.	Schmidt.	Vaughan-Horsey.	Total.
N. Y. C. & H. R.	1	..	..	1
C., R. & Q.	1	2	..	3
Rock Island	6	..	..	6
M., St. Paul & S. S. M.	1	..	..	1
C. & N. W.	1	..	..	1
Boston & Maine	1	..	..	1
L. S. & M. S.	1	..	1	2
Totals	12	2	1	15

With the exception of one engine, viz., the first to which a superheater was applied on the Canadian Pacific Railway, all the engines enumerated above have been equipped with superheaters of the type known as the smoke-tube, this particular engine being equipped with a superheater of the smoke-box type. The Baldwin Locomotive Works has also built a few locomotives equipped with the Baldwin smoke-box superheater. One of these is exhibited at the Jamestown Exposition and was described in the *Railroad Gazette*, June 7, 1907.

The Best Fuel for the Blacksmith Shop.

At the recent convention of the Master Blacksmiths' Association a paper was presented on the best fuel for the blacksmith shop, by J. G. Jordan, of the Texas & New Orleans, who is located at Houston, Tex. Experience of a good many years leads the author to recommend oil for heating and for furnace work, provided the furnace is so made that the oil will not come in contact with the iron while it is being heated. This fuel has been used upon the Texas & New Orleans for making all driving axles, and only one has ever broken, and that was due to over-heating; this with axles, some of which finish 11 in. in diameter. The advantages of oil are that it heats more rapidly than coal, so that the output is increased by its use, besides which it appears that iron will not break, when being bent, so easily when it has been heated with oil as it will when coal is used. In this connection it should be noted that oil can only be used in furnaces or in furnace-like boxes where the blaze is confined. With proper arrangements of this kind, however, it is possible to weld locomotive frames and straighten almost any iron on a car or engine without removing it, and thus avoid the expense of such a removal.

As for cost, if oil can be bought for not more than 4 cents a gallon and coal costs from $4.50 to $5 per ton, oil will be the cheaper fuel to use, as the output in work will be sufficient to cover the difference in price.

As for cost, if oil can be bought for not more than 4 cents a blacksmith fire. For this purpose good coal is the best, and bad coal is no fuel at all. The troubles with low-grade coal are also increased by the receipt of successive shipments from different mines, and when the coal is very bad the difficulties are unending. In fact, in one shop there has been so much annoyance caused by inferior coal that a record is kept of all work done with it, and it is reported as having been executed with bad coal as a protection to the workman. An example of an analysis of coal that is unsuited for blacksmith work is given as follows:

Moisture	5.70 per cent
Volatile matter	18.24 "
Fixed carbon	43.84 "
Ash	27.82 "
Sulphur	4.10

With such a coal as that frames cannot be welded and wherever there is an attempt to use it there will be constant complaint that iron cannot be welded with it, much less steel. It contains too large a percentage of sulphur and ash and not enough fixed carbon to make a coal fit for blacksmith use.

In contrast with this, coal should be bought on specifications, and these should be based upon the following requirements:

Sulphur	1.00 per cent
Fixed carbon, not less than	75.00 "
Moisture, not more than	1.20 "
Ash, not more than	7.00 "

Finally, the best coal that can be bought will be found to be the cheapest in the end.

In the discussion it was asserted that the best coal for blacksmith work is the Blasbur coal. It is a Pennsylvania coal, and its fire can be made to last for five hours with very little cleaning. It makes a good coke, heats clean and causes very little waste to the iron. Another coal that was highly recommended was the Piedmont from West Virginia. This coal produces very little ash, and there is no difficulty in keeping a clean fire.

On the other hand, the Tennessee coal was criticised as being decidedly poor. The fire must be cleaned for almost every alternate heat, and there is always a delay in consequence. The coke is too soft and too light for heavy work and is not worth much. For bad coal it is necessary to have a hard coke and break it up fine.

One speaker recommended gas fumes as best adapted for a tool dresser's furnace.

*Extract from a paper by H. H. Vaughan, Assistant to the Vice-President, Canadian Pacific, presented at the Indianapolis meeting of the American Society of Mechanical Engineers, May, 1907.

Seth Wilmarth's Locomotives.

BY C. H. CARUTHERS.

In reading the early history of the steam locomotive and of locomotive construction one discovers the names of numerous builders who for a time turned out creditable machines and then closed their plants. In some instances these firms soon engaged in other lines of business, but often the closing was final, and after these years it is even more difficult to obtain much reliable data concerning either the personnel of the firms than of the locomotives which they built.

The "Union Works," of Seth Wilmarth, once existing in Boston, Mass., is one of these plants of long ago, of which many of the younger railroad men have probably never heard, and which has become but a shadowy memory to the "old-timers" yet living, although in its day some of the engines bearing its badge-plates were very familiar objects on a number of the leading railroads, and several were of decidedly original types, although these features were attributable to the selection of Mr. Wilmarth as a builder by their designers, rather than to his own inventive genius.

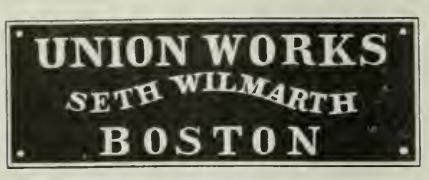
The plant was located on Foundry street, in South Boston, and might be called an off-shoot of the Hinkley & Drury (afterward Hinkley, Williams & Co.) works in which Mr. Wilmarth had previously been engaged, and it is not surprising, therefore, to find the engines of the Union Works very similar in many respects to those of the Hinkley shops.

As nearly as can be determined from the records of dates of construction which have been preserved, the first Wilmarth locomotives came out in 1849 and the last about 1853. Machine tools were also made in the same works, but no existing data seems available to determine whether this feature was continued after locomotive building ceased.

The first authentic record of Wilmarth locomotives appears to be the construction of three for passenger service on the Boston & Worcester Railroad in 1849. These engines were known as "Shanghais," though why, I cannot clearly discover from the various reasons which have been assigned, and had cylinders of 14 in. diameter and 18 in. stroke; driving wheels, 66 in. in diameter; boiler, 46 in. diameter; weight, about 50,000 lbs. The tender was carried on a four-wheel truck similar to those used by Norris at that time. The tracing from which the accompanying illustration is taken was made about eight years ago from a photograph of one of these engines, the "Fury," in possession of an official of the Boston & Albany, who kindly loaned it for the purpose. From this cut it will be seen that the engine is of the inside-connected type, and had double-steam chests, one of each pair containing the cut-off valves which were worked by hooks, most probably of the type illustrated in the *Railroad Gazette* of August 17, 1906, Fig. 6, page 142, although the

owner of the photograph is inclined to think a variable cut-off was used of the type shown in Fig. 5, page 147, in the same issue. As the variable cut-off does not appear to have been used on any road much before 1852 or 1853, it is possible that if the "Fury" had it, it was put on at a later period of the engine's service. It is a matter of regret that the photograph referred to does not show this feature clearly, but as the valve-gear with half-stroke cut-off and drop hooks was used by Hinkley at that time, it is almost certain that this form was used on the "Fury" at first.

Four freight engines and two more for passenger service were also built by Wilmarth for the same road. These passenger engines were somewhat larger than the "Fury" and were built on lines of greater originality, but the freight engines are said to have followed the design of the Hinkley machines very closely.

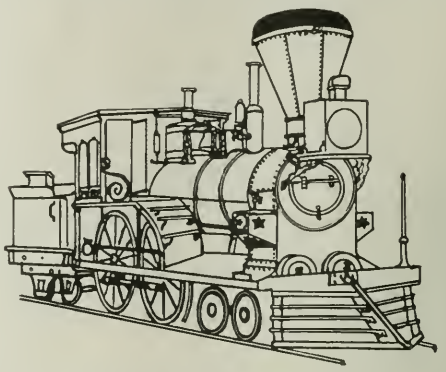


Seth Wilmarth Badge-Plate.

One engine at least was built for the Eastern Railway with two pairs of driving wheels between the firebox and cylinders, a four-wheel truck at the front end and another under the foot-plate; or, as we would now say, a 4-4-4 engine. Another of this class was built for the Old Colony Railroad. Sufficient authentic data has not been available to enable the writer to state positively whether the last eight engines referred to were inside or outside connected, but indications point strongly to inside connections.

A number of passenger engines with outside cylinders and 78-in. drivers were afterward built at these works for the Hudson River Railroad. It is very probable that these engines were of the same general design as two furnished the Pennsylvania about the same time and hereinafter described.

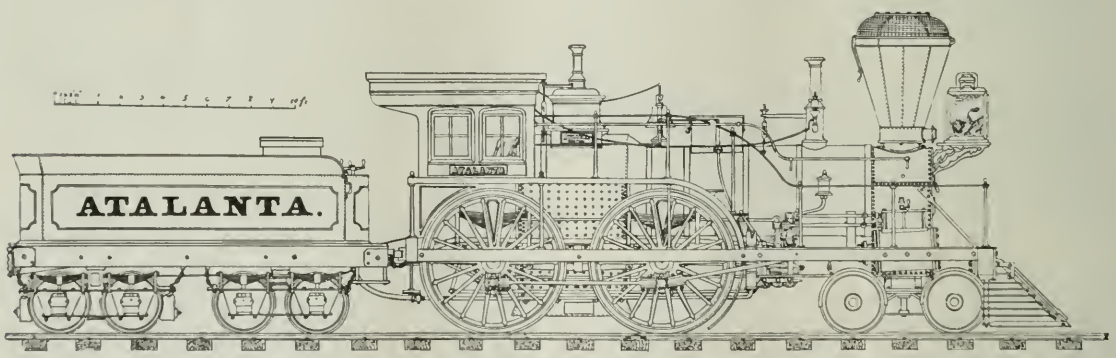
The "Pioneer" was built for the Cumberland Valley Railroad in 1851, and was small and of light construction in every way, even for that early period. It had 9 x 14 in. cylinders, 54-in. drivers, 30-in. leading wheels and 30-in. trailing wheels. Its weight was 26,000 lbs., with about 12,000 lbs. of this on the drivers. It is fitted with Stephenson link motion, and although the present officials of the road seem to think it was built thus, I cannot but think that "D" or "Y" hooks were used originally and the links substituted in later years. The short tender, with a 600-gallon water cistern, is



Boston & Worcester Engine "Fury."

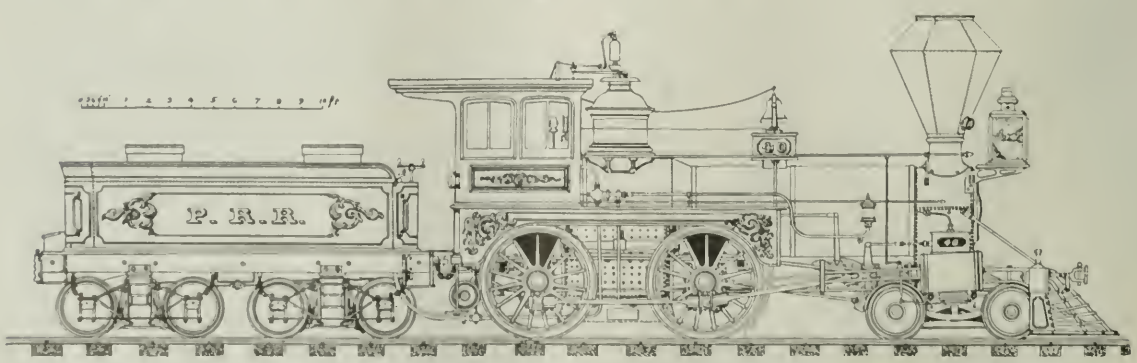
Built by Seth Wilmarth in 1949. Cylinders, 15 in. x 18 in.; drivers, 66 in.; boiler, diameter, 48 in.

placed on an extension of the engine frame behind the cab, and the roof of the latter is also carried back over it, and is provided with canvas curtains at the sides. The sandbox, as shown, was on the engine previous to the St. Louis Exposition, but does not appear in a half-tone from a photograph taken at that place. The steam-chest covers are on the sides of the chests, and the pump is under the foot-plate and is driven by an eccentric on the main axle. The dome is small and is covered by the cab. During the



Pennsylvania Engine "Atalanta."

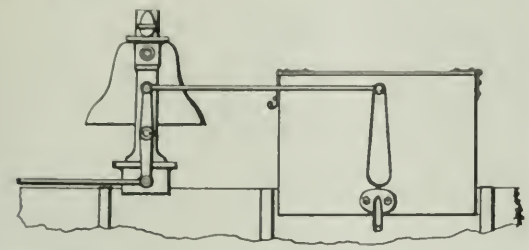
Built by Seth Wilmarth in November, 1852. Wood burner. Weight, total, 59,000 lbs.; weight on drivers, 35,900 lbs.; cylinders, 16 in. x 22 in.; drivers, 78 in.



The "Atalanta" as Rebuilt at Altoona in 1865.

Fitted to burn coal instead of wood. Weight, total, about 62,000 lbs.; weight on drivers, about 38,000 lbs.; cylinders, 16 in. x 22 in.; drivers, 60 in. Scrapped in 1870.

Civil War the cavalry of the Confederate army, under command of General Stuart, raided and burned Chambersburg on July 30, 1864, and included in the property destroyed were the shops and round house of the Cumberland Valley Railroad, but the "Pioneer" fortunately escaped this fire, which damaged some of the company's other engines, as it was then in service and was run to a place of safety. The last time it was run under its own steam was on October 22, 1901, when it was fired up and run by General Foreman J. L. Lawrence out of Chambersburg with the intention of exhibiting it in operation at Carlisle, Pa., during the continuance of a sesquicentennial celebration at that place, but when within about one mile of the two a flue burst and the engine had to be "assisted" into a siding by the track repairmen. It afterward was taken back to

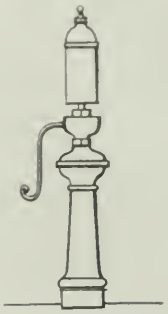


Sandbox, Rod and Connections; "Fury" and Other Engines.

Chambersburg, where it remained until shortly before the opening of the St. Louis Exposition, when it was sent there, and after the close of that show was taken with another ancient locomotive to form part of a museum contemplated by, or under the auspices of, the Baltimore & Ohio, if I have been correctly informed. This museum, however, is either yet in the "proposed" state, or has been abandoned, and the "Pioneer" is lying in a roundhouse at Martinsburg, W. Va., awaiting developments.

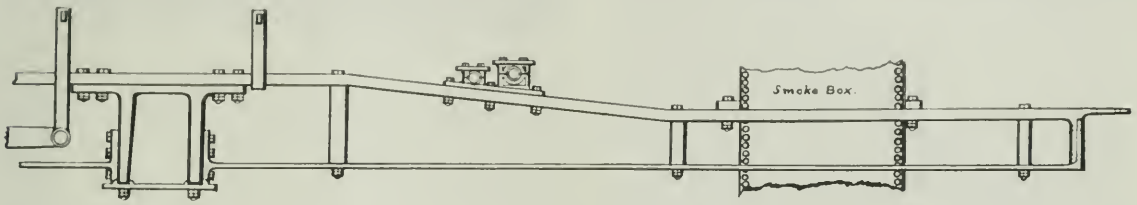
In 1852 two Wilmarth engines of the "compensated" type were built for the Cumberland Valley from designs by Alba Smith, the Master Mechanic of the company. No further mention of them will be made in connection with this article, except to state that the last one passed into the hands of a junk dealer in 1886, and was [illegible] up.

Three Wilmarths, named "Antelope," "Atalanta" and "Eagle," were built for the Pennsylvania in 1852-3. All had 16 x 22 in. cylinders, the "Antelope" and "Atalanta" had 78-in. driving wheels, and the total weight ranged from 55,800 to 61,300 lbs., and that on the drivers from 35,900 to 37,900 lbs. The "Eagle" only had 66-in. drivers, otherwise the engines were uniform in design. Considerable trouble appears to have been experienced with the first two before their service became satisfactory, and this in connection with two serious accidents to one of them caused by running into obstructions on the line at night, gave them an unsavory reputation with the men. Eventually the 78-in. wheels were removed and others of 66-in. diameter were substituted. The safety-valves were all at a later day placed on the dome, and a plain column with the whistle on its top replaced the combined safety-valve and whistle-column shown in the line drawing of "Atalanta" and also in that of the "Fury." The peculiar connection to the sand-valves was also replaced by a straight rod. In 1865 "Atalanta," which by that time was known as No. 40, was partly rebuilt at Altoona shops, as shown in the line drawing. The firebox was arranged to burn bituminous coal, Sellers injectors replaced the pumps, shifting links took the place of the hooks, the outside frames were taken off and other minor changes made as will be evident from an inspection of the two drawings. In this rebuilt form the engine continued in passenger service until 1870, when it was cut up. Its rebuilt appearance as shown is decidedly neat.

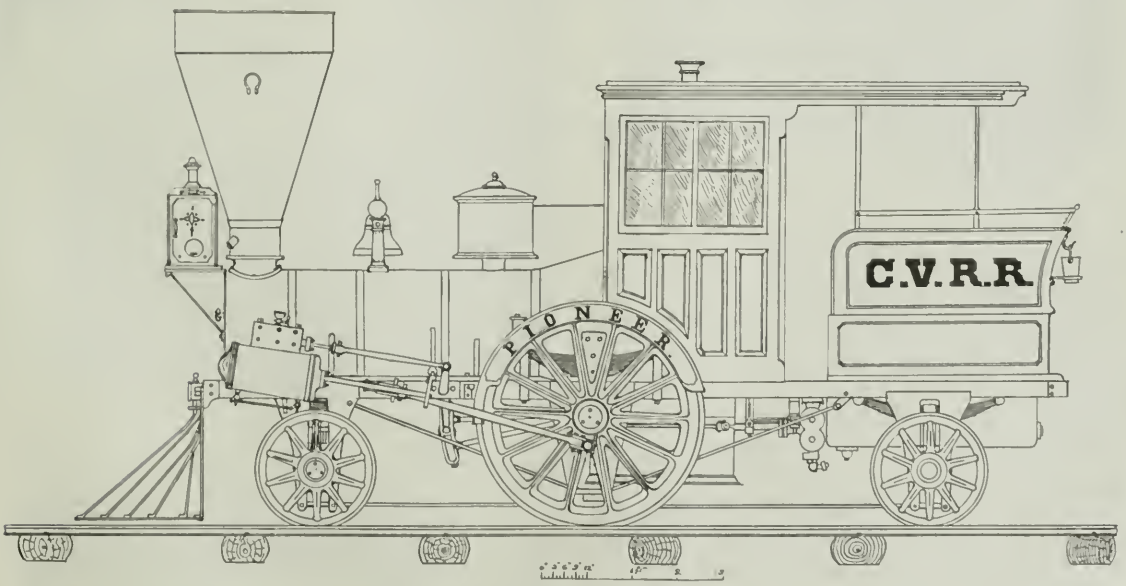


Whistle Stand and Whistle.

Substituted in later years for the combined safety valve and whistle column shown on the "Atalanta" as originally built



Frame of Later Wilmarth Engines.



Cumberland Valley Engine "Pioneer."

One of three "Shanghais" built by Seth Wilmarth in 1871. Weight, 26,-000 lbs.; cylinders, 9 in. x 14 in.; drivers, 54 in.; tank capacity, 600 gals.

The "Antelope" and "Eagle" were transferred in 1865 to the Philadelphia & Erie divison, where they rendered several years' service before going the way of the "Atalanta."

Since boyhood I have heard rather vague statements from some of the older men on different divisions of the road, which when put together imply that a fourth Wilmarth was built for the Pennsylvania Railroad Company, but was lost overboard in its passage from Boston to Philadelphia by vessel and was never recovered In one instance this story named a Smith & Perkins engine as the derelict, but if correct at all the conditions of those days would rather indicate the Wilmarth engine as the "missing link." The most authentic data at my command is a distinct remembrance that an extra tender used on the Pittsburgh division between 1853 and 1860 was often referred to in my presence during boyhood as having belonged to an engine which was lost at sea.

In this connection mention might be made of another engine owned by the Cumberland Valley, which was named "Jenny Lind," and was an almost exact counterpart of the "Pioneer," but bore a badge plate, naming the C. V. R. R. Co. as builder and the date of 1878. From various "earmarks" I believed this engine to have also been a Wilmarth, rebuilt at the time named on the plate, but the company's officials are positive that this is not the case. The "Jenny Lind" differed only from the "Pioneer" in having a longer rear extension of the frame, with a sort of observation room or car for the use of officials built on it and a four-wheel truck underneath. This engine was only cut up within the last two years.

The confirmation of much of the foregoing data is due to the courtesy of M. N. Forney, J. Snowden Bell, Esq., W. H. Taft and various officials and employees of the Pennsylvania and Cumberland Valley railroads.

The Portland & Seattle Railway.

BY H. COLE ESTEP.

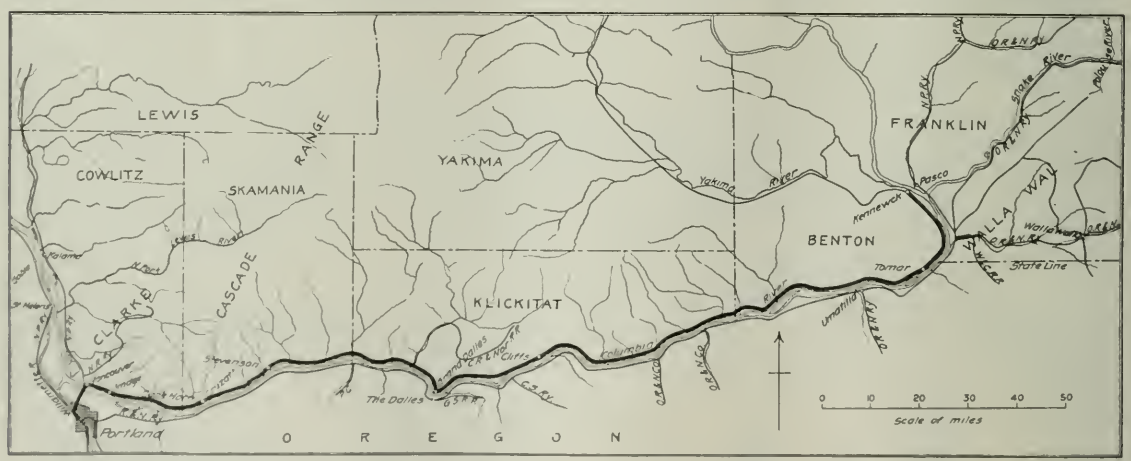
Probably the most spectacular piece of railroad construction in the United States to-day is the new line of the Portland & Seattle from Spokane, Wash., to Portland, Ore., by way of Pasco and the north bank of the Columbia river. The Portland & Seattle is, as is well known, a corporation owned jointly by the Northern Pacific and Great Northern railroads. Its name is scarcely accurate, however, as the line does not go within 180 miles of Seattle.

The road is being built ostensibly to get a direct low-grade freight route between eastern Washington and the coast and thus avoid the haul over the Cascade mountains. At present, on the western side, trains must be lifted from sea level to an elevation of 2,800 ft. in a distance of 75 miles. As a matter of fact, however, the Portland & Seattle would not have been built for years had it not been for the invasion of the state of Washington by the Chicago, Milwaukee & St. Paul and the Union Pacific. As soon as it was certain that these lines were building to Puget Sound, the Hill lines set to work on the Portland & Seattle in order to retain for themselves the only remaining water grade from the "Inland Empire" to tidewater. Construction work on the "North Bank" line, as the portion from Pasco to Portland is called, was actually begun simply in order to keep the other roads out; thus a project which, like all other Washington railroad schemes dates back about twenty years, became a reality.

Preliminary surveys were commenced early in 1905. The location was made during the summer and fall of that year. The locating engineers and their parties who actually did the work of laying out this line deserve the highest praise for the unflinching courage and silent heroism they manifested in the daily performance of their duties. The Portland & Seattle is built for miles and miles along cliffs on the north bank of the Columbia river, ranging from 100 to 700 ft. in height. Not only are there sheer cliffs, but the erosion has worn them into shapes of inconceivable ruggedness,, the famous banks of the Rhine being tame in comparison. Pillars, pinnacles, sharp rocks and deep, narrow, perpendicular walled gorges abound. Only those who have had the experience and know what such work is can appreciate the difficulties encountered in locating a line through such a district. Passengers will ride over the finished track and admire the precipitous scenery, but as the writer stood on the nearly finished grade, which had been literally torn from the cliff by tons of blasting powder, and beheld the ragged face of the mountain, he could not help but think of and admire the splendid courage of the men who, suspended day after day on slender ropes, the sky above, the vicious, swirling river below, had slowly and painfully created a line of railroad over these places. The thought came that it was not dollars, after all, that produced the Portland & Seattle, but engineering skill and courage.

The ultimate purpose is to build a line from Spokane to Portland, a distance of 375 miles, with a branch 75 miles long to Lewiston, Idaho. The work now practically complete is that portion of the main line from Portland to Pasco, 230 miles, and the branch to Lewiston. The Spokane end is not so far advanced. Track laying is in progress between Portland and Pasco at this writing, and all the difficult, subaqueous work on the big bridges near Vancouver has been completed. Fifty miles between Portland and Pasco is being double tracked.

The road from east to west is level or down hill all the way. The maximum grade is 0.2 per cent. compensated for curvature; the maximum curves are 3 deg., spiraled according to the best modern practice. When these facts are considered, some of the difficulties encountered in locating along the tortuous bluffs of the Columbia can be appreciated. From Spokane to Cow creek, in Adams county, Washington, on the main line, and from Lewiston to Washtucna on the Lewiston line, there are no special features.



Map of the Portland & Seattle from Portland, Ore., to Pasco, Wash.

The road through these sections is simply an ordinary first-class line through a broken country. There are six points of special interest on the work, located as follows: Near Cow creek and Washtucna, in Adams and Franklin counties; Pasco and Kennewick; Cliffs and Grand Dalles, in Klickitat county; Cape Horn in Skamania county, and the line from Image, in Clarke county, Washington, to Portland. These will be taken up in the order named.

At the junction of Cow creek and the Palouse river, in Adams county, the Portland & Seattle encounters the most expensive stretch of railroad construction, except that in Devils' canyon, ever known in Washington. The valley is crooked and entered frequently by steep, narrow gulches; the road is built across a succession of "hog backs" and gulches. Eighty-foot cuts are followed by 90-ft. fills in alternation; short tunnels are frequent; high steel trestles are necessary in many places. At one point, near the ranch of James Kennedy, one of the largest of the "hog backs" was pierced by several long, narrow tunnels, which were loaded with many hundred pounds of powder, and then the whole hill was

blown off at one shot. The blast was a decided success and vividly demonstrated the economy of removing large masses of rock by this method.

Approaching Washtucna the line crosses a flat part of the coulee (many peculiar valleys in the region having no direct outlet are called coulees) on a fill approximately 6,000 ft. long and averaging 50 to 60 ft. in height. Here the line crosses the Palouse branch of the Oregon Railroad & Navigation. A concrete arch has been built to permit the latter to pass under the fill. The line

Hydraulic Excavation of a Deep Cut near St. John's.

passes the town of Washtucna on the side of Quality hill, several hundred feet above the village, and proceeding southwestward down the coulee, practically parallels the O. R. & N., the grade being in general about 8 ft. above the older line. Passing Kahlotus, in Franklin county, the line cuts off one corner of Lake Kahlotus on a huge fill, and proceeds, with easier construction, down to Pasco. It was first proposed to cross the lake on a trestle, but the more permanent and satisfactory rock fill was finally adopted.

At Pasco occurs the first crossing of the Columbia river. The Northern Pacific has recently rebuilt its bridge at this point, and the new structure will be used jointly by the two roads. From Kennewick, on the west side of the river, the North Bank line

Erecting First Span of Columbia River Bridge.

proper commences. The construction is fairly easy along the upper Columbia. Fences similar to the snow fences on eastern lines have been erected at dangerous points to keep off drifts of the fine sand abounding in the vicinity. For 20 miles west of Pasco, to Tomar, the line is double tracked. It is single track the rest of the way to Cape Horn, because a double track along the cliffs of the north bank would entail an expense at present altogether out of proportion to its usefulness.

Cliffs, half way down the river, will be a division point and will have a roundhouse, coaling station, switch yard and other usual facilities. About 23 miles below Cliffs is Grand Dalles, opposite Dalles, Ore. The elevation of Dalles is 103, of Pasco, 389, and the distance between them is 130 miles, the average grade being 2.2 ft. per mile.

Below Grand Dalles the difficult solid rock construction commences. Nearly all the grade from this point to within 30 miles of Vancouver had to be blasted out of solid rock cliffs varying in height from 100 to 700 ft. There are 17 tunnels on the line from Pasco to Vancouver. The most notable of these is the Cape Horn tunnel, 24 miles east of Vancouver. It is half a mile long, single track, and bored through solid rock. From Cape Horn (Cruzatt station on the P. & S.) to Vancouver the construction is somewhat easier and this portion is double tracked.

Approaching Vancouver the line leaves the bluffs and curves down across the flats, crossing the east portion of the military reservation on a double-track fill averaging 16 ft. in height. The west end of the reservation, as well as the business portion of the town of Vancouver, is traversed by a double-track pile trestle. The fact that heavy concrete abutment walls are built at all road and street crossings under this trestle indicates that it is the intention to fill it as soon as the work can be conveniently done. At Vancouver there is to be a switch yard and junction with the Van-

Cape Horn on the Columbia River Before Work on the Portland & Seattle Was Begun.

couver branch of the Northern Pacific. This branch, 30 miles long, extending from Kalama, on the main line, to Vancouver, will become a part of the main line of the Northern Pacific as soon as the big bridges and heavy work on the Portland & Seattle between Vancouver and Portland are completed. Northern Pacific trains will be run to Vancouver and thence to Portland on the P. & S., using the magnificent new bridge over the Columbia. The historic old car ferry between Kalama and Goble will be abandoned and the line between Goble and Portland will be used almost exclusively by the Astoria & Columbia River Railroad. The Northern Pacific is now engaged in revising and straightening the Vancouver branch. When this relocation is finished the line will be first-class in every respect, this work being virtually a part of the construction of the Portland & Seattle.

Probably the most interesting section of the Portland & Seattle from an engineering standpoint is the eight miles between Vancouver and Portland. This short stretch includes three large steel bridges, three double-track draw spans, a steel trestle 1,968 ft. long, and one of the largest earth cuts on the road. The road is double-tracked from Vancouver to Portland.

The difficult work on the great Columbia river bridge is completed at this writing. The piers are practically finished. The

bridge, omitting inches, is 2,806 ft. long, divided into ten spans as follows from east to west (i. e., from Vancouver toward Portland): First span, 189 ft.; draw span, 467 ft.; third span, 375 ft.; fourth span, 269½ ft.; fifth, sixth, seventh and eighth spans, each 269 ft.; ninth span, 268 ft.; tenth span, 162 ft. The bridge is double track, its inside dimensions being: width, 24 ft. 6 in.; height, 22 ft. 6 in. A swinging draw is used, which when open, leaves two channels each 200 ft. wide. The piers are set on pile foundations. Those near the center of the stream are 115 ft. high, and at this writing project about 20 ft. above water. The piers are built with concrete cores and granite facings. The steel work is being furnished by the American Bridge Company. The bridge will be the largest and finest in this section of the country.

Following the Columbia river bridge is a steel trestle consisting of 24 82-ft. spans, 1,968 ft. in all, over the swampy end of the island opposite Vancouver. The trestle is followed by another steel truss bridge 1,465 ft. long over Oregon slough, divided into eight spans as follows from east to west (omitting inches): First span, 161 ft.; second, third, fourth, fifth, sixth and seventh spans, each 162 ft., and draw span, 332 ft. A swinging draw is used here also, leaving two 150-ft. clear channels when open.

The line enters northeast Portland, crosses some of the low land on a high fill, and traverses the suburb of St. Johns through a cut approximately 1¾ miles long and 90 ft. deep at the west end. The cut is in earth, sand and loose gravel, and will require the excavation of 1,000,000 cu. yds. to complete it. It is being worked from both ends; from the east end by steam shovel in standard American fashion, while the west end is being sluiced down into the river by hydraulic methods. The water is pumped to the head works through a 10-in. riveted sheet-iron pipe, the stream is played on the earth and the mixture of water and earth is carried back to the river in a sheet-iron lined flume. It is said that 1,600 cu. yds. per day is excavated in this way.

The slopes of the cut are being trimmed by a donkey engine and scraper. The engine is placed on one side of the cut with a cable leading across to the other, to the end of which an ordinary drag scraper is attached. The scraper is started properly and is then dragged down the slope by the engine. It is hauled back by a team, which at the same time drags another scraper down the opposite slope.

The Willamette river is spanned by a 1,700 ft. truss bridge with swinging draw span similar in general to the Columbia river bridge. After crossing the river the line ends at what is called the Portland outside yard, a switch yard built on a plot of ground 150 acres in extent.

The whole road is a splendid monument to American engineering genius and is by all means the most expensive and best built line in the west. The general contractors are Siems & Shields, St. Paul, Minn. The engineering officers of the Portland & Seattle Railway are: N. D. Miller, Chief Engineer; J. E. Turner, Assistant Chief Engineer; B. L. Crosby, Bridge Engineer.

Interior of Main Hall; German Railroad Museum.

Railroad Museum of the German Government.

The German Government has recently established a railroad museum in Berlin of which Germany may justly be proud. It was formally opened by the Emperor some months ago, but only one section was ready that time. All sections of the building are now open to the public. It is housed in the abandoned terminal of the Berlin-Hamburg line, which is situated in the northwestern section of Berlin. The exterior of the building has been left unchanged,

Government Railroad Museum in Berlin.

but inside many changes were made, chiefly in the cellar, where a large power plant was installed to generate steam for heating, electricity for lighting and operating motors, and compressed air to work several models for demonstrating purposes. The exhibition space covers 52,000 sq. ft. and comprises a long main hall with arched glass roof, and a number of smaller rooms in both wings. A few exhibits were so large, however, that they had to be placed outside in the adjoining courtyard.

The museum comprises three large sections: A, railroads; B, marine engineering; C, architectural and construction work. By far the largest space is occupied by the railroad department, which is divided into eight groups. The exhibits represent chiefly modern apparatus, the historical part being limited. Explanatory notes are often given, supplemented by many photographs, drawings and other literature. Many of the models of apparatus can be operated to illustrate their working.

In the first group are rails of all kinds, switches, crossings, sleepers, both old and new. Samples of ballast and material for the maintenance of a road, also the tools used are shown. Of particular interest are sections of wornout rails and sleepers which show the tremendous stresses to which they are subjected on busy lines. The influence of shocks exerted by the rolling stock on the roadbed, etc., is illustrated by samples prepared in a special testing plant. A diagram of the sizes of rails used since 1842 shows clearly the considerable increase in height, length and weight. A complete exhibit of crossing gates used on country roads with the necessary bells, lamps and gate-keeper's houses is also included.

In the next group are models of structures designed for various railroad purposes, such as stations, carsheds, water towers, coaling plants, bridges, tunnels, turntables and the like. The chief exhibit is a fine relief model of the Altona depot which is a good example of a modern German terminal. The first large iron bridge is represented by a model of the Vistula bridge near Dirschau, completed in 1857. Drawings and photographs of old and modern bridges and tunnels give a good idea of this branch of engineering. A model of the ventilating plant of the Kaiser Wilhelm tunnel included in this section can be operated by a small fan.

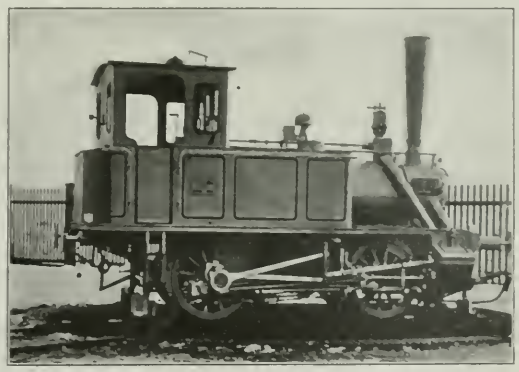
Models of Crossing Gates and Exhibit of Track Tools.

The next section is devoted to signaling and safety devices. No less than 500 devices designed to insure the safety of the traveling public are exhibited. An electrically operated interlocking plant and two mechanical plants are erected and can be operated in connection with a complete track layout, switches and signals outside the building. This is similar to the railroad exhibit of the German Government at the St. Louis exposition in 1904. In addition an electro-pneumatic interlocking plant and a number of block system installations, in full size as well as in miniature, are to be seen inside. Many of them can be operated. They are equipped with telegraphic and telephonic apparatus connected with other parts of the system in order to show the mutual relation of each to the whole. Electric alarms, all apparatus used by the station master, and block signals for single and double track are placed ready for operation. Other new types show the considerable advancement in these devices.

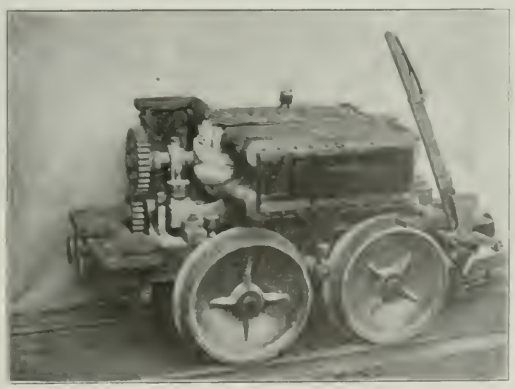
The fourth department is the largest and to the general public the most interesting. It contains locomotives and cars. By far the greatest number of exhibits are models, the rest being photographs and drawings. The models are mostly one-fifth or one-tenth size a few of the exhibits however being originals. These include the engine "Adler" of the first German railroad—Nuremberg-Fürth—of 1835 and the "Borussia" of the Cologne-Minden line of 1858. Modern locomotives for freight and passenger service mountain lines, industrial purposes, etc., are shown by models. Most of these fine models were made by apprentices of the Prussian State Railway shops, while others are presents from manufacturing firms. A full size exhibit represents the cab of a modern express engine and steps have been provided to allow visitors to climb up on the platform. Another full size exhibit is the smokebox of a freight locomotive fitted with a Schmidt superheater which is so extensively employed in Germany, and a third is an old boiler of a locomotive built in 1857 which is cut open longitudinally and illustrates not only the location of the various pipes, valves, grate, etc., but also shows the effect of fire and water on the sheets. Two brake testing racks, each consisting of 20 brakes of the Carpenter and Westinghouse types, respectively, are connected with the compressed air plant and can be used to demonstrate the action of brakes on a 20-car train. Numerous accessories supplement the locomotive section.

A large variety of cars are shown, comprising first, second, third and fourth class passenger vehicles, also workmen's, baggage, mail, funeral, hospital, dining and sleeping cars. The models are mostly one-fifth size and are made with a removable cover to allow in-

Exhibit of Signaling Devices.



A German Tank Locomotive of 1881.



First Electric Truck Built in Germany.

spection of the interior. The most curious object is an open third class carriage of the old Breslau-Freiburg line built in 1843. It contains wooden benches, but has no windows or roof. Full size sleeping compartments of old and new cars are shown. The freight cars supplementing this group are chiefly composed of cars for special purposes, for carrying long iron plates and bars, guns, long trees, glass, liquids, chemicals, cement, cattle, living fish, and the

Model of Old Car Ferry Across the Rhine.

like. Over 400 exhibits show accessories, such as axles, couplers, doors, windows, heating, lighting and ventilating devices, dynamos, etc. A collection of broken axles, worn wheels, bent rods, brake-shoes, tubes and boiler plates is very instructive.

The next section is devoted to the application of electricity as a motive power. Many gifts have been received from the two leading electrical firms, and this section is complete in every way. It shows the development of electric apparatus from the earliest beginnings. Germany was the first country to use electricity for railroad purposes and a large picture on the wall shows the first electric train of 1876 run during the Berlin exposition. The exhibit includes full size controllers, rail-joints, overhead wires, insulators, track switches, underground conduits, motors, etc. The chief attraction is a model one-tenth size of the high-speed car which exceeded 200 kilometers per hour during the 1903 trials on the Berlin-Zossen road. Also the first practical single-phase motor ever built is shown.

The next department covers railroad shops and mechanical appliances. The Prussian Government does not build its own rolling stock, but owns several large shops where cars are repaired and rebuilt, samples of which work are exhibited. On a large table is mounted a relief model of the modern Opladen car shops belonging to the Elberfeld district, and a portion of the locomotive repair shops at the same place. The government devotes much attention to the care of apprentices in these shops, and many samples of their work are placed on exhibition, also models of typical institutes for training such apprentices. The equipment of the shops is represented by exhibits of machine tools, such as lathes for wheel-tires, steam hammers, hydraulic wheel press, jacks for lifting cars and engines traveling cranes, a Dowson gas plant, an attachment for quickly exchanging wornout wheels, etc. In the main hall a large tilting coal wagon unloader is shown by model, a device for changing trucks from the standard to the wider Russian gage, and vice versa, etc. Models of old and new railroad ferries are shown, and also a model representing the only stretch of track in Germany which is too steep for ordinary adhesion trains. The trains are therefore pulled up by a steel cable running over a pulley and attached to a train on the adjoining track going down.

The next department gives a chance to study railroad management from a business point of view. It contains sample printed matter such as rules for stationmasters, engineers, gatekeepers, switchmen, etc., exhibits of devices used in making up trains, communications, tools and uniforms of officials. The method of weighing and checking baggage is illustrated by a full size elevator and scale. There is also a fully equipped ticket office with printing and stamping machine. A collection of railroad tickets from the earliest times is mounted in albums which are locked and carefully guarded. Samples of goods chiefly carried on the freight trains are exhibited in a glass case.

The last group is devoted to the finance and welfare work. Diagrams and literature illustrate the income and expenses of German railroads during the past 50 years and the enormous development of recent times. What Germany does for its railroad employees would be an object lesson to Americans. On German roads when an employee enters the service he is insured for his whole life against sickness and injury. In the museum is a large gilded obelisk which consists of three blocks representing in volume of gold the respective amounts of money spent for the relief of the sick, the injured, and on pensioned employees during the years 1895 to 1904. The total sum amounts to 131,451,321 marks, or $26,300,000. Relief models show exteriors of workmen's dwellings, officers' homes, hospitals and homes for aged employees. The interior equipment of these buildings is shown by pictures and exhibits of medical instruments, beds, disinfecting apparatus, coffee-boilers, clothing and the like.

In the museum building the main hall and the west wing are given up to the railroad department, while in the east wing is an exhibit of marine engineering and civil engineering work. It is not so large but is nevertheless interesting and instructive. A large and modern library and reading room is attached to the museum

Model of First Large Iron Railroad Bridge in Germany Built in 1857 at Dirschau over the Weichsel River.

which in addition to the current journals and books chiefly concerning railroading contains many drawings and photographs and other valuable and rare documents. The museum is a worthy addition to Germany's educational institutions. The railroad man finds here many suggestions and ideas, while the public obtains an insight into many features of transportation about which there was always a mystery.

GENERAL NEWS SECTION

NOTES.

A court in Cass county, Missouri, has held that the law of that state, forbidding the employment of telegraph operators over eight hours a day, is unconstitutional.

Cornelius Burhans, a street car conductor of Brooklyn, N. Y., who has just been retired on a pension of $30 a month, has been a conductor on street car lines in that city for 46 years. He is 72 years old.

The San Pedro, Los Angeles & Salt Lake has contracted for ten million barrels of crude fuel oil to be delivered within the next five years. The price increases from 30 cents a barrel in 1908 to 45 cents a barrel in 1911.

The United States Circuit Court of Appeals of the Eighth Circuit has affirmed the judgment of the District Court, given at Minneapolis last May, fining the Great Northern Railroad $15,000 for granting illegal rebates.

Judge VanDevanter, in the Federal Court, has restrained the state railroad commissioners of Arkansas from enforcing a reduced rate on cotton, which they had ordered to go into effect September 16. The case will be heard October 15.

The Texas Railroad Commission is going to order reciprocal demurrage. The legislature at its last regular session passed a law authorizing the commission to adopt rules and regulations to govern this matter and a public hearing will be given October 8.

Press despatches from Chicago last Monday say that the principal railroads doing business in Kansas have decided to comply with the order of the railroad commission of that state requiring the reduction of all passenger fares to 2 cents a mile on the 1th of October.

It is estimated that the number of colonists arriving in southern California this month will amount to a total of 10,000, about 5,000 having arrived in the first week of the month. It is believed that the number of new settlers in the state this year, up to the end of December, will amount to 30,000.

The State Railroad Commission of Texas has ordered that between competing points the passenger fare by all railroads must be as low as that by the shortest line. The commission has also ordered that the long-and-short-haul rule (as laid down in the Interstate Commerce law) shall be observed in all cases in Texas.

The Missouri, Kansas & Texas has a tie treating plant at Greenville, Tex., which for most of the time for a year or more has not been in operation because the machinery was being changed. Ties will now be treated by the Rueping or creosote process instead of by the zinc chloride process, which was found unsatisfactory.

At a hearing before the New York State Public Service Commission at Buffalo last week, the Secretary of the Corn Exchange gave statistics showing that shippers last autumn had to wait from six to 66 days for freight cars. The longest delay was in the case of an order for 26 cars asked for from the New York Central to be delivered to the City Elevator.

A hundred or more companies and individuals owning refrigerator and tank cars are proposing to form an association. The owners of these classes of cars are not inclined to join the Individual Car Owners' Association which was recently started at Pittsburgh, believing that the Pittsburgh men, mostly coal car owners, will have to sell their cars to the railroads.

In Huron county, Ohio, the Baltimore & Ohio Railroad has been sued for $100 damages for running a train last June from Chicago Junction to Cleveland, 110 miles, in which there was a coupler without an uncoupling chain, thus making it necessary for the brakeman to go between the cars. This suit is prosecuted at the instance of the Ohio State Railroad Commission.

It is announced in Philadelphia that the Pennsylvania and the Reading railroads will, on October 1, reduce to 2 cents a mile all passenger fares now higher than that figure. The expected decision from the higher court in the suit which was appealed by the Pennsylvania Railroad will not be issued before October. The Baltimore & Ohio will also adopt the 2-cent rate in Pennsylvania.

The state health commissioner of Pennsylvania has ordered that sheets in sleeping cars must be long enough to turn over at the upper end 24 in. As the only sleeping cars in Pennsylvania are those run by the Pullman Company, in which the blankets are covered with sheets their whole length, this order would seem to be rather behind the times. The health commissioner also orders that in parlor cars the porters must not brush the clothing of passengers, except at the end of the car. Nothing is said about the application of a rule of this kind to sleeping cars. Probably the commissioner recognizes this as a problem too tough to be tackled offhand.

The Yale and Harvard, the new turbine steamers of the Metropolitan Steamship Company, running between New York and Boston, made their first regular trips on the night of September 18, one steamer leaving Boston and the other New York at 5 p.m., and each reaching their destination the next morning at about 7:30. The distance is 292 miles. The vessels were well loaded with passengers, one of them having 400.

The Superintendent of Motive Power of the Long Island Railroad has been arrested for misdemeanor in allowing a locomotive to be run in the Long Island City yard by an Italian laborer, the engine having run over and killed an engine-inspector while it was in charge of the Italian. Under the Penal Code of New York it is a misdemeanor to allow an engine to be run by a person who cannot read and write the English language.

A statement is going the rounds of the newspapers that in a single year the railroads of the country have been fined over $800,000 for unsatisfactory handling of the mails; and the New York Central is said to have had nearly $37,000 deducted from its compensation in the three months ending March 31 last. Not all of the fines are for slow movement of trains; a considerable portion is for carelessness or neglect in the handling or delivery of bags.

A press despatch from Omaha, September 24, says that the four principal railroads of Nebraska have succeeded in keeping their suits against the state in the Federal Court. They brought injunction suits against the enforcement of a 15 per cent. reduction in certain freight rates which was ordered by the legislature, and the Attorney-General of the state sought to have the questions adjudicated in the Supreme Court of the state. In this he has been defeated.

A reporter at Bloomington, Ill., is the latest expounder of the conservative sensation. He has issued the story about a freight car being lost "unbeknownst." This time it occurred on the Chicago & Eastern Illinois. Conductor Boughter started to set out four cars at Woodland Junction one night recently and found that only three of them were in the train. The train had broken in two some distance back and one car was found off the track; but it was put on again and the train was coupled up and moved on without any serious damage being observed. A following train, however, found the missing car standing nearly upright just clear of the track.

It is reported from the City of Mexico that the judges of the district courts in Mexico have been officially advised to cease their unjust practice of detaining and imprisoning railroad employees on charges of manslaughter when men are killed by trains. There have been many cases where, in consequence of the unavoidable death of a tramp walking on the track, the engineman and perhaps other men on the train have been arrested and imprisoned for months awaiting trial on a serious charge, the officers of the law evidently assuming that someone on the train was necessarily blameworthy. It appears that President Diaz has ordered this practice stopped and that the present notice has been made necessary because the President's order has not been uniformly obeyed. It is gratifying to see that Mexican practice in this respect is in the way of improvement. Before long Mexico will be more civilized than New York city in this respect.

A Tip for the New Haven Road.

According to a story going the rounds of the press, experiments have been conducted by the head of the government college at Caracas, Venezuela, to determine how much electric force electric eels are capable of yielding. Copper wire collars were put around the necks of 100 of these creatures and connections were made between all the collars and a motor, the eels being in a zinc bath. Twenty horse-power current was generated, and with this the scientist ran a mill and lighted up his house and grounds. The power from one eel sufficed to produce a 45-candle incandescent light. It was found that a motor car can be run for 24 hours with 100 eels in a tank 3 ft. long and 1½ ft. square, and weighing complete less than

200 lbs. On this basis it is estimated that the largest ocean steamers afloat can be run with 200,000 eels, producing 40,000 h.p., and contained in a tank not larger than 10 by 10 by 15. This plant, of course, will have to be duplicated so that when the energy in one is exhausted it can be hoisted from the hold to the deck so that the sunlight may infuse new energy into it while the power is furnished by the relay plant.

It is plain that this story did not originate in New York, or at any rate not in Wall street. To be complete it should include a plan for a corporation, with suitable blocks of preferred and common stock, with a prospectus setting forth the number of hatcheries, receiving stations, barrels, trainers, electricians, switch boards, accumulators, etc., that would be required by a concern established to supply eels to all the transatlantic and coastwise steamships. On the New Haven road one night recently a thousand suburban passengers were detained from their dinner tables for an hour or two by the 11,000-volt current going astray and leaving trains standing dead. We are quite sure that no eel, properly trained, would ever be guilty of such dereliction.

Belmont Tunnel Test Trip.

The formal "first trip" through the north tube of the Belmont tunnels under the East river, New York, was made on September 24. The guests included, among others, members of the Public Service Commission of the First district, some of the higher city officials, and officers of the companies operating the subway, elevated and surface lines. The car made the round trip between Third avenue and Forty-second street, Manhattan, and Van Alst avenue and Fourth street, Long Island City. At the luncheon afterward, August Belmont, Chairman of the Board of the Interborough Rapid Transit, said, in part:

"We acquired this franchise in February, 1902, under advice of Strong & Cadwalader that the franchise was perfectly valid, but, notwithstanding, there were certain technicalities to be reviewed. Up to this time the history of corporations in this state was that any company that had undertaken seriously to perfect its franchises and construct the road before the expiration of the franchises was entitled to an extension of the time. We had 18 months to do this work, but we believed that if we went forward earnestly and sincerely we would have no difficulty in obtaining an extension.

"You know the reason why we did not get it. Public clamor against extension in franchises in perpetuity had arisen in the meantime. This was a great injustice to the company, as we were the only one that had actual work under way, and we were trying sincerely to get the work done by the first of January, 1907, and had no obstacles been thrown in the way the work would have been completed during the term of the franchise. I have not a word of regret nor have any of my associates.

"As to the legality of the franchises, the courts have not yet condemned them. As for us, we have still to learn that we have done anything illegal. The city has nothing to say concerning the franchises only as to that part in Manhattan and a small part in Long Island City. The portion under the East river is in control of the state of New York, from which we obtained legal permits. From the bulkhead line in Long Island City to Fourth street we have obtained a grant in perpetuity from the Pennsylvania Railroad Company.

"The company is prepared to operate whenever it can be done under any reasonable and fair arrangements. It is impossible for anybody to make that tunnel pay for three or four years. The business is not there to pay interest on the cost of the tunnel and the equipments. It is not as valuable to us as it is to the city of New York.

"The Interborough company is the only company, in my experience, that can claim the distinction of doing any serious service for the improvement of traffic conditions in Greater New York, in spite of the abuse it has received. I say that the treatment of this company has not been such as to inspire further effort on the part of private enterprise, and until private enterprise is encouraged and confidence restored we won't have any improvement."

Steel Ties on the Bessemer & Lake Erie.

The Bessemer & Lake Erie has completed plans for using steel ties on its lines next year. More than 70,000 will be used for renewals and repairs, where wooden ties are now in use. By the end of next year more than 90 miles of track will be laid with steel ties. Railroads controlled by the United States Steel Corporation are now using over $500,000 worth of steel ties, or enough to lay 150 miles of track. Roads not identified with the corporation are using about 120,000 steel ties on 40 miles of track. During the present year the company has sold about 3,000 tons of ties. A plan has been completed whereby the ties can be insulated, making them available for electric roads.

President Finley on Postponement of Improvements.

The following is from a statement by President Finley, of the Southern Railway: "It has been represented that work has been stopped and forces reduced as a measure of retaliation against adverse state legislation. In no case has this been true. Current railroad income is insufficient to provide funds necessary for extensive improvements and betterments. These can only be provided for, now as in the past, by obtaining new capital. Present financial conditions and the present attitude of investors toward railroad securities are such that it is impossible, for the moment, to sell securities on a basis that any business concern, managed in accordance with sound business principles, would be justified in accepting. It has, therefore, been necessary to postpone many important projects for improvements. Only those will be pushed to completion at this time on which work has progressed so far that the public and the railroad can receive the benefit of their completion at an early date. Other projects have not been abandoned, but will be carried out just as soon as conditions are such that the necessary capital can be secured. Forces have been reduced and expenses curtailed, in the same ratio, in those states in which there has been no adverse legislative action as in others."

Judge Shull on the Two-Cent Law.

In the case of the Susquehanna River & Western Railroad, 13 miles long, Judge Shull, of the Perry County Court, Pennsylvania, has declared the two-cent fare law of that state in derogation of both the United States and the Pennsylvania constitutions. He quotes figures of the company's earnings to show that the enforcement of the rate would be confiscatory. He says that the act is a "caprice of a Legislature many of whose members, without rhyme or reason, facts or figures, information or reputation, were pledged to perform the act in the name of 'reform.' We might say of reform as was said by Madame Roland of liberty in the days of the French Revolution: 'Oh, Liberty, Liberty! How many crimes are committed in thy name!'" To compel this company to comply with the law would rob the bondholders of their securities, deprive the community of the facilities for transportation of freight and confiscate the property and franchises of the stockholders.

Forty Passengers Killed in Mexico.

In a collision between a passenger train and a freight on the Mexican Central, near Aguascalientes, on September 19, 40 or more passengers were killed and 34 injured.

In the South.

A southern railroad had stationed, at a highway crossing, an old negro watchman, whose duties consisted in warning travelers when a train approached. One night a wagon belonging to a farmer was struck, resulting in a bad accident. The company was, of course, sued for damages, and at the trial the old darky replied to the questions put to him in a clear, direct fashion. Among these questions was one as to whether he was sure that he had swung his lantern across the road when he perceived the train approach. The negro replied:

"I shorely did, sah!"

The trial resulted in a verdict for the company and the counsel took early occasion to compliment the aged negro on his excellent testimony. To which the latter replied:

"Thankee, Marse John, but I was shorely skeered when dat lawyer man begin to ask me about de lantern. I was afeared for a minute dat he was goin' to ask me if it was lit or not. De oil done give out some time befo' de accident!"—*Exchange.*

President Diaz's Review of Mexican Railroads.

In his recent message to the National Congress of Mexico, President Diaz gave a review of the progress of railroad construction in that country as follows:

"The unpropitious condition of the foreign markets is the reason that arrangements for the merger of the National Railroad of Mexico and the Mexican Central Railway have not been consummated. A decree was issued on July 6, last, laying down the lines along which the Mexican company that will take over the two properties in question is to be incorporated; but in view of the circumstances it does not seem wise to go on as yet with the incorporation or with the financial operations to which it must give rise.

"Last January the formal inauguration of freight traffic over

the Tehuantepec National across the Isthmus of Tehuantepec took place. During the first five months of operation 123,000 tons of goods were transported across the Isthmus, giving a monthly average of 24,600 tons. The company has received 300 new freight cars which, with those built and repaired at its shops, give an equipment of 1,062 freight cars. The earnings of this railroad have increased by reason of the new freight traffic, the proportion of increase in earnings in the last half year from January to June last, as compared with the same period of the previous year, being 265 per cent.

"The new railroads built in Mexico during the last six months aggregated 171 miles, the largest contributions of new track being those of the lines between Jarita and Columbia, on a branch of the National; the extension of the Pan-American, the line between Ocotlan and Ototonilco, which is a branch of the Mexican Central, the Cananea, Yaqui River & Pacific, and the line from Navajoa to Guadalajara. In addition to the new track, subject to federal jurisdiction, there were new lines subject to state jurisdiction constructed, aggregating 128 miles, making a total of 299 miles of new track constructed during this period. The total length of the railroads of Mexico is 13,882 miles."

Rail Conference.

The following announcement was made last Tuesday: "About 30 representatives of the leading railroads and steel manufacturing companies are in attendance at the conferences. The steel rail question is being thoroughly discussed, and various types of rails which may help to solve the problem are being examined and considered. There is every indication that new types of rails will be agreed upon which will be satisfactory to railroads and manufacturers alike."

University Appointments.

Howard C. Ford, C.E., has been appointed Assistant Professor of Irrigation Engineering and Surveying at the Iowa State College, Ames, Iowa. Mr. Ford is a graduate of the University of Colorado and has been Instructor in Civil Engineering there for three years. Harry J. Kesner, a graduate of the Civil Engineering department of the University of Colorado, has been appointed Instructor in Bridge Engineering in the University of Minnesota. Clement C. Williams and Arthur P. Poorman have been appointed Instructors in Civil Engineering in the University of Colorado. Mr. Williams is a graduate of the University of Illinois and has been for nearly two years on the Delaware, Lackawanna & Western. Mr. Poorman is a recent graduate of the University of Illinois, and has since been in the Weber Concrete Construction Co.

TRADE CATALOGUES.

Ideal Power.—The leading article of the Chicago Pneumatic Tool Co.'s monthly for September is, "The Little Giant Drill Compared with a Stationary Engine and a Locomotive." Asserting that the demand for high-speed portable pneumatic tools is temporary and that good practice will again come back to tools with maximum speed equal to the maximum cutting power of twist drills, comparison of the work done by different classes of such drills is made with a stationary engine and with a locomotive, and a good case made out for the drills. Other articles are, "Sun's Rays Converted into Power"; "Packing Foreign Shipments"; "Compressed Air in Railway Shops," being extracts from the discussion of a paper before the Central Railway Club; "Pneumatic Tools on Egyptian State Railways," and the program of the nineteenth annual convention of the American Boiler Manufacturers' Association to be held in Atlanta, Ga., Oct. 8, 9 and 10.

Drills.—The Cleveland Twist Drill Co., Cleveland, Ohio, sends a celluloid disc which shows, on one side, the feed per revolution per minute with high speed and the carbon drills for wrought iron, machinery steel, and soft tool steel; and, on the other side, the decimal equivalents of fractions. The disc is indestructible, it can be carried in the vest pocket and is a very convenient thing to have.

MANUFACTURING AND BUSINESS.

Edward Laterman has been appointed representative in New York city of the O. M. Edwards Co., Syracuse, N. Y.

F. P. Huntley, for some years Secretary of the Gould Coupler Company, New York, has been elected Vice-President and General Manager. He has been succeeded as Secretary by George G. Milne.

The American Bridge Company, Pittsburgh, Pa., turned out 50,000 tons of fabricated steel during August, which is said to be 1,500 tons more than any structural steel plant has ever finished in one month.

The Union Switch & Signal Co., Swissvale, Pa., has opened the office of its Canadian branch in the Sovereign Bank building, Montreal. V. K. Spicer, Western Manager, will remain in Canada for a few months to get this branch started.

The Pittsburgh Steel Co., Pittsburgh, Pa., has let contracts to the Riter-Conley Company and the McClintic-Marshall Construction Company, Pittsburgh, for buildings at its open hearth steel plant at Monessen, Pa. The work will require 3,500 tons of structural shapes.

According to a Chicago despatch, the Pullman Company is now employing 8,000 men. Early this year its working force was 10,500 men, but the company has caught up with its orders enough to allow of this reduction in employees. No further reduction, however, is contemplated.

The Cuba Railroad recently bought a No. 4 "K" Gates crushing plant built by the Allis-Chalmers Company, Milwaukee, Wis., for use at Camaguey, Cuba. This machine will be mounted on masonry foundation and fitted with smooth head and concaves; it is to be used to crush limestone to 2½ in. size.

The Scullin-Gallagher Iron & Steel Co., St. Louis, Mo., has moved its St. Louis sales department from 412 Lincoln Trust building to 1401 Syndicate Trust building, and its New York sales office from the Trinity building to 1 Wall street. A Denver, Colo., sales office has been opened in the Majestic building.

The Pennsylvania recently equipped a large number of 100,000-lb. capacity cars with Schoen solid steel wheels, replacing cast-iron wheels. The marked capacity of these cars has been increased to 110,000 lbs., with an allowance of 15 per cent. overload because the car bodies and truck frames are amply strong to carry the increased load.

The Chicago & North-Western's plant for treating railroad ties at Escanaba, Mich., is to be enlarged at an expense of $25,000. In addition to the Wellhouse process, now in use, the Rutger creosote process is to be employed hereafter. With the Wellhouse process (chloride of zinc) only soft timbers can be treated to advantage, but with the creosote process hard woods can be treated with profit.

The Chilean Government is asking bids on railroad construction on the state railroads; also for an electric light plant, etc. The estimate is about $600,000. Address Minister of Industry, Communications and Public Works, Santiago, Chile. A concession has been granted Señor Pedro A. Rosseldt, of Santiago, for railroad construction estimated at about $4,000,000. He may be addressed care of the Minister of Industry.

During the traveling engineers' convention in Chicago, special opportunity was given the members to examine in a body the new roundhouse and other up-to-date locomotive terminal facilities that have lately been finished by the Chicago & Western Indiana, one of the belt roads. The roundhouse is equipped with the Miller system for washing out and refilling boilers; it was installed by Julian L. Yale & Co., Chicago. A special train took the convention members to the terminal.

The Cleveland Twist Drill Co., Cleveland, Ohio, has bought the business and plant of the Three Rivers Tool Co., Three Rivers, Mich. The machinery will be immediately installed at the purchasing company's works at Cleveland. J. G. Matthews, former manager of the Three Rivers plant, will have charge of the making of the "Peerless" reamers. The blades of these tools are high-speed steel brazed into a body of low carbon steel. Both solid and expansion types will be made.

The new power stations of the North Shore Electric at Waukeegan and Blue Island, near Chicago, are furnished with alternating current electric cranes made by the Northern Engineering Works, Detroit, Mich. These are 30-ton and 25-ton capacity cranes respectively, 58 ft. and 39 ft. span. The larger crane is equipped with an auxiliary high-speed alternating current hoist. The Black Hills Traction recently installed an eight-ton, 32-ft. span, Northern traveling crane at Spearfish, S. Dak.

The Isthmian Canal Commission will receive bids until October 14 for automatic fire-alarm telegraph systems, marine electric fixtures, fire hose, hose nozzles, fire harness and attachments, firemen's helmets, batteries, dynamite and blasting material, fusible plugs, wire, hoisting engines, shop machines, steel, iron, zinc, copper, brass, rivets, bolts, chain, wrought-iron pipe, cast washers, gaskets, packing, rubber and wire sleeves for dredges, canvas, cotton waste, kerosene, oils, wrenches, ratchet drills, anvils, swage blocks, blacksmith's

mandrel, tire-measuring wheels, crucibles, lamps, dump wagons, piles, bridge timber, etc.

The Isthmian Canal Commission has ordered three steel barges of 400 tons capacity each from the Maryland Steel Company at $59,495, delivery to be made in 120 days. The bid of the United States Steel Corporation was for $85,575, delivery to be made in 225 days. Other bids for the barges were: Newport News Shipbuilding & Drydock Company, $69,000, and Lewis Nixon, $76,950. The lowest bidder for six heavily constructed steel barges for rough work at Panama is the Maryland Steel Company at $125,700, delivery in 200 days, while the steel corporation quoted $135,300, delivery in 230 days. Bids for 12 more steel barges are to be called for soon.

Iron and Steel.

The Atchison, Topeka & Santa Fe has ordered 8,000 tons of bridge steel.

The New York Central & Hudson River has ordered 2,500 tons of bridge steel.

The Lehigh Valley has ordered 2,250 tons of Bessemer rails from the Pennsylvania Steel Co. at $28 a ton.

The Chicago, Milwaukee & St. Paul will soon give an order for 2,500 tons of bridge steel for use on its Pacific extension.

The Carnegie Steel Company has ordered 1,000 tons of fabricated steel from the American Bridge Company for a new power house at its Youngstown plant.

OBITUARY NOTICES.

Samuel Sloan, Chairman of the Board of the Delaware, Lackawanna & Western, and formerly President of that company, died on September 22 at his home at Garrison-on-Hudson. Mr. Sloan was nearly 90 years old.

Henry Clarkson Wicker, formerly President of the Fort Worth & Rio Grande, died on September 20 at his home at Glen Cove, L. I. Mr. Wicker was born at North Ferrisburgh, Vt., in 1840. After graduating from Williston Academy, he began railroad work in 1861 as a clerk in the general freight office of the Chicago & Alton. He was for two years an agent of the Chicago & Milwaukee, now part of the Chicago & North-Western, and in 1866 was made General Freight Agent of the Chicago & Alton. Two years later he was appointed General Freight Agent of the North Missouri, now part of the Wabash, and in 1873 was made joint General Eastern Agent of the Chicago & North-Western, the Chicago, Rock Island & Pacific and the Chicago, Burlington & Quincy. In 1875 he was appointed General Freight Agent of the Chicago & North-Western, being later made Freight Traffic Manager and then Traffic Manager. After being out of railroad service for a year, he was, in 1900, elected President and General Superintendent of the Fort Worth & Rio Grande, from which position he resigned, in the summer of 1901, to become a member of the governing board of the Southwestern Rate Association.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad conventions and engineering societies, etc., see advertising page 24.)

Association of Railway Financial Officers.

At a meeting held in Niagara Falls last week an association was organized, with this name, by the treasurers and financial officers of a number of prominent roads. The President is F. H. Hamilton, Secretary and Treasurer of the St. Louis & San Francisco, St. Louis.

Railway Signal Association.

The annual meeting of this association will be held at Milwaukee, October 8, 9 and 10. The first session will be called at 10 o'clock Tuesday, the 8th. The headquarters of the association will be at the Hotel Pfister.

At this meeting committee reports will be submitted as follows:

Standard specifications for electric interlocking.
Standard specifications for mechanical interlocking.
Automatic block signal systems.
Costs and estimates for installation.

Committee on signaling:

Standard specifications for automatic block signaling.
Foreign current on automatic block signaling.
Signal lamps.
Maintenance of automatic block signals.
Circuits for interlocked signals.
Rubber covered wire.
Maintenance manual controlled signals.
Storage battery.
Office records.
Circuits for manual block signal systems.
Signal definitions.

The Signal Appliance Association has arranged for a theatre party on the evening of the 8th and for carriage rides and other entertainments for the ladies on both Tuesday and Wednesday, on Wednesday evening there is to be a banquet at which the following gentlemen are expected to speak: G. R. Peck, General Counsel of the Chicago, Milwaukee & St. Paul; W. A. Gardner, Vice-President of the Chicago & North-Western; Azel Ames, Jr., Signal Engineer of the New York Central & Hudson River; John I. Beggs, General Manager of the Milwaukee Electric Railway & Light Company, and E. Morse, President of the Simplex Electric Company. The chairman of the exhibit committee is R. A. Patterson, 12 Dey street, New York, and of the local committee of arrangements, W. J. Gillingham, Jr., 1423 Monadnock Block, Chicago.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Alabama Railroad Commission.—The members of this commission are: Charles Henderson, President, Troy, Ala.; W. D. Nesbitt, Birmingham, Ala., and J. G. Harris, Montgomery, Ala. S. P. Kennedy, Anniston, Ala., is Secretary.

Cache Valley.—G. W. L. Brown has been appointed Assistant to the Vice-President and General Manager, with office at Sedgwick, Ark.

Chicago, Indianapolis & Louisville.—L. W. Parker, of Chicago, has been elected a Director, succeeding Gilbert B. Shaw, of Chicago.

Chicago, Milwaukee & St. Paul.—L. J. Pettit, President of the Wisconsin National Bank, Milwaukee, Wis., has been elected a Director, succeeding Joseph Milbank, resigned.

Denver & Rio Grande.—See Missouri Pacific.

International & Great Northern.—See Missouri Pacific.

Kansas Railroad Commission.—The members of this commission are as follows: G. W. Kanavel, Chairman; C. A. Ryker and Frank J. Ryan. E. C. Shiner is Secretary and Rate Clerk.

Louisville, Henderson & St. Louis.—Otto Marx and William Bullitt have been elected Directors, representing minority stockholders.

Missouri Pacific.—A. C. Bird, Vice-President in charge of traffic of this road and of the Denver & Rio Grande, the Rio Grande Western and the Texas & Pacific, has resigned, effective October 1. Mr. Bird has been on leave of absence because of continued ill health for the last two years. J. M. Johnson, Assistant to Mr. Bird, has been appointed Assistant to Vice-President C. S. Clarke of the Missouri Pacific, to Vice-President L. S. Thorne of the Texas & Pacific, to Vice-President C. H. Schlacks of the Denver & Rio Grande and the Rio Grande Western, and to Vice-President Leroy Trice of the International & Great Northern.

Nebraska Railroad Commission.—The members of this commission are: H. J. Winnett, Chairman, J. A. Williams and H. T. Clarke. Clark Perkins is Secretary.

Nevada Railroad Commission.—The members of this commission are: H. F. Bartine, Chairman, Henry Thurtell and J. F. Shaughnessy. E. H. Walker is Secretary.

Oregon Railroad Commission.—The members of this commission are: Thomas K. Campbell, Cottage Grove, Chairman; Oswald West, Astoria, and Clyde B. Aitchison, Portland. George O. Goodall is Secretary.

Rio Grande Western.—See Missouri Pacific.

Texas & Pacific.—See Missouri Pacific.

Operating Officers.

New York, New Haven & Hartford.—W. G. Bierd, who recently resigned as General Manager of the Panama Railroad, has been appointed General Superintendent of the New York, New Haven & Hartford, succeeding O. M. Shepard, assigned to other duties.

Toledo & Indiana.—H. C. Warren, General Superintendent of the Toledo, Port Clinton & Lakeside (electric), has been appointed General Manager of the Toledo & Indiana, succeeding E. Darrow, resigned to go into other business.

Traffic Officers.

Chicago, Indianapolis & Louisville.—The statement published in our issue of September 13 that B. E. Taylor, General Manager, had been appointed General Freight Agent succeeding O. C. Carter was a mistake. Mr. Carter remains General Freight Agent and all correspondence concerning the general freight department should be addressed to him, the office of Traffic Manager, held by the late Charles H. Rockwell, having been abolished.

Chicago, Milwaukee & St. Paul.—J. M. Davis, division freight agent at Milwaukee, Wis., has been appointed to the re-established

office of Assistant General Freight Agent at Milwaukee, effective October 1.

Pittsburgh & Lake Erie.—J. B. Nessle, General Agent at Pittsburgh, Pa., has been appointed Assistant General Freight Agent.

Southern.—C. D. Morris, chief clerk to the General Freight Agent of the St. Louis-Louisville lines, has been appointed to the new office of Assistant General Freight Agent of these lines, effective October 1.

Engineering and Rolling Stock Officers.

Illinois Central.—R. E. Fulmer, Master Mechanic at Paducah, Ky., has resigned to go to another road.

New Jersey Railroad Commission.—Alfred P. Boller has been appointed Civil Engineer, and Boller & Hodge, New York, Consulting Engineers to the commission.

LOCOMOTIVE BUILDING.

The Cincinnati, Hamilton & Dayton is said to be thinking of buying locomotives.

The New York Central Lines are figuring on their usual fall order for locomotives.

The Japanese Government has decided to buy 900 locomotives during the five years beginning with 1908.

The Chicago, Cincinnati & Louisville has ordered five consolidation locomotives from the Baldwin Locomotive Works.

The Austrian State Railroads are asking bids on 43 locomotives, to cost about $800,000, for the Northern lines. Address, Nordbahndirection, Vienna.

The Trinity & Brazos Valley has ordered three simple consolidation locomotives from the Baldwin Locomotive Works.

General Dimensions.

Type of locomotive	Consolidation
Total weight	176,500 lbs.
Weight on drivers	157,000 "
Diameter of drivers	57 in.
Cylinders	20 in. x 28 in.
Boiler, type	Extended wagon top
Boiler, working steam pressure	200 lbs.
Tubes, number	265
" material	Shelby seamless steel
" diameter	2 in.
" length	14 ft. 2 "
Firebox, length	120½ "
" width	39¼ "
" material	Otis steel
Grate area	32½ sq. ft
Heating surface, total	2,169 "
Tank capacity	8,000 gallons
Coal capacity	10 tons

Special Equipment.

Brake-beams	National hollow
Brake-shoes	Diamond steel back
Couplers	Tower
Draft gear	Westinghouse friction
Headlights	Pyle National
Injector	Monitor
Journal bearings	Hewitt
Journal boxes	Franklin
Piston and valve rod packings	Jerome
Safety valve	Crosby
Sanding devices	Leach
Sight-feed lubricators	Nathan
Springs	Railway Steel-Spring Co.
Steam gages	Ashcroft
Tires, driving wheel	Standard Steel Works
Tires, truck wheel	Standard Steel Works
Tires, tender wheel	Standard Steel Works

CAR BUILDING.

The Canadian Pacific is figuring on building 2,000 box cars at its own shops.

The Chicago City Railway, it is said, has ordered 300 Montreal type street cars.

The United Zinc & Chemical Co., Kansas City, Mo., is in the market for 15 tank cars.

The Southern Indiana has ordered 500 gondola cars from the Haskell & Barker Car Co.

The Southern is said to have ordered 500 freight cars from the American Car & Foundry Co.

The New York Central Lines will figure on specifications for rolling stock in a few days.

The Japanese Government has decided to buy 19,000 freight cars and 1,000 passenger cars during the five years beginning with 1908.

The White Pass & Yukon, which recently asked prices on a number of special design cars, intends to build the cars at its own shops about January, 1908.

The Public Service Corporation, Newark, N. J., is said to have ordered 250 additional street cars from the Cincinnati Car Co. Of these, 50 are for November delivery and the rest for delivery during the spring of 1908.

The Italian Government Railroads are said to have decided to ask bids in various countries on about $5,000,000 worth of passenger and freight cars. This is understood to include all the equipment now being figured on, although heretofore the government has reserved a large part of its requirements for its own shops.

The Canadian Pacific has ordered from the Pullman Company eight first-class cars, without smoking rooms; eight second-class cars, five colonist cars and four baggage cars. The first-class cars will measure 65 ft. long and 9 ft. 10½ in. wide over frames, with varnished mahogany outside finish and mahogany interior. The second-class cars will have the same measurements and finish. The colonist cars will measure 67 ft. long and 9 ft. 10½ in. wide, over frames, and will have varnished Douglas fir outside finish and birch, mahogany stained interior. The baggage cars will measure 60 ft. long and 9 ft. 10½ in. wide, over frames, and will have the same specifications as the baggage cars reported in the *Railroad Gazette* of August 24, 1906, except that they are to be heated by direct steam, lighted by Pintsch gas, and that steel backed Diamond S brake-shoes are to be used. Bodies and underframes of all cars will be of wood. The special equipment for all cars except the baggage cars includes:

Body bolsters	Double, C. P. R. standard
Truck bolsters	Double
Brake-beams	Simplex trussed
Brake-shoes	Steel backed, diamond S, flanged
Brakes	Westinghouse, high speed
Center bearings	One of malleable iron and one of steel
Couplers	Tower
Curtain fixtures	Forsyth
Curtain material	Pantasote
Draft rigging	Miner tandem with M. C. B. class "G" spring
Dust guards	Harrison
Heating system	Steam
Journal boxes	McCord
Roofs	C. P. R. standard canvas covered
Side bearings	Susemihl
Springs	Elliptic
Trucks	Four-wheel
Wheels	Paige
Lighting system	Pintsch gas with incandescent mantels
Platforms	Standard Coupler Co.
Seats	Wheeler for first-class and second-class, and C. P. R. standard for colonist cars
Vestibules	Pullman wide

RAILROAD STRUCTURES.

BEAVER, PA.—Arrangements have been made for a joint meeting of the officials of the Pittsburg & Lake Erie and the government engineers to consider the plans for the proposed bridge to be built over the Ohio river here. It is expected that work on the structure will be started this fall. (July 26, p. 110).

CHICO, CAL.—The Northern Electric is reported in the market for a three-span steel bridge, to be built over the Sacramento river between this place and Hamilton City.

EL PASO, TEX.—The Southern Pacific has bought 180 acres of land near this place as a site for enlarged terminal facilities. Tracks are to be laid to have a capacity of 8,000 cars.

GREENVILLE, PA.—Plans are being made by the Bessemer & Lake Erie for a large car shop to be built here. Improvements now under way will cost $300,000.

INDIANA.—General Manager B. McKeen, of the Vandalia, is quoted as saying that extensive improvements are to be made at once on the lines of this company, including six new bridges, several new stations. Many old stations are also to be remodeled.

JACKSONVILLE, FLA.—The St. Johns River Terminal Company, which was formed by the Southern and the Georgia, Southern & Florida, it is said, will at once let the contracts for which bids were opened in July for the two new freight houses here. One of the buildings will be two stories high 30 ft. x 210 ft. and the other one story high 50 ft. x 210 ft.

LONG BEACH, CAL.—The San Pedro, Los Angeles & Salt Lake, it is said, is in the market for a Scherzer bridge to be built over the San Gabriel river.

NEW YORK, N. Y.—The New York Central has given a contract to the McClintic-Marshall Construction Co. for an additional building at its New York terminals. The work will require about 2,500 tons of steel.

Old Orchard, Me.—The Boston & Maine, it is said, has bought about 30 acres of ground as a site for new tracks and a station.

Pittsburg, Pa.—It is reported that negotiations are pending between the West Side Belt and Mayor George W. Guthrie regarding an ordnance to provide for the elevation of bridges along this road in the west end.

Springfield, Ohio.—Plans for the proposed Cleveland, Cincinnati, Chicago & St. Louis new freight house have been made, and bids for the work are to be asked for October 5th.

Tomball, Tex.—Grading is reported under way for the new division freight terminals of the Trinity & Brazos Valley at this place. The work includes a roundhouse, shops and other improvements to cost about $100,000.

Vancouver, B. C.—The Bridge Committee are about to submit a by-law appropriating $1,000,000 for bridges as follows: Granville street, $500,000; Westminster avenue, $150,000; Cambie street, $235,000; Coal Harbor, $55,000, and for contingencies, $60,000.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

Apalachian Interurban.—This company was chartered in 1905. It proposes to build an electric line from the eastern end of Tennessee to the seaboard at Southport, N. C. Townships in Henderson and other counties have already voted favorably on the bond issue. W. A. Smith, president, Hendersonville, N. C. (See Construction Record, Mar. 16, 1896, p. 88.)

Atlantic & East Coast Terminal.—An officer writes that this company, which is building a terminal yard at Jacksonville, Fla., has all the grading done and track laid. The line is 2½ miles long and includes a steel bridge, for which contract has been let to the Virginia Bridge & Iron Company. J. W. Richardson, Chief Engineer, Jacksonville, Fla.

British Columbia (Electric).—Work, it is said, has been started by this company on an east line to Chilliwack, B. C., 62 miles. The work is to cost about $2,500,000, and is expected to be finished in about two years.

Buffalo, Rochester & Pittsburg.—Contract has been given to F. Shumaker, of Bellefonte, to lay a second track on nine miles of this road from Brockwayville, Pa., north to Carmen. The work is to be started at once. It includes straightening the road and a tunnel 1,200 ft. long. These improvements will shorten the line about one mile. When this work is finished second track is to be laid from Punxsutawney to Ashland Junction. (Mar. 15, p. 380.)

Canadian Northern.—Vice-President D. D. Mann, of this company, is quoted as saying that a line may be built from Vancouver, B. C., into northern British Columbia, to a connection with the proposed main line west from Edmonton. The project depends on the grant by the provincial government of a substantial subsidy.

Canadian Pacific.—This company, according to its annual report for the year ended June 30, 1907, has 823 miles of road under construction, mention of which was made last week, divided as follows:

ONTARIO DIVISION.

Toronto-Sudbury Line.—Muskoka, Ont., to Parry Sound, 23.3 miles; Parry Sound, Ont., to Byng Inlet, 40 miles; Byng Inlet, Ont., to Romford, 59 miles.

Guelph & Goderich.—Milverton, Ont., to Goderich, 45.5 miles; Listowel branch, 16.5 miles.

Walkerton & Lucknow.—Walkerton, Ont., to Proton, 37.5 miles.

CENTRAL DIVISION.

Stonewall Branch.—Komarno, Man., north to Teulon, 11.9 miles.

Pheasant Hills Branch.—Strassburg, Sask., west to Battle River, Alb., 360 miles.

Wolseley Reston Branch.—Kaiser, Sask., east to Reston, Man., 21.2 miles.

Moosejaw Branch.—Moosejaw, Sask., northwest 50 miles.

Souris Branch Extensions.—Stoughton-Weyburn, Sask., 37 miles; Lauder east six miles, Broomhill to Jackson, 6.9 miles.

Manitoba & North Western.—Yorktown extension, Sheho, Sask., northwest 37 miles; Bredenbury branch, Bredenbury, Sask., south one mile.

WESTERN DIVISION.

Calgary & Edmonton.—Lacombe, Alb., extension 50 miles.

PACIFIC DIVISION.

Columbia & Western.—Midway, B. C., west 2.2 miles.

Kootenay Central.—Golden, B. C., south 15 miles.

Chesapeake & Ohio.—George W. Stevens, President of this company, is quoted as saying that work has been resumed on improvements which were recently suspended, including the completion of 28 miles of double-track work that had been temporarily abandoned.

Chicago & North-Western.—The report for the year ended June 30, 1907, shows that 56,497 tons of rails were laid, most of which were used to replace lighter rails, on 476.61 miles of track. During the year, 38 steel bridges, aggregating 2,361 ft. long, were added to replace wooden structures, and other wooden structures were replaced with masonry arches. The plans for the passenger terminal in Chicago call for 16 elevated tracks on a tract (three blocks) bounded by Lake street on the north, Madison street on the south, Canal street on the east and Clinton street on the west, with two four-track elevated approaches; one from the west 1.12 miles long and one from the north, .9 mile. The combined tracks of the two approaches will extend from Jefferson street to the tracks of the terminal .3 mile. The work of elevating the South Branch tracks parallel to Sixteenth street from a point 550 ft. east of Western avenue to the west line of South Canal street in the city of Chicago, 2.36 miles, has been continued during the year. Three tracks have been elevated to a maximum height of 15.8 ft. on 1.35 miles. The construction of 3,265 lineal feet of retaining walls, five subways, and foundations for three subways has been finished; and 2.53 miles of sidings, yard tracks and industry tracks have been elevated. The work of elevating the main tracks on the Milwaukee line from the end of the present elevation at Balmoral avenue, to the northern limits of the city of Chicago at Howard avenue, 2.74 miles, under way during the year, is all finished except the permanent subways. The plans called for the elevation to a maximum height of 14 ft. of the two existing main tracks; the construction and elevation of one additional main track and the construction of 1.12 miles of freight yard tracks; also the construction of 4,693 lineal feet of retaining walls and 18 subways. During the year, sidings, yard tracks and spurs have been added to serve industries aggregating 72.13 miles. At Sheboygan, Wis., a cut-off 4.12 miles has been finished; at Eland Junction, Wis., the grades of the Ashland division main tracks have been raised, the bridges and culverts permanently replaced and freight yards enlarged and improved. Important grade revisions have also been finished on this division between Sheboygan, Wis., and Bartel, and between Milwaukee and Port Washington. During the year new lines have been opened for traffic as follows: Wyoming & North Western, from Casper, Wyo., west to Lander, 147.89 miles; Manitowoc, Green Bay & North Western, between Manitowoc, Wis., and Eland Junction, and from Pulaski to Gillett, a total of 123.20 miles; Milwaukee & State Line Railway, a two-track line from the Milwaukee line near Lake Bluff, Ill., to an intersection with the same line near St. Francis, Wis., 50.24 miles; the Pierre, Rapid City & North-Western from a point .2 miles north of Fort Pierre, S. Dak., west to Rapid City, 165.48 miles, was opened for traffic in August; the Pierre & Fort Pierre Bridge Railway to connect the P., R. C. & N.-W. line with the Chicago & North-Western at Pierre, 1.79 miles, including a bridge consisting of seven masonry arches, to have four fixed spans each 350 ft. long, and a draw span 445 ft. long, is expected to be opened for traffic this year. The extension from Bonesteel, S. Dak., northwest to Gregory, 25.96 miles, has been opened for traffic, and the further extension of this line from Gregory to Dallas, 4.84 miles, is expected to be finished this year. An extension has been built from Elton, Wis., east 6.6 miles, which is being further extended to Langlade, 3.36 miles. An extension has been finished from near Marathon City, Wis., to Rib Falls, 4.75 miles.

Chicago, Rock Island & El Paso.—See Chicago, Rock Island & Pacific.

Chicago, Rock Island & Gulf.—See Chicago, Rock Island & Pacific.

Chicago, Rock Island & Pacific.—J. W. Robins, General Superintendent, is quoted as saying that grading has been finished on the Chicago, Rock Island & Gulf from Amarillo, Tex., west to the Texas-New Mexico boundary, 69.87 miles, and on the Chicago, Rock Island & El Paso from that point to Tucumcari, N. Mex., 41.12 miles. According to the provisions of the charter track must be laid this year. The company is planning to begin this work shortly.

Chicago, St. Paul, Minneapolis & Omaha.—The report of this company for the year ended June 30, 1907, shows that the company during the year added 8,474 tons of rails on 67.41 miles of track, most of which were to replace lighter rails. The extension from Hartington, Neb., to Crofton, 15.8 miles, has been opened for traffic, and it is expected that the extension from New Castle, Neb., to Wynot, 18 miles, will be opened for traffic this year. During the year second track between Merrillan, Wis., and Augusta, 21.70 miles, was put in operation, also third and fourth tracks, between East St. Paul and a new freight yard near the Harvester works, 3.2 miles, and second track between Duluth passenger station and

St Louis river bridge, 1.86 miles. Work is under way on second track between Altoona, Wis. and Augusta 18.98 miles. This is expected to be put in operation this year. The net increase in the side and passing tracks during the year was 17.96 miles. Work on the Minnesota & Iowa division, changing the line at Minneapa, Minn., between Ottawa and St Peter and between Minneopa and Lake Crystal, has been finished, also on a change of alinement and grade south of Cumberland, Wis. for 2.25 miles.

COLORADO & SOUTHERN.—Local reports state that the Trinity & Brazos Valley is considering the question of removing its tracks from a point near Kirven, in Freestone county, Tex., on its Dallas-Houston line, and building a connecting line to the Fort Worth line at Mexia. The proposed change will shorten the distance several miles over the existing line which joins the main line at League.

DANVILLE & EASTERN ILLINOIS (ELECTRIC).—See Illinois Traction.

DENVER, LARAMIE & NORTHWESTERN.—This company, which was organized to build a line from Denver, Colo., to the northern boundary of Wyoming, 500 miles, is said to have secured all the right of way. In Denver ground has been bought aggregating about 160 acres as a site for terminals. (April 5, p. 499.)

EUNICE, LAFAYETTE & ABBEVILLE.—Incorporated in Louisiana with $1,000,000 capital and office at Lafayette. The company proposes to build a line from Eunice, La., southeast via Lafayette and Abbeville to a point on the Gulf. The directors include J. J. Lewis, President; J. N. Green, Vice-President; C. D. Caffery, Secretary and Treasurer; G. Fusilier, J. J. Stagg, P. L. De Clouet, C. D. Trahan and F. A. Godchaux.

GEORGIA-CAROLINA RAILWAY (ELECTRIC).—Local reports say that a contract is to be given by W. L. Hodges, of Hartwell, Ga., President of this company, to survey its proposed line from Athens, Ga., northeast to Anderson, S. C., 60 miles.

GRAND TRUNK.—Application is to be made by this company for permission to build a branch from St. Lambert, Que., to Brosseau station, thence north and west to the easterly entrance of the Victoria Jubilee bridge. Plans and a profile of the route have been filed.

GREAT NORTHERN.—Contract is reported let to J. H. Stewart, of Grand Forks, B. C., for grading 40 miles on the Vancouver, Victoria & Eastern, between Keremeos, B. C., and Hedley. (March 15, p. 384.)

ILLINOIS TRACTION.—The capital stock of the Springfield Belt Railway has been increased from $5,000 to $500,000. The company is to build a belt line from the McKinley road east of Springfield, Ill., to connect with the line south of the city limits, to avoid sending express cars through the city of Springfield. The Danville & Eastern Illinois has also increased its capital from $5,000 to $500,000. This company is to build a line from Danville, Ill., southeast to Terre Haute, Ind., 50 miles.

INTERSTATE TRANSFER RAILWAY.—This company, organized in Wisconsin to build a line 10 miles long from Superior, Wis., north to Duluth, Minn., has been granted a certificate of public convenience and necessity in Wisconsin. (Aug. 9, p. 164.)

JOLIET & SOUTHERN TRACTION.—This company has been authorized to issue $1,500,000 bonds. It is understood that the proceeds will be chiefly used in the construction and equipment of new lines. Contracts have already been let to the Fisher Construction Co. to do some work. (March 15, p. 385.)

LORAIN & WEST VIRGINIA.—See Wabash.

MEXICAN PACIFIC.—Reports from Mexico City state that this company, which operates 59 miles of railroad in Mexico, proposes to build a branch from Acapulco, Mex., northwest along the Pacific coast. This is said to be a Harriman project, and is eventually to connect with the line which the Southern Pacific is building from Guaymus, southeast down the coast. The Mexican Government has granted a liberal concession to the Mexican Pacific. (Aug. 30, p. 247.)

MIDDLE CAROLINA & WESTERN.—Work, it is said, has been started by this company on its proposed line from Greenwood, S. C., on the Seaboard Air Line and the Southern Railway, southeast to Salada, 29 miles. B. W. Crouch, of Augusta, Ga., is said to be interested in the project.

MISSISSIPPI RAILWAY.—Local reports state that a charter has been granted to this company in Mississippi with $100,000 capital to build a line from Bay St. Louis, Miss., on the Gulf of Mexico, north to Grand Junction, Tenn. J. E. Thornton, of Pass Christian; J. L. Ross, of Mendenhall, and G. C. Sprague, of Brandon, are said to be interested.

MISSOURI & NORTH ARKANSAS.—This company, it is said, has over 1,400 men now at work on its extension between Leslie, Ark., and Searcy, 97 miles. Track has been laid on 23 miles from Leslie, and on 30 miles between Heber and Searcy. It is expected to have trains in operation to Heber by January 1. The road is to be extended southeast to Helena, Ark. (June 21, p. 917.)

MUSKOGEE RAILWAY & NAVIGATION CO.—Incorporated in Oklahoma, with $1,500,000 capital, and offices at Shawnee and Muskogee, to build a line from Muskogee, Ind. T., south to a point on the Fort Smith & Western, in the Choctaw Nation, 55 miles. The incorporators include I. L. Reeves and S. M. Rutherford, of Muskogee, C. R. Dean and C. H. Gillman, of Shawnee.

NORTHERN ELECTRIC.—This company, it is said, will extend its line from Chico, Cal., north via Redbluff and Redding to Kennett, 90 miles. The company is now building an extension from Chico west to Hamilton City in Glenn County, 18 miles.

PITTSBURGH & LAKE ERIE.—Twenty-five tracks, each about half a mile long, are being laid in this company's yards at Aliquippa, Pa.

PUGET SOUND INTERNATIONAL RAILWAY & POWER COMPANY.—This company, which was incorporated in Maine last spring with a capital of $200,000 to build an electric line from Seattle, Wash., north via Everett to Bellingham, about 100 miles, has acquired through a lease the Everett Street Railway and electric light and water properties recently bought by the Stone & Webster interests of Boston, Mass. It is understood this line is to form part of a through electric line between Seattle and Vancouver, B. C. E. W. Purdy is President; C. D. Wyman, Vice-President; Albert K. Todd, Secretary. (See Washington Roads, June 28, p. 949.)

ROBERT LEE & FORT CHADBOURNE.—According to reports from San Angelo, Tex., President Spencer of this proposed line has given a contract to J. T. Hunter to do grading. The proposed route is from Robert Lee, in Coke county, east to Winter, about 30 miles.

ROSWELL & EASTERN.—Residents of Roswell, N. Mex., have granted to this company a bonus of $220,000 and a right-of-way through the town. The company proposes to build a line from Roswell, N. Mex., east to Lubbock, Tex., 120 miles. Edward Kennedy, of Houston, is promoting the project. A company under this name was incorporated some time ago to build from Torrance, N. Mex., south to the Texas state line. (Mar. 15, p. 391.)

SAN DIEGO & ARIZONA.—This company, it is said, has begun building its line from San Diego, Cal., east to Yuma, Ariz., 200 miles. The company was organized in December, 1906, and bought the franchises and property of the San Diego-Eastern, projected over this route. John D. Spreckels is the principal promoter. (March 15, p. 391.)

SOUTHERN.—For suspension of work on this road see statement of President Finley on page 366.

SOUTHERN PACIFIC.—See Mexican Pacific.

SPRINGFIELD BELT RAILWAY (ELECTRIC).—See Illinois Traction.

TRINITY & BRAZOS VALLEY.—See Colorado & Southern.

VALLEJO & NORTHERN (ELECTRIC).—This company has all the right-of-way secured for a two-track electric line to be built from Vallejo, Cal., northeast to Sacramento, about 40 miles. Work is to be started at once. (March 15, p. 393.)

VANCOUVER, VICTORIA & EASTERN.—See Great Northern.

VIRGINIA AIR LINE.—This company, which was incorporated last year in Virginia with $25,000 capital, has increased its capital to $500,000. The company is building a line from Lindsay, Va., on the Chesapeake & Ohio south to Upper Bremo on the James River division, about 30 miles. Reports say that grading is finished from Lindsay to Palmyra, about 10 miles, and that track laying is to begin at once. T. O. Troy, President, Amherst, Va.; J. M. Robertson, Secretary, Charlottesville, Va. (March 15, p. 393.)

WABASH.—The extension, building under the name of the Lorain & West Virginia, from Wellington, Ohio, north to Lorain, about 35 miles, is reported to be now in operation. (May 24, p. 728.)

WASHINGTON, FREDERICK & GETTYSBURG (ELECTRIC).—This company has issued bonds to build and equip about 25 miles of line now under construction from Frederick, Md., north via Thurmont, to Emmitsburg. Grading has been finished on six miles and it is expected to have the line between Frederick and Thurmont finished in November. D. C. Kemp, President, Frederick, Md.

WESTERN PACIFIC.—This company has a total of 234 miles of track laid out of 929 miles of main line as follows: In California 27 miles west from Stockton to a point 52 miles of open; 26 miles from Stockton, north to the Mokelumne river; 27 miles from Marysville northwest to Oroville, and in Utah and Nevada for 154 miles from Salt Lake west to within about eight miles of Shafta, Nev., which will be the junction point with the Nevada Northern running south to Ely, Nev.

There remain three gaps to close, one of 52 miles from Oakland through Niles Canyon; a second of 62 miles from the Mokel-

umne river north through Sacramento to Marysville, and a third of 695 miles from Oroville across the Sierra Nevada to a point just east of Shafta. Work has been started on the 1,600-ft. tunnel in San Francisco, the shaft leading from Islais Creek district north into the southern section of the city, with but eight miles of track to be laid to reach Shafta from the east. It is probable that Salt Lake and Shafta will be connected, a distance of 162 miles, by October 1.

Wisconsin Central.—This company expects to finish track laying on the extension building from Ladysmith, Wis., northwest to Superior, 105 miles, by November first. A steel bridge is being built over the Chippewa river just north of Ladysmith that will probably be finished this month. Work trains can then be run as far north as Douglas county. On the whole line there are to be 45 trestles and five steel bridges.

Wichita, Cleveland & Gulf.—Incorporated in Oklahoma with $50,000,000 capital stock and office at Cleveland, Okla. The company proposes to build a line 634 miles long from Wichita, Kan., south through the counties of Sedgwick, Butler, Cowley and Chautauqua, in Kansas; the counties of Osage and Pawnee, in Oklahoma, and through the Cherokee, Creek and Choctaw nations, and the states of Arkansas, Texas and Louisiana to the gulf. The incorporators include: David Ratner, J. F. Hethering, J. C. Byers, R. L. Lunsford and A. Cecanko.

Youghiogheny & Cheat River.—Incorporated in Pennsylvania with $200,000 capital to build a line from Ohiopyle, Pa., on the Baltimore & Ohio, at the Youghiogheny river west to a point in Wharton township, Fayette county. The incorporators include: E. W. Mudge, President, Pittsburgh; C. B. Ferree, R. G. Campbell, G. C. Landers, H. N. Trimble and C. M. Thorp.

RAILROAD CORPORATION NEWS.

Albany & Susquehanna.—See Delaware & Hudson.

Boston & Maine.—This company has sold to Bond & Goodwin, Boston, $4,000,000 one-year 6 per cent. notes. The proceeds are to be used to refund short term notes. Most of the new notes have been disposed of and the rest are being offered at 100¼. See New York, New Haven & Hartford.

See Fitchburg Railroad.

Chicago & Alton.—Judge K. M. Landis has announced that the promise of immunity from prosecution on account of rebates given the Standard Oil Company of Indiana will be kept. It is believed that this decision removes the most important obstacle to the ultimate consummation of the acquisition of the Chicago & Alton by the Toledo, St. Louis & Western.

Delaware & Hudson.—The United States Circuit Court has handed down a decision in favor of the stockholders of the Albany & Susquehanna in their suit against the Delaware & Hudson for 12½ per cent. annual dividends, as rental, instead of the 9 per cent. which the Delaware & Hudson has been paying on the A. & S. stock since 1902. The point of the suit was that the D. & H. in refunding issues of 7 per cent. and 6 per cent. A. & S. bonds with 3½ per cent. convertible D. & H. bonds had effected a saving in interest charges of which the A. & S. stockholders should get the benefit under the terms of the lease; the latter therefore brought suit for increased dividends, with the above result. (Nov. 2, 1906, p. 124.)

Fitchburg Railroad.—At the annual meeting on September 25, the stockholders annulled their vote of January 30, 1907, authorizing $800,000 bonds for double-tracking between Troy, N. Y., and Johnsonville, and for the elimination of grade crossings, and, instead, authorized an issue of $2,900,000 bonds, part of which are to be used to refund $2,000,000 bonds maturing May 1, 1908, and the rest for the double-tracking and for other improvements. They also authorized the purchase of the Conway Street Railway, a small electric line in Conway, Franklin County, Mass., and authorized the issue of preferred stock and bonds to pay for this property. The bill allowing this purchase was passed last spring by the Massachusetts legislature.

Illinois Central.—In a letter asking for proxies for the annual meeting on October 16, Stuyvesant Fish says that for some time there have been persistent efforts to put the control of the company in the hands of Union Pacific and Southern Pacific interests. The policy of the Illinois Central, operating as it does north and south lines, has been to deal with each of its east and west connections to the best advantage without making exclusive traffic alliances. It delivers more tonnage to connecting lines than it receives from them, and its control would therefore be particularly valuable to the Union Pacific and the Southern Pacific. Although the Harriman interests denied at the annual meeting last year that the Union Pacific had an interest in Illinois Central stock, the Interstate Commerce Commission investigation in February showed that the Union Pacific had bought, before the 1906 stockholders' meeting, nearly 30 per cent. of the Illinois Central capital stock. The annual report for the year ended June 30, 1907, shows an extraordinary increase in net receipts during the last four months. During the first four months they increased $670,000; in the next four months, after the change of presidents, they decreased $570,000, and in the last four months they increased $1,250,000, of which over $600,000 was in the single month of June, and then, although neither mileage nor operating conditions had changed, the month of July, 1907, showed a decrease of $35,000 in net revenue. A resolution of inquiry introduced by Mr. Fish was referred for answer to President Harahan, who was in charge, through an assistant, of the accounting methods which Mr. Fish questioned. Mr. Fish now asks for proxies because of the evident intention of electing Mr. Harriman and others of his selection to the Board of Directors to fill the four places on the Board.

Mr. Harahan has sent out a circular letter answering these statements. He says that the charges that Illinois Central accounts have been manipulated are absolutely untrue, and that the reports of the accounting and traffic officers, called for in the resolution referred to, show this. There has been no change in the relations of the Illinois Central with the Union Pacific and the Southern Pacific. Mr. Harahan then speaks of the reasons why Mr. Fish was dropped from the presidency. He gives specific instances of loans made by Mr. Fish from Illinois Central surplus, of which the Directors disapproved; their other reasons are given in the letter from the Directors to Mr. Fish, which was written last November and a copy of which is enclosed in Mr. Harahan's circular letter.

Interborough-Metropolitan.—See New York City Railway.

Ione & Eastern.—John Raggio, Stockton, Cal., has been appointed Receiver of this road, which runs from Ione, Cal., to Martell, 12 miles. The interest on the $340,000 bonds is in default.

Metropolitan Street Railway.—See New York City Railway.

New York City Railway.—Adrian H. Joline, President of the Missouri, Kansas & Texas, and Douglas Robinson, of the real estate firm of Douglas Robinson, Charles S. Brown & Co., have been appointed Receivers of this property on the petition of the Pennsylvania Steel Company and the Degnon Contracting Company, creditors for about $50,000. A few months ago the assets of the company were given as about $29,000,000 and the liabilities as about $38,000,000. It is alleged that the floating debt amounts to $2,000,000 and that the company cannot pay it. An immediate result of the receivership will be the passing of the guaranteed 7 per cent. dividends on Metropolitan Street Railway stock, and it is believed that since the property is now in the hands of the federal courts, the investigation of the Interborough-Metropolitan's relations with its subsidiaries, which has been carried on by the Public Service Commission for the First district, will have to stop, so far as the New York City Railway is concerned.

New York, New Haven & Hartford.—A special meeting of the stockholders has been called for October 30 to authorize an issue of $35,469,500 additional capital stock. This is to be issued to stockholders and convertible debenture holders at $125 a share to the extent of 25 per cent. of their present holdings; for this purpose, $150 in debentures is equivalent to $100 in stock. There are outstanding $30,000,000 convertible debentures and $121,878,000 stock. Part of the latter is, however, held in the treasury, having been issued by the company to itself in exchange for its own holdings in Consolidated Railway stock.

See editorial columns for President Mellen's attitude concerning the relations of this company with the Boston & Maine.

Pan-American.—The Mexican government is said to have bought the majority of the capital stock of this company. There is $10,000,000 authorized, of which $1,084,600 was outstanding in April, 1906. About 200 miles of road are in operation from San Geronimo, where it connects with the Tehuantepec National, to a point 50 miles from the Guatemala border.

Southern Pacific.—Gross earnings for July, 1907, were $11,451,270, an increase of $2,237,535; net earnings, after taxes, $3,452,587, an increase of $47,568. These returns were compiled after the manner of those of the Union Pacific, which see.

Toledo, St. Louis & Western.—See Chicago & Alton.

Union Pacific.—Gross earnings for July, 1907, were $7,233,994, an increase of $1,026,165; net earnings, after taxes, $3,041,983, a decrease of $79,398. These earnings were compiled in accordance with the Interstate Commerce Commission's new accounting rules, and the figures for the same month in 1906 have been revised to conform with them for comparison.

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS.

THE BRITISH AND EASTERN CONTINENTS edition of the Railroad Gazette is published each Friday at Queen Anne's Chambers, Westminster, London. It contains selected reading pages from the Railroad Gazette, together with additional British and foreign matter, and is issued under the name Railway Gazette.

CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.

ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

OFFICERS.—In accordance with the law of the state of New York, the following announcement is made of the office of publication, at 83 Fulton St., New York, N.Y., and the names of the officers and editors of The Railroad Gazette:

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CONTENTS

VOL. XLIII., No. 11. FRIDAY, OCTOBER 4, 1907.

The huge figures for the freight and passenger movement in the United States, and its enormous growth within a short period, during which the increase in mileage has been comparatively small, tends to create the impression that there is generally great density of traffic, which impression is strengthened by the obvious fact that many important lines have had at times more traffic than they could handle. Taking the railroad system as a whole, however, the traffic must still be called thin. The movement on the 222,340 miles reported for 1906, if evenly distributed in time and over the railroads, was equivalent to a daily movement in each direction of 181 passengers and 1,330 tons of freight, say one train a day each way with three full carloads of passengers and another with 33 full carloads of freight. Seeing as we do on the more important lines train after train pass much larger than these (though rarely fully loaded in both directions) it is hard to believe this; but by as much as the traffic vastly exceeds this on certain lines, by so much it falls below it on others; and rates which leaving a narrow margin of profit where the traffic is dense, yet yield an abundant return, are not likely to pay the working expenses where it is light. But the average density of traffic is still much greater than formerly. There is nearly twice as much passenger traffic per mile of railroad as in 1897, and quite twice as much freight traffic as in 1895. From 1870 to 1885 the very large increase in mileage frequently reduced the average traffic per mile. Main lines had few interruptions in their growth; but thousands of miles of new lines on the frontier and of branches in undeveloped country often more than counterbalanced this. Now, it is practically impossible to add 10 per cent. to the mileage in a single year, as was often the case formerly, and it is many years since the addition has been as much as 3 per cent.

The New York, New Haven & Hartford Railroad Company's property reaches four states in which it encounters varying statutes of taxation. The appearance recently of its president before a special committee of the Massachusetts legislature as an advocate of direct taxation of the corporation instead of the personal taxation of the stockholder or bondholder is significant, if for no other reason, because it is based on a wide range of experience. The forms of railroad taxation in the country are still infinite. But there appears to be a slow but steady drift toward the New Haven President's suggestion of taxation directly levied by the state on railroad debt at or about par value and on capital stock at nearly market value —usually in practice a little below that value on the theory that any large amount of the stock, if put on sale, would depress the market price. This sweeping dictum of direct taxation by the state based, in the case of interstate systems, on mileage within the state, has the manifest advantage of simplicity and of reaching every holder of stocks and bonds. Its disadvantage is the minor one of taxing a varying market value of the stock and, for example, letting a railroad now and then carry over a new issue of bonds or of stock just beyond the assessment period and thus escape for a year. If the plan, which a number of states adopt, of redistributing tax receipts among the towns, cities or counties through which the railroad runs is also adopted, the equities of the tax adjustment seem pretty complete. In this big, waxing and complicated question of railroad taxation one broad movement may also be noted: When the railroad lines were short, local and isolated the theory of local taxation was naturally dominant. As the lines have consolidated into longer lines and these into systems state taxation has come to the front, the state sometimes collecting for itself, sometimes acting merely as a tax collector for the municipalities and lately, in the case of New Jersey "splitting" the question by taxing "main stems" for state revenue while other railroad property pays local taxes. But the whole system of American railroad taxation is shot through with inequities. Why, for instance, should the resident of Connecticut be taxed on outside railroad bonds but go free on outside railroad stocks without regard to the outside and local taxation which either may bear? Ere long, also, the street railways are going to load the general problem with new enigmas. Just now the street railways may be regarded as fittest subjects of municipal rather than state taxation. Generally speaking their higher valuations are localized to centers of dense population, and the municipality which has yielded franchise rights in its streets has the primary claim to revenue from taxes. But the situation is sure to be modified as the local systems merge, extend into long distance, cross country and interstate systems, are taken up by the steam companies and ultimately—as in the case already of the New Haven—consolidated with them. State equities as against local equities in such a hybrid status of the blended lines will give us some fresh tax problems sure to be puzzling and often polemical.

The ten-wheel locomotive for the Great Western Railway, illustrated elsewhere in this issue, has a number of features that should at least attract the interested attention of American railroad men. Some of them suggest a possible simplification of our own practice, while others go to the opposite extreme and suggest complications that no superintendent of motive power in the United States would

care to advocate. Chief among these is the use of four simple cylinders instead of two. If these four cylinders were of exceptional size and the engine of great weight the reason for their existence would be readily understood. But why four cylinders of 14½-in. diameter instead of two of the equivalent diameter of 20⅛-in.? The one advantage that they possess is that the reciprocating parts are in perfect balance and are light; but it would hardly seem that this advantage could outweigh the disadvantages of the duplication of every working part, the trouble from the inaccessibility of the machinery between the frames, the crank axle and all the accompaniments. A glance at the illustrations will show that inspection of the inside working parts is quite out of the question except from a pit, and it must be remembered that this includes the whole of the valve motion except the end of the rocker and the stem of the outside valves.

The valve motion is designed along lines that are worthy of examination. There are no eccentrics or return cranks, and this may mean a possible simplification. Whether the cross connection from one set of cylinders to the other can be made more cheaply and cost less for maintenance than the usual construction with the Walschaert gear, remains to be seen. Certainly nothing can be much more simple than the return crank, and we hear of very little trouble caused by it; but that is no reason why we should not look into this Great Western scheme.

The care with which the details are worked out will undoubtedly insure the success of the engine mechanically, and under the conditions of English practice, possibly economically also; though if it were to be subjected to the ordinary treatment of locomotives on American roads it would probably not have either of these results to its credit. It stands, however, as a strong exemplification of the position of the English chief of motive power, as compared with his American brother, in that he can design and build such a machine as this without a question, because he is the responsible party and is the dictator as to what shall be built and used; a course of action that would be quite impossible in the United States.

THE EFFICIENT ILLUMINATION OF PASSENGER CARS.

Illuminating engineering is one of the newest of the professions. It is so new, in fact, that the significance of the term is not generally understood as yet. It has been defined as "the efficient use of artificial light"; that is, obtaining the best illuminating effects with the least waste of light. Comparatively few persons understand and appreciate the importance of this, and that the proper placing, reflecting and shading of artificial lights is an art requiring the expert knowledge of a specialist. As a result, most of the artificial lighting of to-day is a succession of examples of "how not to do it."

This lack of understanding and appreciation of the correct principles of artificial lighting is as manifest in passenger train lighting as elsewhere. For while the problem of efficient lighting of cars contains limitations not found in other places, the fact remains that the methods generally in vogue were evolved with little or no thought of the visual comfort of the passenger. For example, it is a fundamental rule that brilliant radiants should be kept out of the field of vision, or else that their intrinsic brilliancy be greatly reduced, as exposed lights, of any but low intensities, strain the eyes, yet ignorance of this rule is responsible for one of the commonest faults of unscientific artificial lighting. A line of brilliant unshaded lights along the ceiling of a car, as is the general custom, tries severely the eyes of all passengers having to face them. No one who has spent any time on a passenger train after dark needs to be told this. Since it is impracticable to place these lamps outside the field of vision, they should be so shaded as to reduce their intensity to a comfortable degree. The popular belief that the more light there is the better one can see is fallacious. There is a limit to the amount of light the retina of the eye can endure with comfort, and more than this produces strain, making it harder to see well than with less light.

The secret of correct illumination lies in properly directing or diffusing the light. For general lighting of cars, where hiding the lights is impracticable, as with gas lamps for instance, opal or, preferably, holophane globes should be used to keep down the intrinsic brilliancy. As a matter of fact, the general practice for illumination of cars is very wasteful of light. Much better results could be obtained at a less cost by actually reducing the quantity of the light and delivering it where it is needed by the use of suitable reflectors.

Electric lighting offers the illuminating engineer the best opportunities for the exercise of his art, of course, the incandescent lamp being the best adapted of any for getting just the results desired. But since this is the most expensive form of car lighting, general practice will continue the use of other kinds for some time to come. Therefore, since present conditions of illumination with these lights are susceptible of considerable improvement, efforts might profitably be directed to the application of methods to get better results from them and thereby not only save money by actually diminishing the amount of light now considered necessary for adequate illumination, but at the same time enhance materially the comfort of the passengers. However, it was stated at the September meeting of the Western Railway Club that by the use of proper methods in reflecting and diffusing the light the effective illumination of cars could be secured at a reduction of about one-third in the amount of electric power now generally used. This being correct, it means apparatus of less capacity, and therefore of less cost, to furnish the power, and lower cost of operation and maintenance. Since the expense is the one barrier to the general use of electricity for car lighting, a means for lessening this obstacle appears to be at hand. But aside from the important desideratum of cost, it seems not improbable that the time is approaching when the scientific illumination of passenger cars will be considered fully as important as their comfortable heating, and almost as necessary as a proper system of ventilation.

THE HARRIMAN REFRIGERATOR CARS.

Beginning October first, the refrigerator traffic on the Harriman lines, including the extremely heavy transcontinental fruit traffic, is being carried entirely in the companies' own cars, 5,000 of which have already been delivered to the Southern Pacific, with 1,600 more to come, the total cost of the equipment being approximately eleven millions. This is the most interesting immediate outcome of the action of Congress in making private car lines common carriers. The Armours formerly supplied the Harriman lines. It was brought out in testimony that the Armour interests owned some 14,000 refrigerator cars, and rented them on a mileage basis of three-quarter cents per mile, going and coming, with a further agreement, in the case of the Southern Pacific, that the Armour Car Line Company should furnish 5,000 cars, or such number as might be necessary to secure to the fruit shipping interests of California a sufficient number of combined ventilator and refrigerator cars for the transportation of fresh fruit and vegetables from California to the eastern states, in return for which the Armour Car Line was given the exclusive privilege of furnishing the refrigerator equipment, so long as it complied with these conditions. Because of the disparity between the volume of deciduous fruit shipments during the summer months and that of the citrus fruits during the winter months, the Southern Pacific Company had believed it would be unwise to provide cars of its own, since these cars would presumably lie idle for a good part of the year. In the Armour organization, the seasons in different parts of the country were utilized to strike a balance, and cars not needed in the California trade could be sent temporarily to Michigan, Texas, Georgia or elsewhere, as the need might be. But the Harriman lines have now bought a third more cars than the entire number formerly furnished them by the Armours, at a cost more than double that which was testified to in 1905 as prohibitive, and it will be a traffic question of great interest to note how the experiment works out, and whether work for the cars can be found, all the year around, in Harriman territory. If not, refrigeration charges must either provide for the dull season, or the cars must be sent out in competition with the Armour cars, and subject to difficulty in dealing with any kind of exclusive contracts to which one-season fruit roads, like the Pere Marquette, may have been able to bind themselves under the new law.

But it may be assumed that these difficulties will not prove very serious. According to the 1905 testimony, the total number of refrigerator cars in the country at that time was about fifty thousand, and the demand had grown to exceed the supply. In view of the tremendous growth of the California fruit industry, it may be hazarded that the present supply of cars will not exceed the present demand, and that mutually satisfactory adjustments can be made. Shipments of California oranges, lemons and grapefruit for the season now closing aggregate nearly 30,000 carloads. Deciduous fruit shipments have also made a high record for the season. Moreover development of an all the-year-round orange crop

to meet the constant demand for this fruit has been carried out so successfully that now there is hardly a day in the year in which orange shipments are not made. On account of the increased acreage coming into bearing, it is estimated that the citrus fruit shipments from California during the season beginning Nov. 1 will reach 35,000 cars. Pre-cooling before fruit is loaded into cars is being resorted to on a greater scale than ever before, with the result that a considerable quantity of fruit and melons that are now spoiled in transit will reach the eastern market in good condition. The Southern Pacific is erecting three ice manufacturing plants for its new refrigerator car service, to avoid the possibility of an ice shortage such as has happened in past years, causing loss to the fruit shippers.

The refrigerator car business on the Harriman lines will be carried on by the Pacific Fruit Express Company, a company controlled by the Union Pacific, and specially organized to take over the traffic formerly handled by the private refrigerator lines. Some doubt had existed on the right of the Union Pacific to own stock in a refrigerator line, but all uncertainty on this point was cleared up at the last session of the Utah legislature. At that session a new railroad law was passed codifying the railroad laws of the state and including in the privileges accorded to the railroads organized under the laws of that state the right to own express and refrigerator lines.

Mr. Harriman has been quoted to the effect that the lines in his system would hereafter be able to give an enlarged and better service and that earnings would undoubtedly be increased from that source. "Whatever they (the Armours) made, we will make," he said, but he left unsettled the question whether this was to apply to profits made wholly on his own lines or not.

HIGH CAPACITY CARS IN GERMANY.

The Prussian minister of public works has asked for proposals for the construction of coke cars of 15 metric tons capacity that shall dump and be self-clearing, and has offered prizes of 10,000, 7,500 and 5,000 marks for the best designs. Commenting on the German situation, the *Journal des Transports* says, that as far as car capacity is concerned, the fact that Germany is so far behind France is probably due to the lightness of the construction of its roadway and bridges. The American high-capacity car, with bogie trucks, has been the subject of quite contradictory opinions in Germany. It was at first rejected in 1891, when the tonnage limits were established, but a trial was afterward made in 1899 under the Essen management, with cars of 30 and 40 metric ton capacities, built after the designs of Talbot and the Pressed Steel Car Co. They passed through a period of disfavor but were taken up again, in 1904, by the Royal Bavarian Railways. These trials were no more successful than those which preceded them, and they have finally yielded to the hostility manifested. The objections that are raised to this type of car are that it is too heavy to be moved readily by men, and cannot be handled by existing facilities, such as turntables, transfer tables and the like; with the result that the cars are seldom used except for the transportation of heavy freight, such as rails.

Upon a further examination of the problem, the German engineers have found that the ratio of tare weight to local can be made almost as low for a four-wheeled car as for one equipped with bogie trucks. For example, the 20-ton standard car with side doors and trap's at the end weighs about 8.5 tons, while the 40-ton car with bogie trucks will not weigh less than 17 tons. It is quite true that a train of 600 tons can be formed of these high-capacity cars on a length 18 metres (59 ft.) less than that required with the four-wheeled cars, but this advantage is considered small when compared with the inconveniences attending the use of such long and heavy cars.

The technical convention of the German Railroad Union has limited the static load per wheel under a full load to 7,000 kilograms (15,100 lbs.), and the total weight to an average of 3,100 kilograms per metre (2,080 pounds per foot) of length over buffers. Still, on some lines where the superstructure and bridges are of sufficient strength, the weight per wheel is raised to eight metric tons, and the latest instructions regarding the maintenance of the superstructure on the main lines make this load of eight tons the minimum. It would seem, then, that the construction of the 20-ton-capacity cars that run for the most part on the main lines, could be modified in such a way that a load of from 7.375 to 7.60 tons could be carried per wheel, by giving the sides a height of 1.8 metres (5.9 feet), so that they could be loaded with 21 tons of coal or 20 tons of coke.

Independent of this increase of capacity there is a demand in German industrial circles for self-dumping cars. Up to the present the cars of this character, that have been built in Germany, have been vehicles intended for the transportation of special bulk loads such as ore, coal, broken stone, limestone and similar products, and usually make the return trip empty. In certain places, where self-dumping cars can be used to advantage they are coming into service, especially for carrying supplies to the large manufacturing establishments of the Rhenish provinces and Westphalia.

Their use is naturally subordinate to the construction of suitable sidings and chutes. Hopper bottom cars have been in use for a number of years in the valley of the Saare and on the Lahn because the structures there are suited to them; but they cannot be utilized where this is not the case. In fact the majority of the interests affected prefer the side discharge.

The position taken is that the rapidity and saving, in comparison with hand labor, of the self-dumping feature, is offset by the fact that such cars can only be used with freight that will not be injured by such a method of handling, and that, even then, they can only be used in connection with special discharging facilities. A limitation is thus imposed upon the utilization of these cars which is a serious obstacle to an increase of their numbers. It may also be added that they cost about 50 per cent. more than the common type of car, and that the ratio of the tare to loaded weights is also unfavorable to them.

These observations will show the difficulties that beset the minister of public works in his search for a type of car that shall combine the advantages that seem to be so contradictory: that is to say, an automatic discharge with a first cost and maintenance charges that shall be low enough to permit it to be used in ordinary traffic.

Railroad officers and other interested parties must look for the results of this contest with some curiosity. For, if a satisfactory solution is found, it is very certain that, in order to use the self-dumping car to the best advantage, it will be necessary to overhaul the station facilities at many points, so as to assure a rapid handling of the rolling stock during periods of congested traffic.

The initiative that has thus far been taken by some of the great industries as well as by the Prussian railroad management, has had its imitators. The State Railroad of Hungary, for example, has just given a trial order for the construction of 10 open cars of 30 metric tons capacity, to have movable sides, and for 50 more fitted with the Talbot system of side discharge.

Nothing is given out about any agreement between the New York, New Haven & Hartford and its western connections in regard to car service, so it is to be assumed that the withdrawal of that road from the per diem agreement has gone into effect; and that for western cars now coming east with freight for New Haven lines that company will have to pay a "reasonable" price per day. What this will be remains to be seen. To the notices, heretofore referred to, which the New Haven received from its connections it replied that it was ready to enter into a "reasonable arrangement"; but this was accompanied by three questions, viz.:

"Do you consider it reasonable to charge this company for the use of cars during the four days after delivery, when this company has no use of such cars because of the operation of the law giving consignees four days free of charge between delivery and final unloading?

"The cars to be delivered by you to this company will vary greatly in value, capacity and condition. How are we to ascertain what would be a reasonable charge per day for any particular car?

"How would you propose to classify cars and what would you consider it reasonable to charge for the different classes of cars to be delivered?"

It is said that most of the roads replied that they considered the per diem rules a sufficient answer to all the questions. In other words an arbitrary rate is the only practicable rate. As the arbitrary rate now in force everywhere else (fifty cents a day) is at present far below the real value of cars and therefore more favorable to the borrower than to the lender the position of the connection would seem to be strong and that of the New Haven weak. The question quoted above might make an interesting assortment of bones for lawyers to pick, but it is hard to see how they can be worth anything for any other purpose. Possibly the New Haven intends to contest in the courts every car service bill presented to it by its connections; but as the city of New Haven is supposed to be still stanchly orthodox, in spite of the supremacy of the Modernists in Yale University (and the wickedness at Hartford which gives us a four-days-free law) we may hope that the officers of the road will instead follow the advice given in the first Gospel, fifth chapter, 25th verse—to agree with thine adversary quickly, while

thou art in the way with him. Happily, the penal clauses of the Interstate Commerce law probably cannot be made to apply to interchange car service rates, so that the rest of this scripture, about being cast into prison, need not be quoted here.

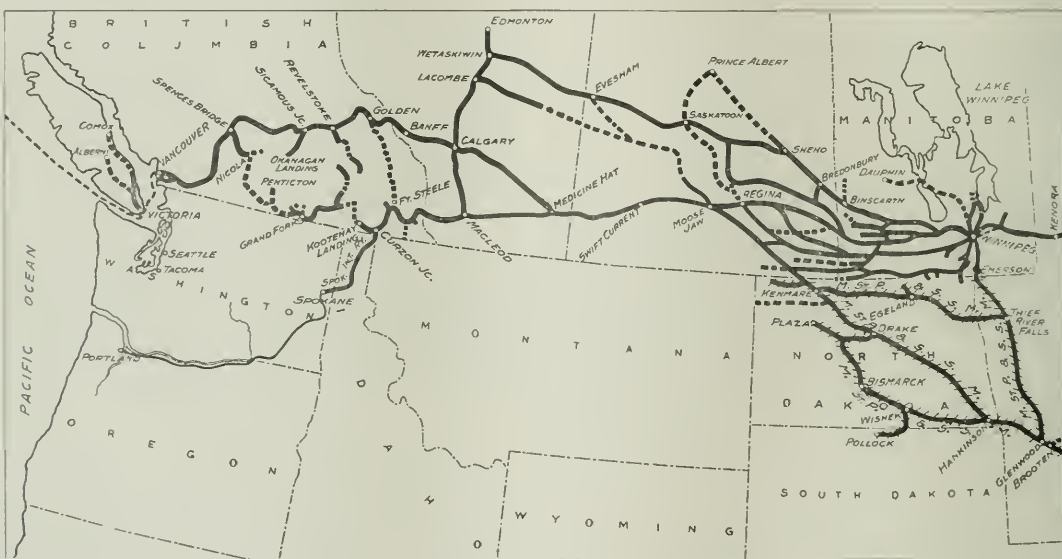
Canadian Pacific.

The Canadian Pacific is a great property. There is no railroad like it as a railroad and no railroad corporation like it as a corporation. It owns a line of railroad from the Atlantic ocean to the Pacific, with thousands of miles of branch and connecting lines in between. Besides lake and coast steamships, it owns a line of steamers from Quebec to Liverpool and another from Vancouver to Yokohama; it owns the Dominion Express Company, which operates the express business over its lines and carries more than half the total express traffic of Canada; it also owns the telegraph lines which serve its territory and receives their profits from commercial business. It owns its own parlor and sleeping cars. It owns a controlling interest in two United States railroads—the Duluth, South Shore & Atlantic, which operates nearly 600 miles of line, and the Minneapolis, St. Paul & Sault Ste. Marie, which operates over 2,000 miles. Finally, it owns directly or indirectly 14,800,000 acres of unoccupied land. No other railroad in the world has such a property as this.

Financially, the company belongs more to London than to Montreal or New York. Its 4 per cent. consolidated debenture stock and stantly increasing in value, after subtracting all expenses of the land grant and a dividend of 1 per cent. on the common stock paid to stockholders in April of this year. It still holds in reserve 12,300,000 acres, besides 2,500,000 acres which it is to receive through a subsidiary.

Of the 12,300,000 acres of land unsold, 8,900,000 acres are agricultural land in Manitoba and Saskatchewan. The British Columbia lands amount to nearly 3,500,000 acres. Some of these, it is known, and many more it is probable, contain valuable mineral deposits. Within a few days the head of the mineral department of the company has been quoted as saying that the Canadian Pacific is spending $1,500,000 on its coal deposits at Fernie, B. C., and that within a year or two the company will occupy an important position in the coal trade of the province. Much of these British Columbia tracts contain lumber, so that western lands, although not at the moment as readily salable as the agricultural lands further east, may in the end prove much more valuable.

The average price received for the 990,840 acres sold during the last fiscal year was also just under $6, but this included a large area for which contracts had been made in earlier years at from $4 to $5 an acre. The average price realized from lands actually sold within the year was over $8 an acre. At this average value—and as the price of the lands is rapidly increasing, the company is likely to receive a much higher average for its holdings—the value of the unsold lands is about $120,000,000, which, added to the $65,000,000 gross already received, would make a total ultimate value of the



Canadian Pacific System; Western Lines.

4 per cent. preference stock are held almost exclusively abroad, where they are highly regarded. This is proved by the fact that the company received more than par for about $6,000,000 of these two classes of stock sold during the last year, when safe 4 per cent. stocks of railroads in the United States were selling considerably below par. Even the company's common stock, which is regularly traded in on the New York Stock Exchange, was held at a level 20 or 30 points above the price at which similar United States railroad stocks were selling, by the large holdings and demand for it in England and on the continent.

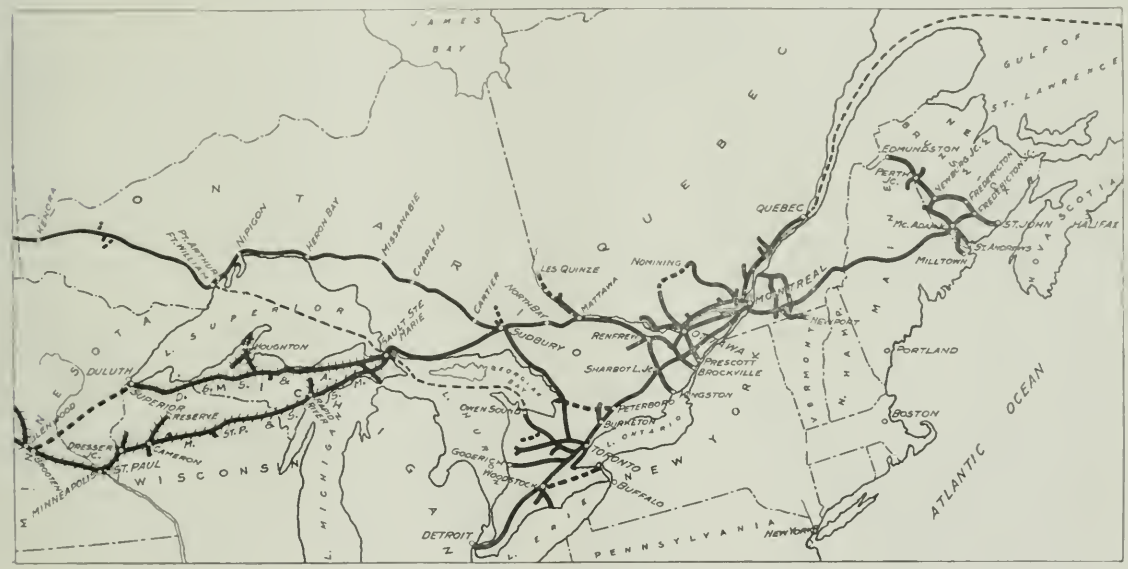
The Canadian Pacific probably has more concealed equities than any other railroad company in the world. The balance sheet by no means records the total value of its holdings in securities and lands. The Dominion Express Company, all of whose stock is owned, was until 1905 carried at $113,000. This figure was then pushed up to $2,000,000 which is said to represent about a sixth of its real value. Common stock of the Canada North West Land Company is carried at par. It has sold on the basis of $100 shares at $1,100 a share.

These are cases where the undervaluation of the company's assets can be plainly seen. In the long list of acquired securities given in the report there are undoubtedly other instances of similar if not as great undervaluation. The most important concealed asset, however, is the item of land holdings mentioned in the balance sheet only by a footnote. The company has already received $58,000,000 in cash or in deferred payments secured by land which is con- company's land grants of $185,000,000. This great asset came along with cash subsidies of $30,000,000 and 713 miles of railroad which cost $35,000,000 to build, from the Dominion or provincial governments. To-day this seems like lavish generosity, but the Canadian Northwest has now an assured and prosperous future. The first trans-continental train was run on the Canadian Pacific on June 28, 1886. At that time most of its lands were of no immediate value whatever to the railroad or to the country. More by far than to any other one cause Canada owes the wonderful development of her western territory to the Canadian Pacific Railway. The inducements offered, of small immediate but great potential value, were necessary to bring about the construction of such a railroad, as was proved by the failure of earlier similar projects to be carried out without such inducements.

For years the absolute master of the railroad facilities of the western part of Canada, the Canadian Pacific is now facing not far in the future serious competition. In the first place, the Canadian Northern threw out a network of rapidly built lines in the wheat growing regions of Manitoba, the longest of which is now in operation as far as Edmonton, Sask.; next came the defeat of the Conservative party, the ally of the Canadian Pacific, in the Canadian elections, and the Grand Trunk Pacific project, backed by the Liberals under the leadership of Sir Wilfred Laurier and the Grand Trunk Railway, which then held an almost complete monopoly of most of the province of Ontario. This meant more serious competition, for a through line from coast to coast with numerous branches and feed-

ers in the western country was to be undertaken. This competition was particularly serious because backed by government credit. The Canadian Pacific replied by beginning construction of various lines in Ontario paralleling the Grand Trunk mileage and reaching its traffic centers, and, not less important by the improvement of its existing lines and a rapid occupation of territory in the great Northwest by new lines. Then there came still a third competitor, J. J. Hill of the Great Northern, who promises to build a through low-grade line from Winnipeg to Vancouver with numerous important branches.

This last challenge the Canadian Pacific has already answered. A through freight and passenger service has been begun from Minneapolis and St. Paul over the Minneapolis, St. Paul and Sault Ste. Marie and the Canadian Pacific's main line as far as Medicine Hat, thence through the southern part of British Columbia to a connection with the new Spokane International Railway, recently completed from Spokane north 141 miles—a road on 51 per cent. of whose stock the Canadian Pacific has a 10-year option and with which it has a close traffic arrangement. This brings it to Spokane, one of the most important Hill traffic centers. But the new route does not stop there. By a traffic arrangement between the Harriman interests, who are willing enough to help along competition with the Hill lines, the Oregon Railroad & Navigation brings the "Soo-Spokane route" down the Columbia river to Portland. From St. Paul to Portland this new route is slightly shorter than either the Great Northern or the Northern Pacific, though this will not be so when the years have been on a large scale. Summing up the progress of the road for five years in a letter read before the Canadian parliament last spring, Sir Thomas Shaughnessy, President of the company, showed that during the five-year period $28,000,000 had been spent on equipment, $44,000,000 on improvements to the existing lines, shops and roundhouses and $45,000,000 for new lines and for new Atlantic steamers. The line improvements include double-tracking and grade revision at various points between Lake Superior and the Rocky mountains, which have been turning the Canadian Pacific from a high grade to a low grade road. There have been particularly large sums spent in improvements and purchases in Winnipeg, the western headquarters of the system. During the last three years about $5,000,000 has gone into terminals, a Canadian Pacific hotel and the acquisition jointly with the Canadian Northern interests of the Winnipeg Electric Railway. The principal double tracking has been from Winnipeg east to Fort William, which involves one change of line about 30 miles long. About 200 miles of this double track is to be ready for use before the end of the year and the whole distance, 427 miles, by the end of 1908, if present expectations are realized. This is a most important improvement, for this stretch of track as can be seen from the map is in reality the throat of the whole system. The network of branch and feeder lines in the agricultural regions between Winnipeg and the Rockies, as well as the through line from the coast, pour their streams of traffic together at Winnipeg. From here there is only one outlet to the eastward. Much of the grain is carried only as far as Fort William, whence the



Canadian Pacific System; Eastern Lines.

Portland & Seattle, the "north bank" road of the Hill lines, is in operation between Spokane and Portland; to Spokane it is a little shorter than the Northern Pacific and a little longer than the Great Northern. It was in July that this route was opened to through passenger traffic, a special limited train being put on between the Twin Cities and Spokane, with a close connection at Spokane for Portland. This route can be traced on the map published herewith, on which the Oregon Railroad & Navigation line from Spokane to Portland is included. How effective it will be as a competitor of the Northern Pacific and of the Great Northern with its low-grade efficient line has yet to be proved.

Against these three sources of severe competition there is the encouraging fact that the development of western Canada is going on so fast that there will probably be business enough for all the railroads which are ready to take it. The Canadian Pacific, moreover, should be in a position, by reason of its numerous improvements and the development of its plant, to handle this more efficiently than its newer competitors. The new lines of the Canadian Northern, at any rate, are of the lightest and most temporary character possible for a large standard gage railroad. The Grand Trunk Pacific is likely to be better built, but hardly up to the Canadian Pacific's standard. The Hill road is really most to be feared in the matter of efficiency, as Mr. Hill is not likely to abandon his lifelong and successful habit of building railroads with low grades whose cost of operation is at a minimum.

The Canadian Pacific's betterments and additions during recent company's lake steamers carry it south to be reshipped to the railroad at Owen Sound on Georgian Bay, thence eastward over Canadian Pacific lines to eastern markets and tidewater.

The five years' record of improvements, summed up by President Shaughnessy, brought the record down to June 30, 1906. Last year $700,000 was spent on ocean, lake and river steamships, $4,500,000 on construction of new lines, $11,000,000 on additions and improvements and $13,500,000 on rolling stock, shops and machinery. This is a record of tremendous progress.

The past year's earnings show that the Canadian Pacific's experience was like that of most other railroads. Gross earnings largely increased, but the cost of operation rose at an even faster rate. Gross earnings were $72,200,000, against $61,700,000 in 1906, an increase of $10,500,000, or 17 per cent., while operating expenses increased $8,200,000, or 21 per cent. This leaves net earnings of $25,300,000, against $23,000,000 in 1906, a gain of 10 per cent. One special reason why operating expenses rose so fast was the severity of last winter, an operating handicap which fell with particular hardship on the Canadian road. For weeks at a time railroad operation was most difficult and for short periods impossible.

The income in net for 1907 was $18,400,000, against $16,000,000 in 1906, and $8,900,000 in 1905. Dividend payments reduced this to $9,300,000, which was the final profit and loss surplus of the year, as no special appropriation for additions and improvements was made. In the previous year there was an appropriation of $5,000,000 for these purposes, but only about $700,000 of it was used, leaving a bal-

ance of $4,300,000 still available. For this reason no new appropriation was made. A good deal of money was received during the year from sources other than those shown in the income account. The total receipts from land sales for the year were $8,300,000. Against this must be set off $1,500,000, the final payment to the Dominion government, on account of land grant bonds, thus leaving the land holdings free and clear to the company. There was $15,800,000 received from sale of new common stock and something over $6,000,000 from sales of preference and of consolidated debenture stock.

The increases in earnings were large. Freight earnings were nearly $46,000,000, against $39,500,000 in the previous year. Passenger earnings increased from $16,000,000 to $19,500,000. These returns indicate the general and unprecedented prosperity of the Dominion, as they follow a year in which the increases over the previous year had been very large. In passenger earnings the great strength of the Canadian Pacific is the large amount of through business, much of it from one seaboard to the other, which goes over its line. Besides the traffic which would naturally come to it from Canadians, Englishmen traveling on this continent as a rule choose the Canadian Pacific for at least one way across, partly because of patriotic feeling and partly because the Canadian Pacific, as a railroad, is so well known abroad. Travelers from the United States also take the trip in great numbers because of the magnificent scenery through the Canadian Rockies, which is unequaled by any transcontinental road in the United States. This large amount of through passenger business does not seem to be reflected in the passenger-mile rate, which is 1.83 cents per passenger per mile, but this figure is much affected by the low rates and large numbers of immigrant passengers.

The bulk of the freight traffic is in two classes of business—grain and lumber. Flour, live stock, fire wood and manufactured articles are listed separately, and all other freight traffic besides these six classes is bulked together in one group, which amounted last year to 4,800,000 tons. The growth of the grain traffic through the tremendous expansion of the road's mileage in the grain-growing districts of Manitoba and Saskatchewan is shown by a large increase in grain tonnage during the last two years. In 1905 there were 59,700,000 bushels of grain carried; in 1906, 82,200,000 bushels, and last year, 93,200,000 bushels hauled by the road. It is evident from the fact that all other articles besides the six classes already mentioned amount altogether to less than 4,800,000 tons, that the coal traffic of the road is not large. The development of the coal measures in British Columbia should result in greatly increasing this article of traffic. Another kind of heavy traffic which is likely to increase in the future is iron ore. Large deposits of iron ore have recently been opened commercially north of Lake Superior, and the Canadian Pacific will receive the haul on these ores from the mines to the manufacturing centers in the East.

Maintenance of way expenditures were $1,115 a mile last year, which appears to be a liberal figure, first, because the proportion of branch-line prairie mileage is large, and, second, because on the lines in the East, south of the St. Lawrence, traffic is light. The cost per mile was about $1,050 in 1906 and $1,000 in 1905. Maintenance of equipment figures are not given in detail. The increase in the cost of conducting transportation was very large. This account stood at $23,800,000, against $18,800,000 in 1906, a rise of $5,000,000, or 26 per cent. Detailed figures are not given under this account, but it is clear that not only the severity of the winter but the greater cost of labor and supplies has had its effect in raising the total of ordinary running expenses. Largely on this account the operating ratio for the year increased from 63 per cent. in 1906 to 65 per cent. last year.

Aside from these handicaps, the road was more efficiently operated than in the previous year. An increase of 193,000,000, or 22 per cent., in passengers carried one mile was taken care of with an increase of only 12 per cent. in passenger-train mileage. In the same way there was an increase of 629,000,000 ton-miles, or 10 per cent., against which there was an increase of only 6 per cent. in freight-train mileage. Empty freight car mileage decreased 10,700,000 car-miles, or 11 per cent., and the revenue trainload rose from 279 tons in 1906 to 295 tons last year. The freight-train earnings per train-mile increased 11 per cent., and the freight-train earnings per mile of road from $4,410 per mile to a little more than $5,000 a mile, a gain of 13 per cent. The passenger-train earnings per mile increased even more than this—17 per cent.

Most of the President's comments in the report are as usual taken up with description of new construction. A branch from Moose Jaw, on the main line in Saskatchewan, northwesterly 50 miles, has already been authorized. This is shown on the map as a completed road. It will shortly be continued 100 miles further. A branch is also projected from Regina, Sask., to Saskatoon, 165 miles. The cost of these branches is to be met by an issue of 4 per cent. consolidated debenture stock. The Regina-Saskatoon line, as shown by the map, is projected further to reach Prince Albert. Up to about a year ago the Canadian Pacific leased the Qu' Appelle, Long Lake & Saskatchewan Railway, which runs from Regina, via Saskatoon, to Prince Albert. This was taken over by the Canadian Northern, which held it during the last winter. In the spring complaint was made that the road had not been operated with any regularity by the Canadian Northern, that at times it had been entirely abandoned, and, therefore, that the Canadian Northern should not be allowed to continue to hold the road. This matter does not appear to have been definitely settled at this time, but if the road should be returned to the Canadian Pacific the branch from Regina to Saskatoon and thence to Prince Albert will probably not be built.

In carrying on construction work the scarcity of labor has made progress slow. Of the 747 miles west of Lake Superior under way at the time of the previous annual report, two-thirds of the grading has been finished, 270 miles of track laid and the rails and fastenings for the rest of the mileage are on hand. In eastern Canada the line from Guelph, Ont., to Goderich, on Lake Huron, is about to be put in operation. On the Walkerton & Lucknow, which is to run from Proton, Ont., to Walkerton, 38 miles, 20 miles of grading was done. On the cut-off which runs on the east side of Georgian Bay, to give the Canadian Pacific its own route between Toronto and the main line, the whole 226 miles is to be ready for freight traffic by the end of the year. This is the line which runs from Kleinburg, Ont., north to Sudbury. It was supposed that $30,000 a mile would cover the cost of its construction, but owing to the difficult character of the country and the greater cost of labor and material, the cost has exceeded the original estimates, and additional funds to an amount not exceeding $10,000 more a mile, are to be authorized. The probable completion of 200 miles of second track between Winnipeg and Fort William has already been mentioned. Second track is also being laid between Ste. Anne's, Que., and Smiths Falls, Ont., 108 miles, of which 50 miles are to be finished before the end of the year and the rest in 1908.

The progress of the Canadian Pacific during the next ten years, the effect on it of the competition just beginning, and the development of Canada which is likely to come about through the great amount of new railroad construction there under way, are likely to be peculiarly interesting. There is a further field for interesting speculation in the probable value of the company's total assets, as it will work out in its effect on the returns to stockholders. The obligations owed to the Dominion government on account of land grant bonds are now fully paid up and all receipts from land sales are a free asset of the company, and, therefore, of the stockholders. Sooner or later there must come a distribution of these assets to the holders of the company's common stock. It is this unknown future equity which largely accounts for the high price at which Canadian Pacific stock is held.

The principal results of the last two years' operations are summed up in the following table:

	1907.	1906.
Mileage worked	9,416	8,777
Freight earnings	$45,885,968	$39,512,973
Passenger earnings	19,528,878	16,041,636
Miscellaneous earnings*	6,079,744	5,408,161
Gross earnings	72,217,518	61,669,758
Maint. way and structures.	10,110,957	9,105,250
Maint. of equipment	9,083,249	7,369,566
Conducting transportation.	23,765,138	18,789,696
Operating expenses.†	46,914,219	38,696,446
Net earnings	25,303,309	22,973,313
Net income	18,376,034	16,012,216

*Including earnings from sleeping cars, express elevators, telegraph and miscellaneous; also profit from ocean steamships. Mail earnings not included.

†Including parlor, sleeping car and commercial telegraph expenses; also expenses of lake and river steamers.

Minneapolis, St. Paul & Sault Ste. Marie.

The Minneapolis, St. Paul & Sault Ste. Marie is a grain carrier, the bulk of whose mileage is in the North Dakota and Minnesota prairies. Its through lines are from Minneapolis to Sault Ste. Marie, from Minneapolis to a Winnipeg connection and from Minneapolis to a Canadian Pacific through connection at the boundary line between North Dakota and Saskatchewan. Within the last two years it has been expanding rapidly by building new mileage in the wheat country of North Dakota. The road is shown on the map of the Canadian Pacific published in another column. The line from Thief River Falls, Minn., west to Kenmare, N. Dak., 296 miles, was finished more than a year ago. It runs through a rich agricultural country where new towns sprang up even before the opening of the railroad, and business and agricultural development have been rapid. Other recent extensions have been in the neighborhood of the Missouri river in North Dakota, particularly the line from Drake to Plaza, on which about $1,400,000 was spent during the last fiscal year.

The effect of this new mileage is shown in various ways in the results of the last year's operations. There was a falling off both in passenger and freight density. There were 52,000 passengers carried one mile per mile of road, against 55,000 in 1906; and 519,000 tons of revenue freight, against 537,000 in 1906. At the same time there was a heavy falling off in the amount of company freight carried. The non-revenue freight ton miles fell from 191,000,000 in 1906 to 169,000,000 in 1907, and the average trainload, including revenue and non-revenue freight, shows a decrease. On the other hand, the

revenue trainload increased from 324 tons to 331 tons. The main line revenue trainload was 385 tons against 382 tons in 1906, and the branch line 202 tons against 172 tons in 1906. The reduction in the amount of company freight carried is, of course, due to the large amounts of construction material for the new extension carried in the previous year. A reduction in passenger and freight density is the usual result of the opening of any considerable amount of pioneer mileage.

The gross earnings of the year increased 11 per cent. over 1906. They were $12,900,000, against $11,600,000. The increase came largely in freight earnings, which were larger by over $1,000,000 than in the previous year. The increase in gross earnings was more than wiped out by the greater cost of operation. Operating expenses rose from $5,800,000 in 1906 to $7,400,000, an increase of 28 per cent. This was due in particular to the difficulties of operation last winter, which was the most severe within the remembrance of living operating officers and which fell on the "Soo" line with particular and remarkable severity. The increase in operating expenses also was due to the greater cost of labor and of almost every class of material and supplies. The gross earnings at the same time were somewhat reduced by the general car shortage. As a result of all these factors the operating ratio rose from 50 per cent. to 58 per cent., and net earnings decreased from $5,800,000 in 1906 to $5,500,000 last year, a decrease of 5 per cent. Fixed charges were $300,000 more than in the earlier year, leaving net income of $2,600,000, smaller by nearly $700,000 than in the 1906 year—this while gross earnings per mile of road increased even with the handicap of the new extension from $5,729 in 1906 to $5,775 last year.

The increase in operating expenses came in both classes of maintenance as well as in conducting transportation. Maintenance of way was larger by nearly $500,000, maintenance of equipment by nearly $400,000 and conducting transportation by $800,000. Even with this increase, maintenance of way per mile stands at only $675, a very low figure. It is, however, much larger than in 1906, when only $476 per mile was spent on way and structures. Even with its large amount of prairie mileage, the larger of these figures is much too low to maintain the physical condition of the permanent way. Repairs and renewals cost $2,370 per locomotive, against $2,397 in 1906; $878 per passenger car, against $957 in 1906, and $42 per freight car, against $39 in 1906. Especially with renewals included, this amount per freight car is not nearly liberal enough to properly maintain the freight car equipment.

There were considerable additions to the equipment during the year, the principal of which were 75 locomotives and 1,000 box cars. The total expenditures on new equipment were about $3,000,000. Maintenance of way betterments, costing a little over $1,000,000, were charged to the betterment fund, to which only $800,000 was appropriated out of income against $1,050,000 in 1906. More than half the expenditure was on grade reductions on the Minnesota division which carries the road's through traffic to a connection with the Canadian Pacific at Sault Ste. Marie.

The following are the costs of some of the individual conducting transportation accounts compared with the previous year:

	1907.	1906.
Engine and roundhouse men	$629,000	$562,000
Fuel for Locomotives	1,263,000	997,000
Water supply for locomotives	56,000	40,000
Oil, tallow and waste	32,000	27,000
Other supplies, locomotives	21,000	12,000
Freight train service	443,000	368,000
Supplies and expenses	36,000	29,000
Switch, flag and watchmen	124,000	36,000
Telegraph expenses	142,000	115,000
Station service	357,000	282,000
Damage and loss to freight and baggage	76,000	53,000
Injuries to persons	217,000	73,000
Operating yards, tracks and terminals	143,000	106,000

The greatly increased cost of carrying on its transportation operations is sharply shown in these contrasted figures. There were decreases in the cost of advertising and in the amount spent for outside agencies; also in damage to property, including live stock. Under general expenses, salaries of general officers increased from $52,000 to $67,000.

The balance sheet shows an increase from $10,000 to $1,948,000 in equipment trust notes outstanding. The current liabilities stood at $2,200,000 on June 30, 1907, against $1,580,000 the year previous. At the same time there was little increase of current assets. Cash on hand at Minneapolis, St. Paul, New York and London amounted to $2,680,000, against $3,180,000 the year before.

Funds for new equipment and better terminal facilities at Minneapolis, St. Paul and other principal points to the extent of about $2,700,000 have been advanced from time to time from surplus earnings. The company's business has grown so fast that large expenditures have been required to keep up with it. In order to replace these advances and to provide funds for other improvements which are greatly needed the stockholders, on September 17, authorized a doubling of the company's common and preferred stock, the total of which now stands at $42,000,000. Of the new stock $4,200,000 is now being offered to stockholders at par. Thus the present time marks the expansion of the road's capital to keep pace with its earnings and prosperity.

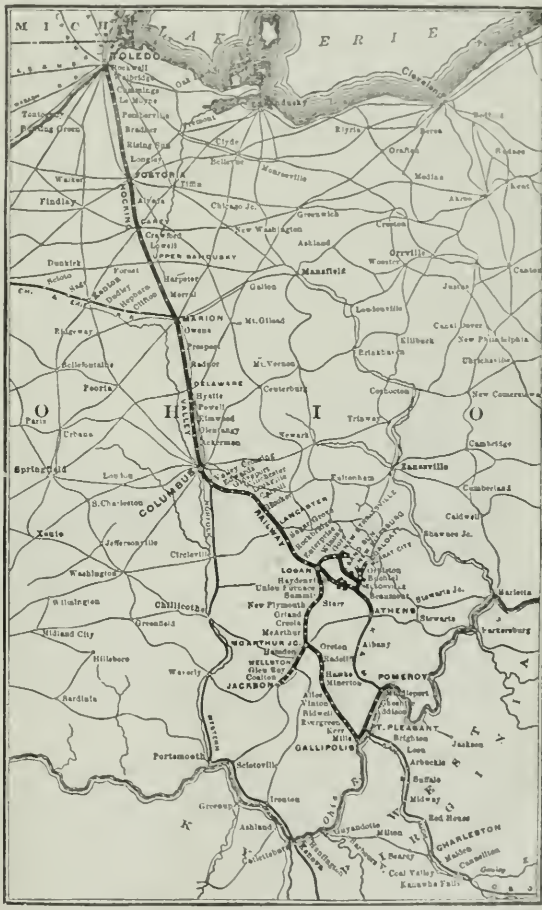
The most important extension now projected is a line from Brooten, Minn., northeast about 200 miles to Duluth, which will give the "Soo" line a direct connection with the Duluth, South Shore & Atlantic, also controlled by the Canadian Pacific, and will make it possible for it to carry traffic from North Dakota direct to the head of the lakes. Work on this contract is already under way.

The last three years' results are given below:

	1907.	1906.	1905.
Mileage worked	[illegible]	[illegible]	1,771
Freight earnings	[illegible]	[illegible]	[illegible]
Passenger earnings	[illegible]	[illegible]	[illegible]
Gross earnings	[illegible]	[illegible]	[illegible]
Maint. way & structures	[illegible]	[illegible]	[illegible]
Maint. of equipment	[illegible]	[illegible]	[illegible]
Conducting transportation	[illegible]	[illegible]	[illegible]
Operating expenses	[illegible]	[illegible]	[illegible]
Net earnings	[illegible]	[illegible]	[illegible]
Net income	[illegible]	[illegible]	[illegible]

Hocking Valley.

The plan for the consolidation of the Hocking Valley and the Kanawha & Michigan was announced last fall, but the completion of the merger has been held up ever since because of the suit brought by the Attorney-General of Ohio, attacking the ownership by the Hocking Valley of the stock of the Toledo & Ohio Central,



Hocking Valley.

which is a parallel line. If the consolidation is brought about, the $15,000,000 4 per cent. preferred stock of the Hocking Valley is to be refunded in new 4 per cent. bonds and new stock is to be exchanged for Kanawha & Michigan stock. The annual report of the Hocking Valley for the year ended June 30, 1907, shows 11 per cent. earned on the $11,000,000 common stock after the $600,000 preferred dividend. Dividends amounting to $3\frac{1}{2}$ per cent. were paid on common, as compared with 3 per cent. in the previous year. The com-

pany's share, through stock ownership, in the surplus earned by the Toledo & Ohio Central and the Kanawha & Michigan would, if these surpluses were distributed as dividends, bring the amount available for Hocking Valley common up to about 23 per cent.

Aside from the increase in operating expenses because of the high cost of labor and material, the Hocking Valley has had to meet two expenses not common to all companies. These were the flood in the Hocking district last March, and the renewal of a large number of freight cars retired from service because they were so old or so small that it was not worth while to fit them with air-brakes, which change had to be made before September 1, 1907, on all freight cars interchanged with other lines. The cost of flood repairs was about $83,000 and most of this was charged to operating expenses for the year. The cost of the renewals of freight cars were not entirely paid out of the equipment reserve fund; it seems that the annual appropriations to cover depreciation of rolling stock have heretofore been too small. This depreciation fund amounted to $595,000 on June 30, 1906, and $658,000 was added during the year. Of this amount, $852,000 was used to cover 40 per cent. of the cost of new coal and box cars and the entire cost of three locomotives bought for renewal, and for rebuilding and betterment of freight and work cars; while the rest is reserved to pay the semi-annual instalments for three years on the equipment trust notes issued for these cars. The company now has 14,779 freight and work cars, as compared with 14,083 at the end of the previous year. The new equipment ordered consists of 2,000 steel underframe coal cars, of which 1,100 were for renewals and the rest additions, and 850 box cars, of which 550 were for renewals. All the box cars and 1,170 coal cars had been delivered on June 30. The cost of this additional equipment, as well as that of eight new passenger train cars, was $393,000, which includes cash payments and reserve for instalments payable on equipment trust notes. This amount was appropriated from income. On June 30, 1906, there was in the treasury $194,000, the remainder of the proceeds from the sale of 4½ per cent. consolidated mortgage bonds, which have been used from year to year since the creation of the bonds at the formation of the company in 1899. This amount could, under the mortgage, be applied to additions to property and the retirement of existing equipment obligations; all of this was used during the year and $18,000 additional appropriated from the year's income. New repair shops and yards at Logan, Ohio, to cost $300,000 were authorized; work was begun and $12,000 has so far been spent on them.

Gross earnings increased from $6,440,000 to $6,907,000; the increases in coal earnings and passenger earnings were less in proportion than the increase in freight. Tons of freight carried increased from 8,600,000 tons in 1906 to nearly 8,900,000 in 1907, and the greater part of this increase was in freight received from connecting roads and other carriers. The average haul increased from 116 miles to 122 miles. During the previous year, most of the increase in traffic had come from the building up of local freight business owing to the growth of industrials in the territory served by the road. It seems from the above figures that this business has fallen off somewhat particularly since the tonnage of manufactures originating on the road was only 643,000 in 1907 as compared with 663,000 in 1906. The average train load on the entire line increased from 608 tons to 625 tons, the figures for the main line being 655 tons, an increase of 24 tons, while that for the River division was only 250 tons, which compares with the high record last year of 271 tons. The highest figure for the entire line, 678 tons, was reached in 1902. The revenue per ton mile decreased from 0.505 cents to 0.496.

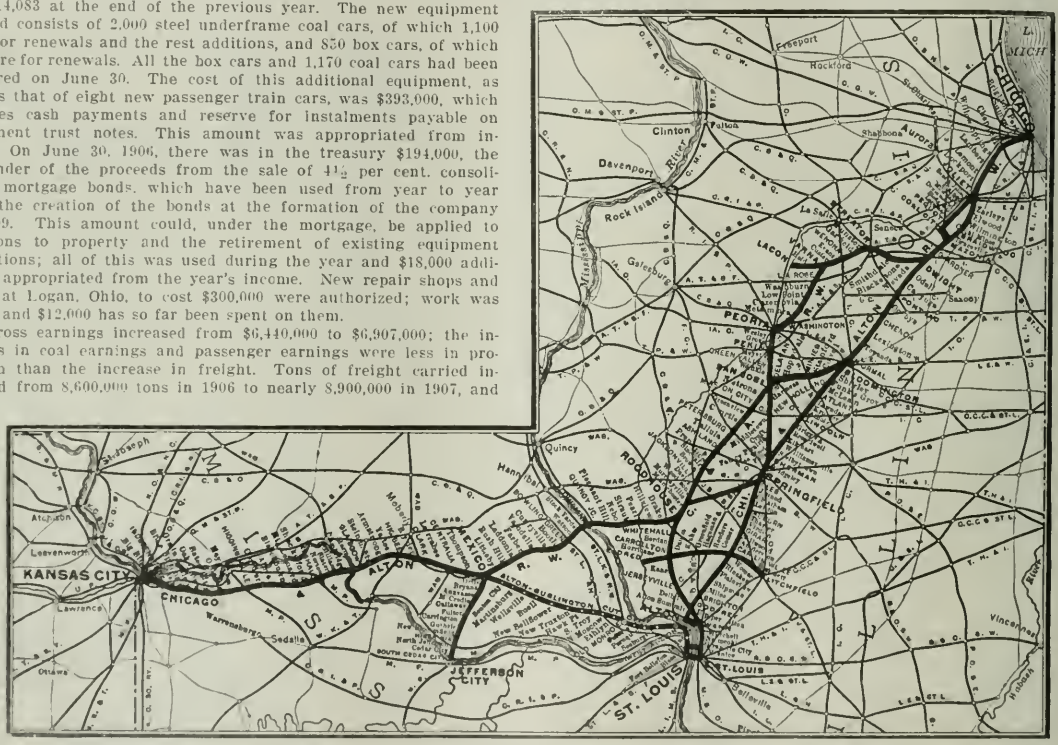
Maintenance of way charges show a large increase, having been $1,984 per route mile in 1906 and $2,325 in 1907; part of this increase is due to the unusual repairs made after the flood already mentioned. Repairs and renewals of locomotives cost $2,151 in 1907, $2,169 in 1906 and $2,579 in 1905. Passenger car maintenance increased from $510 per car to $523 per car, and the maintenance of freight and work cars increased from $63 per car to $71.

The principal results of operation are as follows:

	1907.	1906.
Mileage worked	347	347
Passenger earnings	$807,210	$796,828
Coal earnings	2,900,340	2,802,776
Freight earnings	2,434,277	2,238,833
Gross earnings	6,907,048	6,439,809
Maint. way and structures.	806,625	688,461
Maint. of equipment	1,491,995	1,325,449
Conducting transportation.	2,052,755	1,831,139
Operating expenses and taxes	4,709,809	4,181,744
Net earnings	2,197,239	2,258,035
Net income	1,827,486	1,772,934
Surplus for the year	313,479	753,369

Chicago & Alton.

No railroad during the past year has been the subject of more general comment and interest than the Chicago & Alton. The facts of its reorganization in 1899—matters of record as they were—when given the prominence of a public investigation at a time when railroad financial management was of particular interest, stamped it in the public mind as the crowning example of the methods of high finance. Without attempting to discuss the justice or injustice of all the details of the reorganization, it may be well to mention that, taken in the large, it amounted simply to the substitution of a large par value of securities of low return for a small par value of securities of high return, the natural effect of this substitution being sooner or later reflected in the market price. It is noticeable, in view of the bitter criticism of the reorganization which has often charged that the property was wrecked, that in the past year, after paying the full dividends on the preferred stock, there remained a surplus equal to over 5 per cent. on the total amount of common stock outstanding.



Chicago & Alton.

The striking thing about the Alton's income record for the year is that there was nearly three times as large a proportionate increase in net earnings as in gross earnings, and, furthermore, that there was scarcely any increase at all in the cost of conducting transportation. Gross earnings were $12,800,000, a gain of $1,200,000, or 10½ per cent. Operating expenses increased only a little more than $200,000, or 3 per cent., leaving net earnings larger by over $1,000,000, or 27 per cent., than in the preceding year. This unusual record was not brought about by skimping the maintenance accounts, for as much was spent on maintenance of way per mile operated as in the year before, and more on repairs and

renewals per locomotive, passenger car and freight car. These unit maintenance expenditures were as follows:

	1907	1906
Maintenance of way, per mile	[illegible]	1,172
Repairs and renewals per locomotive	[illegible]	[illegible]
Per passenger car	[illegible]	791
Per freight car	[illegible]	[illegible]

Freight earnings increased 12 per cent., revenue freight tonnage 23 per cent., and revenue freight ton mileage 18 per cent. As there was no change in the operated mileage up to the end of the fiscal year, the freight density also was increased 18 per cent. In spite of the fact that the ton-mile rate decreased 5 per cent., there was a small increase in the earnings per train-mile. Freight earnings per mile of road increased from $7,730 to $8,637, or 12 per cent.

The gain in passenger earnings was 7 per cent., with an increase of 9 per cent. in passengers carried one mile. The average number of passengers per train-mile rose from 49 in 1906 to 55, thus increasing this important passenger economy by 11 per cent. The earnings per train-mile in consequence increased 12 per cent. in spite of a slight decrease in the passenger mile return.

The increase of 15 per cent. in the number of ton-miles of revenue and company freight was handled with an increase of only 10 per cent. in freight train mileage. At the same time the average trainload increased from 381 tons to 409 tons of revenue freight, and from 418 tons to 439 tons of all freight, while the average loaded car carried 21 tons, against 19 tons in 1906. The loaded car miles eastbound increased 15 per cent., against a slight decrease in the loaded car mileage west. The empty car mileage eastbound at the same time decreased 39 per cent., while the empty car mileage west increased 25 per cent. It will be interesting to observe what effect the ownership of the Chicago & Alton by one of its eastern connections will have on these figures of loaded and empty car mileage.

The form of annual report is similar to that adopted by the companies controlled by the Rock Island Company, and is, in consequence, fuller than previous Chicago & Alton reports. The current report for instance contains 35 pages against 26 pages in the report of 1906. The income account is fuller and more clear, and the balance sheet and the consequent changes in the capital accounts of the company are set down in much greater detail. Operating expenses are given in detail for the first time. Each bond issue of the funded debt is carefully described.

The most important improvement was the completion of the air line from Iles, just south of Springfield, Ill., southwest to Murrayville, 34 miles, which is just being put in operation. This line is tangent and has no grades steeper than 16 ft. in a mile in either direction. Ten per cent. of the cost of the whole line has been used in avoiding grade crossings with other railroads, of which there is only one. The line is equipped with modern water stations and 3,400-ft. passing sidings, every six or seven miles. The stations are all built on a uniform plan; the rails are 80-lb., and the line is being thoroughly ballasted with gravel. This cut-off shortens the route from Chicago to Kansas City by five miles and gives the Chicago & Alton, by different routes part of the way, two tracks from Chicago to Murrayville, 222 miles. Through trains from the Kansas City line to the East can now reach the main line at Springfield instead of having to go north as far as Bloomington. The following table shows the advantages of the new route over the old between Roodhouse and Bloomington. On the basis of these figures and last year's traffic the cut-off will save 55,000 train miles on eastbound freight traffic alone.

Old and New Routes—Roodhouse to Bloomington.

	Old line.	New line.
Distance in miles	110.5	105.1
Total rise, ascending grades, ft.	1,059.0	512.0
Total fall, descending grades, ft.	934.0	387.0
Total degrees of curvature	940.0	226.0
Maximum degrees of curvature	5.0	2.0
Controlling grade:		
Northbound, ft. per mile	38.6	15.3
Southbound, ft. per mile	52.8	37.4

The Toledo, St. Louis & Western, which has a through line from St. Louis to Toledo, has bought control of the Chicago & Alton from the Rock Island Company, making payment in collateral trust bonds secured by Chicago & Alton stock. It is not improbable that these two roads—together with the Iowa Central and the Minneapolis & St. Louis—will be brought into a more or less compact system, whose extent can be judged from the map published in the *Railroad Gazette* of August 30, 1907. The purchase of the Alton by the "Clover Leaf" seems to be more to the advantage of the purchaser than of the larger road. If eastbound traffic from Kansas City over the Chicago & Alton is to be, so far as possible, turned over to the "Clover Leaf" in the St. Louis territory, the Alton will lose the benefit of the haul north either to Bloomington, where it connects with the Lake Erie & Western and the 'Big Four;' Dwight, where it crosses the east and west line of the Chicago, Indiana & Southern; Joliet, the Michigan Central connection; Chappelle, where it meets the Lake Shore and the Chicago Terminal Transfer; or Chicago, with its many eastbound lines. Through any one of these junctions the Chicago & Alton gets a longer haul than through a junction with the "Clover Leaf" at St. Louis. The Alton lines between St. Louis and Chicago, however, go far toward being self supporting, as the Alton has a strong hold on Chicago-St. Louis traffic, and there is important coal and agricultural traffic in the territory between the two cities.

The results of operation are summarized below:

	1907	1906
Mileage worked	970	[illegible]
Freight earnings	[illegible]	[illegible]
Passenger earnings	[illegible]	[illegible]
Gross earnings	[illegible]	[illegible]
Maint. way and structures	[illegible]	[illegible]
Maint. of equipment	[illegible]	[illegible]
Conducting transportation	[illegible]	[illegible]
Operating expenses	[illegible]	[illegible]
Net earnings	[illegible]	[illegible]
Net income	[illegible]	[illegible]
Year's surplus	1,010,220	[illegible]

NEW PUBLICATIONS.

Recollections of an Ill Fated Expedition to the Headquarters of the Madeira River in Brazil. By Neville B. Craig, in coöperation with members of the Madeira and Mamoré Association. [illegible] pages. 6 in. x [illegible] in. Published by J. B. Lippincott Co., Philadelphia. Price, [illegible].

In 1878 a bold and apparently well designed enterprise in railroad survey and construction in South America was begun and quickly ended in disastrous failure. It was brilliant and dramatic in conception, but in the execution the drama became a succession of tragedies. The money loss was enormous, as money was counted in that generation; hundreds of lives were sacrificed, while hardships and jungle fevers damaged to an extent not measurable the health of the bold engineers who survived. Nearly one-fourth of those who sailed in the ships sent from Philadelphia to the Amazon and Madeira were drowned or killed by malignant fevers.

Bolivia has more than half a million square miles; is rich in gold, silver, iron, coal, rubber and lands for grain and grazing. It has no sea coast, and on the west the Andes mountains form a barrier, not insurmountable by railroads, but a costly obstacle which when surmounted still leaves a long route by the Pacific ocean and Cape Horn to reach Atlantic ports. From the Atlantic ocean the Amazon is navigable, as is also its tributary, the Madeira, to within about 150 miles of the northwestern boundary of Bolivia. The building of about 240 miles of railroad from this point, rounding the rapids of the Madeira and the lower part of the Mamoné river would make accessible the navigable waters of the Mamoré and its tributaries in Northern Bolivia. It would open an empire to trade.

This magnificent possibility attracted the imagination of a pioneer genius, Col. Geo. E. Church, and, with a faith that never faltered and an ardor that a succession of rebuffs and failures during eight years never cooled, he lived to see his enterprise begin with every prospect of success and end miserably. He was a thorough engineer, and a diplomat with such a winning way that the Brazilian Emperor, the Bolivian parliament and British financiers were alike amenable. And after the British organization had tried and failed, he turned unabashed to his own country and found powerful men ready to help. Franklin B. Gowen, of the Reading Railroad, and Col. Thomas A. Scott, of the Pennsylvania, were alike zealous, although hostile to each other. A son of Col. Scott organized the firm of Mackie, Scott & Co. and contracted to furnish the river navigation. P. & T. Collins, rich and successful railroad builders, contracted to build and equip the Madeira & Mamoré Railroad.

In January, 1878, the first ship, the "Mercedita," overloaded and wretchedly equipped, succeeded in carrying 54 engineers, with laborers, a locomotive and railroad material from Philadelphia, up the Amazon and Madeira, to the railroad's starting point. The second ship, the "Metropolis," was wrecked off Currituck beach and 90 of the adventurers were drowned. In general, the undertaking failed because of bad financiering; in detail, the story of the summer of 1878 is a record of heroism. The survey was made, a short piece of road was built, and then it was all over. Of the engineers, not many survive. Among them are George W. Creighton and C. A. Preston, superintendents on the Pennsylvania Railroad; Joseph S. Ward, of the Reading; Charles W. Buchholz, Consulting Engineer of the Erie, and O. F. Nichols, Consulting Engineer of New York city bridge department. The maps in the book are excellent.

Development of the Locomotive Engine. By Angus Sinclair. 668 pages; 6 in. x $8\frac{3}{4}$ in. Published by Angus Sinclair Publishing Co. Price, $5.00.

The personality of the author, his geniality and his harshness, is apparent in the 33 chapters of this entertaining book. Although he is accurate, so far as can be determined by a hasty reading, in the essential facts and in the more than 400 engravings and drawings which richly illustrate the text, nevertheless the inferences, the sweeping judgments on the great men who have had to do with locomotive development, are frequently not those with which the reader can agree. To disagree with Angus, however, is not at all disagreeable either to him or to his friends. An example of this is the following comment on the life work of the great mechanical

engineer of the London & North Western Railway: "I never heard of any lavish praise being expended on the Webb compounds outside of the designer's immediate friends." And yet most people recognize that Mr. Webb was a great and bold, but too self-confident experimenter; ahead of his time, and one to whom the profession owes much, although he cost his company a great deal of money.

The scope of the book was evidently intended by the author to be strictly that indicated by its title. He shows in 258 consecutively numbered drawings the successive undertakings made by many men to improve the effectiveness of the steam locomotive. In the second chapter, "Early Attempts at Locomotive Construction," 14 drawings are shown. In the third chapter, "Development of Locomotives in Great Britain," there are 13 drawings. In the remaining chapters there are 231 consecutively numbered drawings of designs by American engineers. It would seem, therefore, that the work done in Great Britain has not attracted the author's attention unduly; being Scotch, he has become a very enthusiastic American. Nevertheless, taken as a whole, and without regard to nationality, we have in this book easily the best picture that has ever been given of the progress in designing and also the mistakes and the way they were discovered, the results of trial in service. This has naturally led the author to give many charming paragraphs and chapters to early railroad history. For example, whole chapters are devoted not only to the development of the locomotive, but to the development of the lines of the Baltimore & Ohio, the Erie, work done on the Pennsylvania Railroad and on the Reading, as well as the New England and the western roads; also on the Lackawanna and the Lehigh Valley roads—and all these chapters are interesting and have a value

The portraits and personal sketches of the great locomotive builders and of the many locomotive superintendents and master mechanics who have been concerned in improving the machine form not the least attractive feature. These sketches are lovingly done. The author is a man of warm heart as well as of strong prejudices. These personal sketches are not grouped by themselves; they are distributed throughout the book wherever, apparently, the author has happened to think of them, and it is evidently due to this association of ideas that he reserved for insertion in the last chapter, entitled, "The Locomotive of To-day," an excellent portrait and sketch of Samuel M. Vauclain, Superintendent of the Baldwin Locomotive Works. The concluding tribute is somewhat glowing but it is so nearly correct that it is worth reproducing:

"As General Superintendent over these immense works, Mr. Vauclain has the power of a monarch and it is wielded with a spirit of giving a square deal to the humblest and highest under his charge. Under his broad, kindly management harmony prevails and contentment takes the place of the antagonisms so common in great industrial establishments."

Laying-Out for Boiler Makers. New York: The Boiler Maker. 191 pages; 10 in. by 13 in.; 425 illustrations. Cloth.

The book is something more than its title indicates, for not only does it contain rules and directions for the actual laying out of sheets and the spacing of rivets, but also rules for the calculation of the stresses of the plates and the methods of strengthening them. In a work of this character especial emphasis is put upon the method of doing the work so that an intelligent workman might follow the instructions blindly without any idea of why he was doing it, and get fairly good results. This neglects all discussion of the principles involved, which are matters for consideration when the theoretical aspects of the case only are considered. In one or two instances these fundamental principles are discussed, as in the case of the determination of the shape of a sheet by triangulation, and the statement is distinctly made elsewhere that for the attainment of the highest degree of skill the whole subject should be mastered from a theoretical standpoint.

The book then is essentially devoted to the solution of specific problems, such as the laying out of elbows, tubular, locomotive and Scotch boilers; the repairing of locomotive and other types of boilers; the laying out of steel stacks and miscellaneous problems. The chapter on repairs is especially rich in suggestiveness and while it does not pretend to cover the whole range of what may be needed on the locomotive boiler it does cover a wide range of work for the firebox, such as the renewal of sheets, patching, replacing stays and the like. Then, throughout, the other chapters there are interspersed methods of calculating stresses and of proportioning the metal to sustain them, that will be of value not only to the man charged with the mechanical work of laying out but to the designer upon whom rests the responsibility for the safety of the structure.

Switches and Turnouts. By Howard C. Ives, Assistant Professor of Railroad Engineering, Worcester Polytechnic Institute. Pamphlet. 6 in. x 8½ in.; 28 pp. 50 cents.

In the three chapters which compose this pamphlet, Professor Ives has succeeded in making clear to his students the method of deriving formulae for different kinds of leads, both where the main track is straight and where it is curved. In the last chapter the mathematics involved in the design of the double step switch crossing seems to be an original undertaking and it is well done.

CONTRIBUTIONS

Freight Claim Obstruction.

Pittsburg, Pa., Sept. 30, 1907.

To the Editor of the Railroad Gazette:

I have been much interested in Colonel Prout's address dealing with obstructions in the claim department, printed in your issue of July 19, and in your editorial on the settlement of freight claims, printed Aug. 9. I think the accompanying record of transactions with a railroad which I will call the A. B. & C. should be placed before your readers. Nothing in this record has been altered for publication except the name of the railroad and the names of places and persons.

Bill sent to the A. B. & C., March 14, 1902, for $17.51, covering overcharges on eight shipments from Athens to Sparta, via X. Y. Company and A. B. & C. Railroad. Acknowledgment was made by the General Freight Agent of the A. B. & C. that this claim was valid and a proper claim. Three other claims for overcharge on the same class of goods shipped several months previous were paid promptly. Much correspondence regarding this bill was had during the succeeding year, and we were advised in May, 1903, that all the papers in the case had been lost and duplicate papers were requested. This request came from the Freight Claim Agent of the X. Y. Company. Duplicates were promptly forwarded as requested on May 11, 1903. Continued to keep after this matter from time to time and finally on May 11, 1907, I wrote a personal letter to R. B. Ely, president of the A. B. & C. We very promptly got a letter from the Third Vice-President, H. T. Evans, making apologies, and assuring us that it was their desire to pay claims promptly and that the matter would be attended to energetically and pushed to a final adjustment. We received several calls from a very affable gentleman, representing the A. B. & C. Finally this gentleman advised us that all these papers had again been lost, and asked for a triplicate set, which we furnished in June, 1907. And, in spite of many letters since that date we have received nothing further from them.

This certainly looks like a deliberate attempt to avoid payment by worrying claimants, and as if one of the railroads at least had a professional loser.

MANUFACTURER.

Seth Wilmarth and His Locomotives.

Boston, Mass., Oct. 1, 1907.

To the Editor of the Railroad Gazette:

In reading the article by Mr. Caruthers in your issue of Sept. 27, "Seth Wilmarth Locomotives," it occurs to me that I may supply some features of Mr. Wilmarth's career that Mr. Caruthers was not able to find. At the time these engines were built I was a clerk in the office of the South Boston Iron Company, whose plant was adjoining to that of Mr. Wilmarth, and I was well acquainted with Mr. Wilmarth. His business originally was a general machine shop, until he took up the building of locomotives, and up to this time his business was successful and prosperous; but after a few years he made a contract with the Erie Railroad which brought him to bankruptcy, and his plant and business were sold out. I do not remember about his career after his bankruptcy, but have an impression that he was appointed to some superintendence at the Boston Navy Yard. I understand Mr. Wilmarth made a contract with the Erie Railroad for some 25 or 30 locomotives, which was a very large undertaking at that time, especially for a man of Mr. Wilmarth's limited means, and who was (as was generally the case with industrial manufacturers at that time) obliged to buy his supplies on credit. When he had fairly launched in the manufacture of these locomotives he found that the Erie Railroad could not pay cash, and he was obliged to take notes in payment, and when these notes became due he was obliged to renew them. This situation destroyed Mr. Wilmarth's credit, and he was obliged to realize on his notes as best he could. I understand that for a while he sold these notes to Daniel Drew, who was a banker as well as trustee of the Erie Railroad, at a discount, but this management was short-lived, and he was forced into bankruptcy. Another of the original locomotive builders within a stone's throw of the Wilmarth plant was John Souther, who associated with O. N. Pickering, organized the "Globe Works." I understand that Mr. Souther (who is now living in Boston, 90 years old) designed and made the patterns for the first locomotive which was used on the Old Colony Railroad, and which was named the "Souther." The Globe Works built many engines, covering several years of successful business, up to the time of the Civil War, when they turned their attention more particularly to work for the United States Government.

WM. P. HUNT,
President, Hunt Spiller Manf'g. Corporation.

Control by State Commissions.*

BY ALEXANDER C. HUMPHREYS.

As I understand, we are gathered here to-night by reason of the belief that is happily taking root that there should exist a better understanding between those responsible for the management of public utility corporations and those to whom, in a degree not as yet finally determined, is entrusted the limiting control of these corporations.

It cannot be denied by any one who is competent in the premises and at the same time is fair minded enough to give expression to his honest opinion that there has been in this country, during the last few years, a tendency on the part of the public, a tendency cultivated by the yellow press and temporarily adopted as a vote winner by the politicians, to treat all public service corporations as enemies of the public and, hence, as unworthy of consideration. Unquestionably, in not a few cases this tendency has led to injustice being done to corporations which have been ably and honestly administered in the interest of the public as well as that of the proprietors.

Investigations have been held under state and federal authority which have not been honest investigations even as to intent but have been more nearly of the character of star chamber inquisitions; and this in spite of the ready boast of patriotic Americans that this is a country of liberty and fair play.

Public service corporations have been between two fires. On one side the reformers, some of them of the professional type, making reform their vocation, and others amateurs, zealous, generally honest, usually only partially informed on the subject they attempt to direct in, and bumptious in proportion to their ignorance; on the other side, the greedy professional politicians ready either to "strike" the companies or to serve temporarily as allies to the reformers in the hope of rehabilitating their damaged reputations, as for the moment seemed to point more directly to their final material advantage.

It would be laughable, if it were not so disquieting, to observe the zealous, honest, impressionable, hasty, and, hence ignorant reformer so often pulling the chestnuts out of the fire for the mercenary politicians—the men who are in politics for what there is in it.

I am not here to speak against reform, that is, true reform. There has been need of reform in connection with the matters to-night under discussion; and let us not forget that there has always been such need and there always will be. And let us hope there always will be those ready to fight for reform. Also let us not forget as freedom-loving Americans that no lasting great reform can come from injustice, no matter to whom or what applied. Therefore, in welcoming this pressure for reform, we need be all the more insistent that justice should be meted to all. In spite of the mistakes made through the ill-directed zeal of many of the amateur reformers, we may still find comfort in the reflection that their work and the ready response made by the masses to their appeals indicate that the people at large hunger for better things. Abroad we are credited, or rather debited, with being materialists. But our professional politicians have long since learned that, as a nation, we are idealists and can be influenced, sometimes improperly, by appeals to our moral sense.

The working man has been incited by the yellow journals to believe that capital, as represented in corporations, is necessarily inimical to their interests. I fear that labor is likely to learn, during the next six months or a year at the most, that capital cannot be injured without the ill effects being transmitted to labor. It remains for labor to learn—and possibly for capital to learn—that the two interests must be bound together, no matter what each interest may do to weaken the bond.

Unquestionably much good has been done by the reformers now so active; unquestionably also much harm—unnecessary harm—has been done in the securing of this good.

Apparently the cue has been taken from the head of the government in Washington. With his striking personality, his tremendous force, his restless and almost resistless energy, his enormous capacity for work, his ability to impress his auditors with the belief that his intentions are honest, his supreme self-confidence, his probably honest belief that many of the industrial corporations of the country were conducting their business outside of the law and, with it all and through it all, his unparalleled ability as a politician, President Roosevelt has been able to make a record against the power of capital which is not matched, as far as I know, in the history of the world. The odds at first seemed to be overwhelmingly against him but he has persevered against the odds and has, for the time, won out. The public loves a fighter, especially one who fights against odds. Roosevelt by his audacity has won the applause and votes of the people and apparently still retains their confidence.

*From an address on the "Control of Gas Companies by State Commissions," read at Madison Square Garden, New York, Oct. 1, by Alexander C. Humphreys, President of the Stevens Institute of Technology.

Thus the President has done an immense amount of good, and in the doing he has done an immense amount of harm. It must be the task of history to strike the balance and show whether it rests upon the side of harm or good.

We are all suffering at present from these reform measures so indiscriminately applied. When I say "we" I do not mean those of us who are interested in public service corporations but I mean the people of the United States at large. It will not, [illegible] I fear, before no argument will be required to show that the shrinkage of values which has characterized the recent months of [illegible] has injured the country as a whole. It will be demonstrated that the prosperity of the country—material prosperity—depends upon public confidence and that the west and other parts of the country are mistaken in their claims that they are now strong enough to demonstrate that they are not dependent upon "Wall Street" for financial support. Call the money center what you will, it will never be found that trade can proceed along normal lines while those who are in control at the world's money centers are in doubt as to the future protection to be afforded to capital.

We are now having forced upon us—and we are likely to have it still more strongly forced upon our attention—that sentiment in material things, while possibly intangible and hard to exactly appraise, is very real as to its influence. All of this should need no argument when we reflect upon the fact that only a very small percentage of the business of the world is done upon anything else than credit. And what in the last analysis is credit but confidence in our fellowmen? It is only the belief in the unparalleled material resources of this country generally held by the capitalists at home and abroad which has so far prevented a ruinous commercial panic born of fear as to the effect of the reckless "reform" legislation in which so many states have competed for first place, and the radical innovations which the National Executive has instituted for the control of corporations. And while a panic has thus, for the time at least, been averted, properties have been tremendously depreciated and innocent investors have been injured.

The situation was in part well covered in an address recently delivered at a western college: "The greedy politicians call for expenditures while refusing to let the railroad earn the money to pay for them."

I have stated that some of the investigations which have been held have been conducted unfairly, not in the hope of bringing out the whole truth but in the hope of proving the corporation under fire to be in the wrong. In a paper read last spring before the New England Association of Gas Engineers, in which I endeavored to point out the necessity for the adoption and maintenance on the part of the gas men of America of a uniform system of accounts and records, I gave some cases which have come under my personal observation. I also drew attention to a case reported to me by a friend. A few days before the conversation with me, he had a talk with a prominent judge and they had discussed the results to be expected from an investigation of the character to which I am now referring and which had been carried by appeal into the courts. The judge asked my friend his opinion as to the outcome; my friend being well informed as to the character of the evidence on both sides expressed the opinion that the outcome must, of necessity, be favorable to the corporation under fire. The judge then expressed the opinion that the courts, in spite of the evidence, would not dare to decide in favor of the companies *because public opinion would thus be outraged*. And this was the opinion expressed by a judge generally held in respect. If this was the case a year or more ago, let us hope, for the sake of our country's good, that it is not so to-day.

There are some indications that the tide has commenced to turn and, if these indications are verified, we may well expect to find the politicians changing their tune and preparing to desert reform and return to other practices which, in the past, have put the public service corporations on the defensive and, in some cases, have appeared to force these companies into courses which the politicians now find it to their advantage to condemn. Thus the corporations having been delivered from the fire by the offered refuge of the frying pan, are again threatened with the fire—an uncomfortable position at the best.

Let us hope that the opinion expressed in a recent editorial in one of our New York evening papers has a real foundation in fact, viz.:

"Signs multiply that the fury of destructive legislation has almost run its course."

At least it appears to be true that it does not to-day require as much courage for a public servant, judge or member of a commission, to follow his conscience as opposed to public sentiment and clamor as it would have been, say, a year ago.

In the address just referred to, the speaker—a man of wide experience in the subject treated—traced the history of the development of government in the United States, and showed how the democratic idea had been steadily abandoned in the search for efficiency and also showed the dangers to be apprehended from this

seeking after increased efficiency of control. Let me quote a single paragraph:

"As a result perhaps three-fourths of the relations which the people hold to corporations, municipal and business, are now in the hands of the commissions and bureaus. In the majority of cases, the work is done by incompetent or inexperienced men, and is, therefore, badly done. There is continual interference with the freedom of internal trade and commerce of which we have always boasted ourselves; while the executive, instead of being weakened, has been strengthened by exercise of the power of appointment and removal. But the most illuminating feature of these intervening bodies is that they have been fashioned for the avowed purpose of avoiding or averting the popular control; a tendency which has commanded general acceptance. Their history illustrates the trend towards a central power, verging upon the absolute, retiring so-called democratic government further into the background and promoting the growth of that bureaucracy continually held up to reproach when dealing with the systems of other countries."

The dangers pointed out by this speaker are very real, and, as a self-governing people, we may well regard with apprehension the present tendencies.

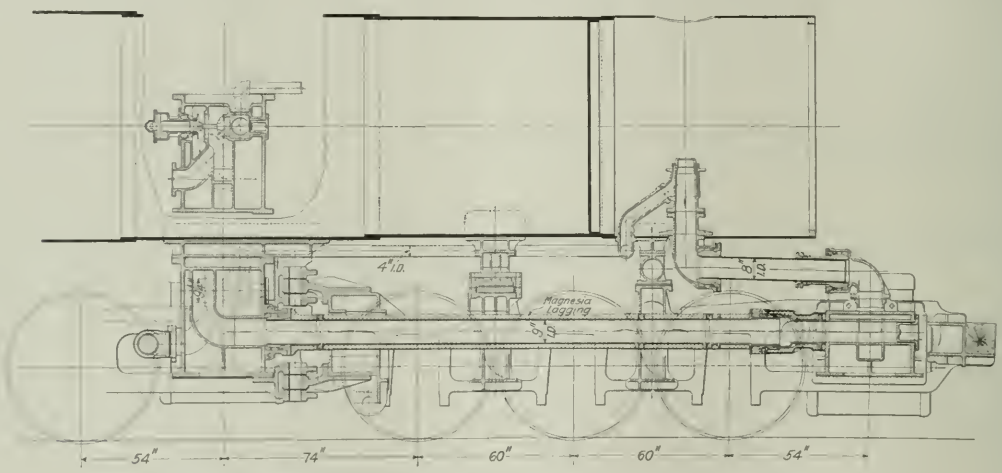
But to-night we are called upon to consider the conditions as they exist and we must recognize that, apparently, the gas companies of the state of New York for some time at least must be prepared to accept a certain measure of control at the hands of one or two state commissions. Our experience with legislative control had not been encouraging and so many of us were led to believe that the men in control should be limited in number and selected for the work in hand. Unquestionably, it is better to be subject to the control of a limited number of honest and capable men, who can, from time to time, add to their knowledge of our business and so be better prepared to render a fair judgment on problems more or less intricate, problems which it has taken some of us a lifetime to solve. But it finally resolves itself into the question of personnel. I think we have reason to believe that the public service corporations of the state of New York can congratulate themselves not only that the old commission has been legislated out of office but also on the personnel of the new commissions. We cannot expect these men at once to know everything about our business, but we can expect that they shall inform themselves as rapidly as possible, and we can expect and demand that they shall render a fair decision in every case based upon their understanding of the evidence. To Fourth-of-July Americans it should be unnecessary to make such a point, but unfortunately it is too often the enthusiastic spread-eagle type of American who needs this kind of reminder the most. Enthusiasm is a grand thing and a people without enthusiasm is started on the road to decay; but enthusiasm uncontrolled by common sense and a dominating spirit of justice is an ever present danger.

Unquestionably the evidence has not controlled in many of the cases which have been carried before the governmental commissions during the last year or two, and, to be more specific, unquestionably the evidence did not control in the cases taken before the old Commission of Gas and Electricity of the state of New York.

But the question of correct judgment cannot rest entirely with the commissions. Having satisfied ourselves how far we can go in acknowledging the jurisdiction of the commission without legal prejudice to our companies' rights, it remains for us to do our utmost to assist them in the fair performance of their duties. We must be frank and fair in the presentation of our data, and we must be all the more careful when we come before them in any specific case. Having exhausted every possible means to prevent our cases before to the commission in accordance with the facts as we understand them, if we fail to obtain what, after full consideration, we believe is justice, then it finally remains for us, as trustees for our bondholders and stockholders, to appeal to the courts for protection and to carry the appeal, as high as it can be lodged. In other words, we must resolve to be absolutely fair ourselves, and, having so resolved and having lived up to the resolve, we must not flinch from the test if we have to fight to the limit for our rights.

Details of Mallet Articulated Compound Locomotive.

A general description of the articulated Mallet compound locomotive that has recently been built for the Erie Railroad by the American Locomotive Company was published in the *Railroad Gazette* of August 16. Allusion was there made to a number of special features which will now be taken up and illustrated in detail. In an engine of this character one of the difficulties that will appeal to the designer will be that of conveying the steam from the throttle to the exhaust of the low-pressure cylinders without leaks or joints that are liable to leak and yet compensate for the varying relative positions of boiler and cylinders. Here there are three movable parts changing their relative positions not only in angu-



Steam Piping Mallet Articulated Compound Locomotive; B. & O. Railroad.

larity but in linear distances, and the steam must flow through the three sides of the varying triangle that they may be considered to represent, starting from one as its source and returning to the same for the exhaust.

Up to the point where the steam is discharged from the high pressure cylinders there is no essential change from conditions obtaining on ordinary locomotives. The special throttle is placed in the dome with a dry-pipe leading forward. This dry-pipe, however, instead of extending on to the front tube-sheet, stops short at 62½ in. in front of the dome and turns up through the shell to a tee upon the outside, from which the steam pipes are led down on either side to the tops of the steam chests of the high-pressure cylinders. This is all shown very clearly by the engravings on pages 171 and 172 of the issue of Aug. 16, where there is also a general description of the steam connections. It is, however, as the steam leaves the high-pressure cylinders that the real interest in the steam passages begins.

It will be remembered that, in the general description of the locomotive, it was shown that the two high-pressure cylinders were not joined on the center line of the boiler but that the half saddle of the one on the left-hand side extended 8½ in. over to the right in order that it might contain the intercepting valve and have the outlet to the receiver in the axis of the engine. By referring to the engravings of the high-pressure cylinders on page 172, it will be seen that the exhaust passage of the one at the right leads back to an 8-in. opening in the rear of the half saddle, and that there is a similar opening in the left-hand cylinder casting to the large exhaust passage leading up to the intercepting valve chamber 9½ in. in diameter near the top of the saddle. These two openings are

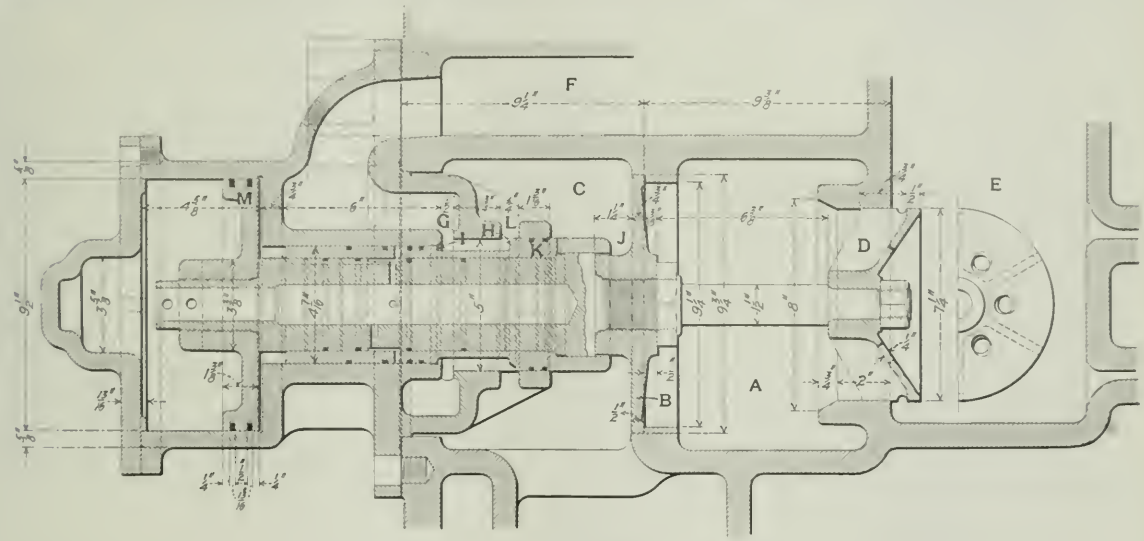
connected at the rear of the saddles by a cast iron return bend, with a clear circular opening 8 in. in diameter and spaced 23½ in. from center to center. It is held to each half saddle by four 1 in. bolts, and the joints are made tight by the ordinary ground cast iron rings with ball joints in the main casting turned on 6 in. radii and with flat faces on the return bend. As there is no motion here the whole passage is rigid.

The steam from both sides is thus discharged into the exhaust passage of the left-hand cylinder and then rises to the intercepting valve. This is of the Meilin type, first used and developed in the two cylinder compounds built by the Richmond Locomotive Works, but differs from that valve in some of the details of its mechanism and in its location on the engine. In the Richmond two-cylinder compound locomotive, the high-pressure exhaust was delivered direct into the smokebox receiver pipe passing in an arch from one side of the cylinder to the other, and the intercepting valve was placed in the low-pressure side. That is to say, the intercepting valve was placed between the receiver and the low pressure steam chest. In operation live steam was automatically admitted at a reduced pressure to the low-pressure cylinder until the high-pressure exhaust had banked up sufficient pressure in the receiver to open the intercepting valve; when that event occurred, and the flow of direct steam to the low-pressure cylinder was cut off, the receiver steam admitted and the engine thrown into compound action.

In the Mallet compound the order of events is the same but the arrangement of parts is different. Instead of placing the intercepting valve at the low-pressure end of the receiver pipe it is allowed to pass forward through the small pipe shown in the engraving of the steam pipes to the main exhaust, the details of which will be considered later.

When this emergency exhaust valve is open there is no tendency to raise the pressure beneath the main valve B of the intercepting valve, and the whole locomotive works in single expansion. If, on the other hand, steam is not admitted to hold the emergency exhaust valve open, the spring closes it and holds it there, which it is arranged to do because the valve is partially balanced by the pressure against the face of the piston and the unbalanced force tending to open it is only that represented by a ring ⅛ in. wide and 5½ in. outside diameter, the difference between the exposed areas of the valve and the piston.

With the emergency valve closed and the intercepting valve in its normally closed position which is that existing at starting, the sequence of events at that time is as follows: When the throttle is opened, live steam is admitted to the passage F outside the valve case and passes down through the port G and, filling the grooved opening in the reducing valve K, presses with equal intensity against the shoulders H and I. As the area of the shoulder H is the larger of the two, because of its larger outside diameter, the valve K, which is merely a sleeve fitted with packing rings for its bearing surfaces, is moved to the right and the live steam flows freely into the chamber C. As the pressure rises in this chamber, it acts upon the whole of the end of the sleeve K, and as this end area combined with that of the shoulder I is greater than that of the shoulder H, it follows that before the pressure in C has risen to the full



Intercepting Valve.

placed, as already stated, in the saddle of one of the high-pressure cylinders and receives the exhaust direct from both of those cylinders. This exhaust steam enters the space A beneath the main valve B, which is held normally closed by the reduced pressure live steam admitted back of it into the space C. Attached to the stem of the main valve and moving with it is the wing piston D. This latter part serves to guide the stem of main valve, and, through the holes in its face and the opening about its rim, permits the high-pressure exhaust to pass on to the passage E, whence it has direct access to the emergency exhaust valve.

In the original Richmond compound the emergency exhaust was in a line and concentric with the axis of the main valve. In this modification for the Mallet compound it is a separate mechanism. By referring to the horizontal section of the left-hand cylinder on page 172, it will be seen that there is an opening on the outside face of the saddle that connects directly with the intercepting valve chamber. The flange (1) of the emergency exhaust casing is bolted to the side of the saddle so that its opening is put in communication with the chamber (2), which is closed by the wing valve (3) held normally against its seat by the spring acting on its stem and located outside the casing. Also attached to the stem of this valve is the piston (4) that is fitted with spring rings and moves in the short cylinder bored in the casing to receive it. When it is desired to work the engine in single expansion for all four of the cylinders, a cock is opened in the cab and live steam admitted through the opening (5) to the space back of the piston, moving the latter ahead, and opening the valve (3) through which the exhaust is boiler pressure exerted on H, there will be enough of an effort exerted on J to push the sleeve toward the left and thus close the opening made by the passage of the shoulder H past the port L. The ratios of these areas are so adjusted that, when the pressure in the chamber C has risen to the point at which it is desired that the initial pressure in the low-pressure cylinders should stand, the sleeve will close the port L.

Steam admitted to the chamber C has free access to the receiver and the low-pressure steam chests; so that as soon as the throttle is opened steam is admitted to all four of the cylinders and the normal tractive effort is exerted.

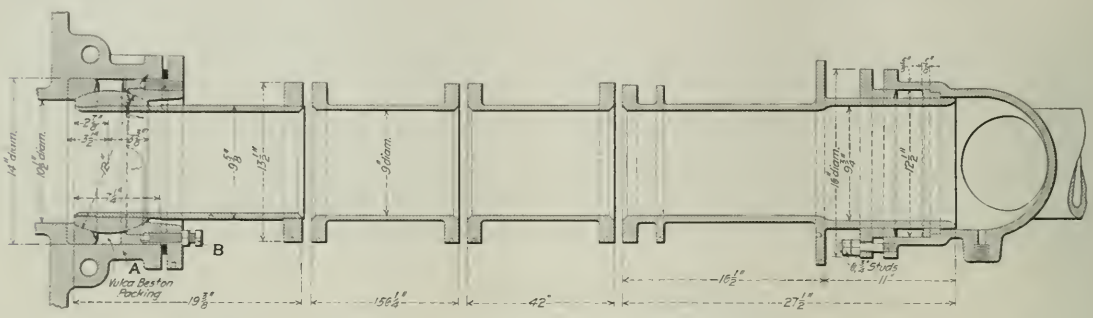
Then the first exhaust of the high-pressure cylinders passes into the space A and fills the passage E and the chamber (2) of the emergency exhaust valve, and when the pressure in these cavities has risen to a point slightly above that existing in the chamber C, the main intercepting valve B is opened by being moved to the left and the high-pressure exhaust is thus given a clear passage to the receiver and the steam chests of the low-pressure cylinders.

As the main valve B is moved to the left it strikes the end of the sleeve K and, carrying it with it, closes the port L and thus prevents the admission of any more live steam to the chamber C and the receiver, and the engine enters upon its compound working. But if, at any time, the additional tractive power that can be obtained in single expansion action is desired, the opening of the emergency exhaust valve from the cab will bring that condition about.

At the rear the stem of the main valve is fitted with a piston

M that moves in a cylinder forming a dashpot and thus preventing any approach to slamming. The surface where the stem is in contact with the inside of the sleeve is fitted with packing rings sprung into place so that leakage of steam is prevented.

When the steam leaves the chamber C of the intercepting valve, it passes out through a passage cored in the saddle to the receiver pipe. As will be seen by referring to the assembled engraving of the steam pipes the passage from the intercepting valve drops down and curves to the front for the receiver pipe connection. Up to this point there has been no necessity for any flexibility in the joints as all parts have been attached to and move in unison with the boiler. With the connection of the receiver pipe this is changed, for not only must there be a possibility of an angular displacement due to the relative positions of the two trucks, but there must be an extension due to the motion that must exist between the frames. The detail of the receiver pipe shows how these requirements are met.



Receiver Pipe.

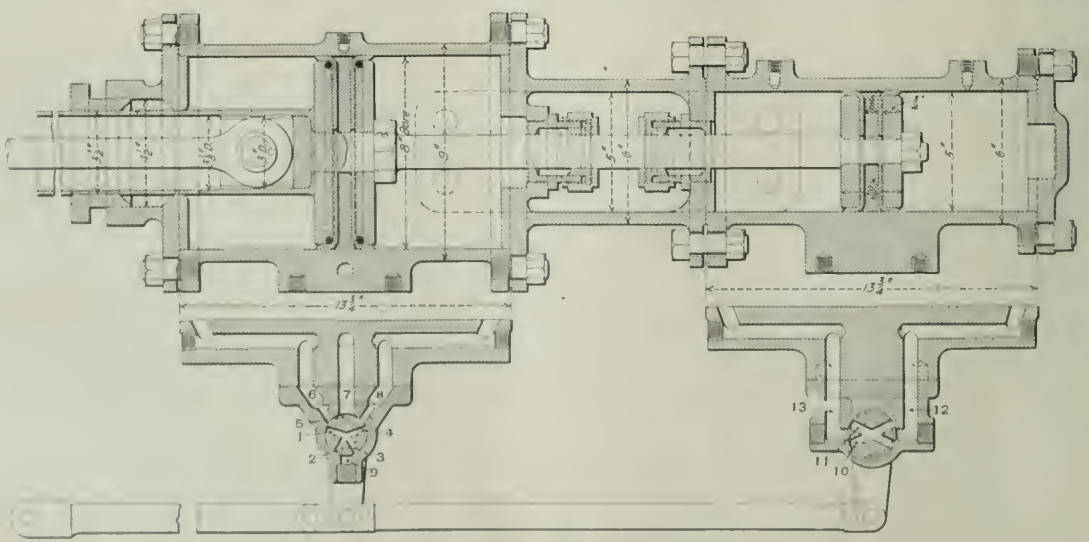
There is an extension A on the front of the high-pressure saddle that is bored out to receive two glands turned to a spherical inside fit and which can be adjusted against the ball-bearing on the pipe by the studs B, so that lost motion occasioned by wear can be taken up and leakage of steam prevented. This is the only flexible joint in the receiver pipe, and is the only one that is necessary because the center line of the pins coupling the two frames nearly coincides with the center of the ball joint, so that the whole of the front truck, with its cylinders, swings around this point and the angular displacement is nearly the same.

The receiver pipe is made in three sections merely for convenience in erecting, and at the front end it passes through an ordinary stuffing box in a tee, in which it has a fore and aft motion by which the variations in length can be made. The joints between the sections are made tight by the insertion of cast rings of V section turned to fit the recesses shown in the ends of the pipe. The tee at the front is a simple iron casting with branches to mate with the admission openings in the back of the low-pressure saddles, and the joint between the two parts is made tight with the usual ground ball joint.

The steam passes through the low-pressure cylinders, doing its work in the usual way and issues from the top through exhaust openings set near the center line of the engine and spaced 7⅝ in. apart from center to center on the two saddles. An exhaust pipe elbow is bolted on to cover both openings and to turn the exhaust back towards the smokebox. This elbow is fitted not only with a universal ball joint by which the exhaust pipe is enabled to swing and keep in line with the corresponding elbow on the smokebox, but also contains a stuffing box and slip joint by which the variations in distance between the centers of the two elbows are taken care of. At the rear the exhaust pipe terminates in another universal ball joint set in the smokebox elbow, so that the exhaust pipe can adjust itself to any and all variations in the relative positions and alinement of the low-pressure cylinders and the smokebox.

The hole above the smokebox elbow is 16½ in. ahead of the center of the stack, so that the interior exhaust pipe is given an offset of that amount in order to bring it in line. In addition to this it has the added peculiarity of an attachment for the emergency exhaust. This exhaust pipe is led forward from the outlet of the emergency exhaust valve to a point just ahead of the front tube-sheet. Here it turns in to the axis of the boiler and thence through another elbow enters the smokebox and connects with the auxiliary exhaust pipe back of the main one. The main casting is made with a flange and short connecting pipe leading to an annular space like a steam jacket about the exhaust passage from the low-pressure cylinders. The exit from this annular space is through a contracted annular nozzle about the main one. With this arrangement there is no interference with the integrity of the low-pressure exhaust at any time, either when starting or when running the engine in single expansion. As the emergency exhaust pipe is connected rigidly to the boiler or parts moving with it at each end there are no flexible joints required in it.

Closely allied to the required flexibility of the steam piping



Valve Arrangement for Power Reversing Gear.

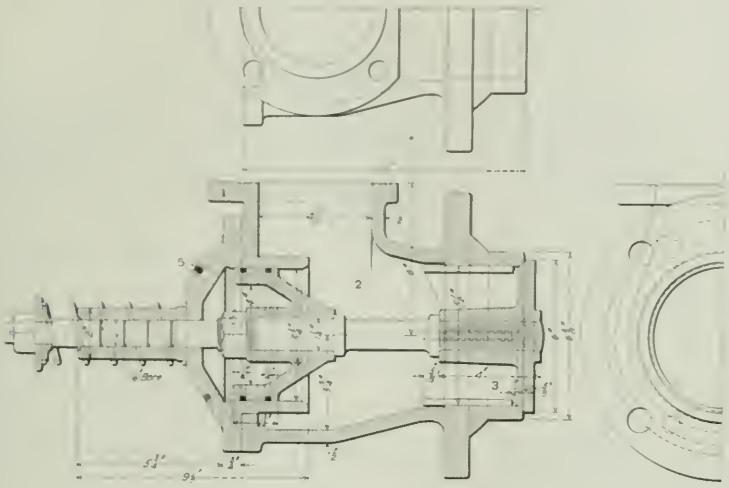
are the connections between the frames and the boiler. The boiler is necessarily supported by both front and rear frames, but it is rigidly attached to the rear one only, sliding supports being provided for the front. The connection between the two frames is by means of pivot pins and is of such a character that the whole tractive effort of the forward cylinders is transmitted to the rear frame through this connection and thence back to the drawbar connecting the tender.

The general arrangement of the connection between the two frames is clearly shown by the assembled engraving of the steam pipes, which is that of the Baltimore & Ohio engine but is the same as that of the Erie. At the rear end of the forward frame heavy cross-tie castings are attached to both the top and bottom rails, and these in turn carry the male sections of a pivotal connection, the female being bolted across the front face of the saddle of high-pressure cylinder and attached to the frames. Two heavy pins complete the connection.

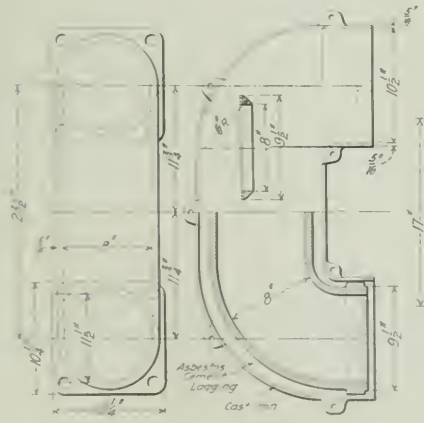
The boiler is fastened to the rear frame at the high-pressure saddle and at three points beneath the firebox, the one at the extreme back end taking the form of the usual buckle plate. This holds the boiler in line with the rear frames at all times and causes a large range of lateral displacement over the front truck; a displacement that increases toward the front end of the machine and at the cylinders is at the extreme, as illustrated by the half-tone engraving of the front on page 174. The boiler is therefore carried on two sliding supports by the front frame. Of these one is placed about midway between the high-pressure cylinders and the front tube-sheet which is intended to carry the whole of the load of the front end of the boiler. The second is intended to serve merely as a guide and centering device to bring the boiler back central with the front frame when it runs out of a curve. It is provided with bearing surfaces but it is expected that the lifting springs with which it is provided will relieve these surfaces of all load.

The general arrangement of this centering device is shown in the engraving of the assembled parts. The casting A is attached to the boiler and has the spring case B bolted to its lower face. The lower face of this spring case is planed smooth and is fitted with a wearing surface provided with oil grooves so as to move easily to and fro across the top face of the heavy frame cross-tie F that is bolted to the frames G G. The spring case contains two nests of helical springs provided with thimbles in whose sockets the stems E E have a bearing. These stems are pivoted in the brackets D which are bolted to the cross-tie F. At the center the two springs have a bearing on the spring case B. It is evident that when the boiler swings to one side or the other of the center lines of the frame and carries the spring case with it, the spring at one end or the other is compressed and tends to push the case, and with it the boiler, back to the central position.

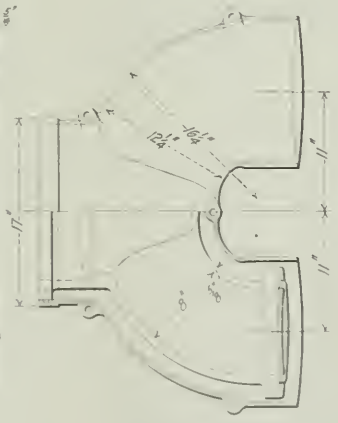
In order to relieve the bearing surfaces between the spring case and the frame cross-tie F of that part of the weight of the boiler that would naturally come upon it and, at the same time, render the centering action of the springs more effective, an upward thrust is exerted against the main casting A. Near the lower edge of this casting there are two hemispherical sockets in which the ends of the relief stems I I are fitted. The lower ends of these relief stems



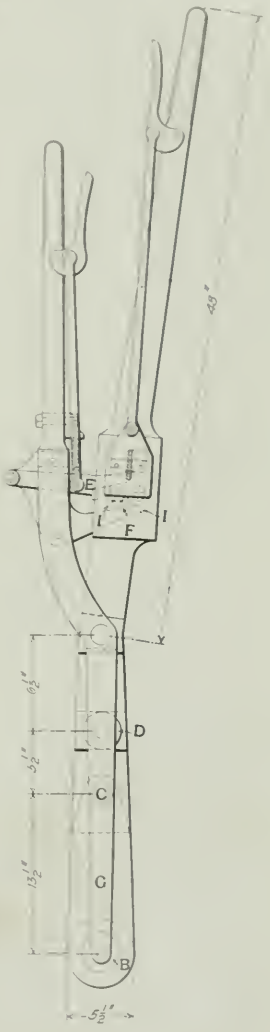
Emergency Exhaust Valve.



Exhaust Passage Connection; High Pressure Cylinder.



Dry Pipe Tee.



Reverse Lever.

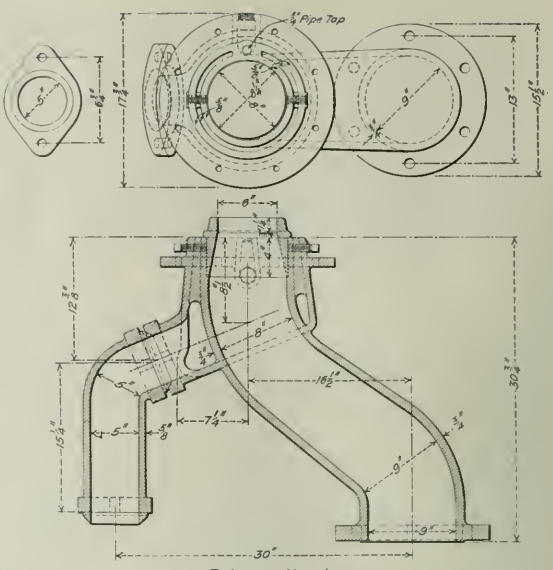
rest in sockets attached to the swinging seats J. These seats are pivoted to a cross-tie H that rests upon the lower rails of the frame. They are held up against the lower ends of the relief stems I by U bolts K K, and these are, in turn, supported by springs which rest upon the cross-tie. These springs are put in position under a tension sufficient to sustain that portion of the weight of the boiler of which it is desired that the surfaces between B and F should be relieved. They also serve to compensate for any angularity that the relief stems may assume due to the lateral motion of the boiler.

By this arrangement the boiler is free to move to and fro across the supporting surfaces without exerting an undue frictional thrust upon the frames and without being raised above its normal position by the auxiliary supports. There is a support back of the centering device upon which the weight of the forward part of the boiler rests and to which attention has been called. This consists simply of castings fastened to the boiler shell and frames and fitted with suitable wearing surfaces that are properly lubricated and with stops so adjusted that the desired fore and aft movement due to the play between the two frames is allowed.

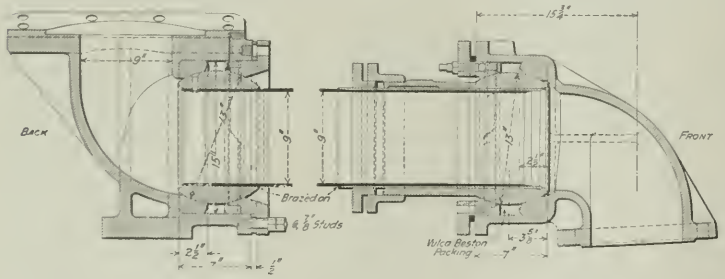
Owing to the fact that there are two sets of valve motions to be moved by the reverse lever an air-operated reversing gear is used. In the cab there is the usual reverse lever attached to the reach rod in the ordinary way and fitted with the regular latch engaging in the teeth of the quadrant. In addition to this the reverse lever is also coupled to the piston rod of the air gear. Back of the main reverse lever and pivoted upon it there is what looks like an auxiliary lever. This is used for the handling of the motion when air is worked. The engraving of the two levers show the relative proportions and their connection with each other. The main lever is pivoted to the reverse lever stand at B; is connected to the piston of the air cylinder at C and to the reach rod at D. It is fitted with the usual latch engaging in notches cut in the quadrant and is also provided with a special latch for locking and limiting the motion of the auxiliary lever.

The auxiliary lever is pivoted on the main one at A, and when a change of cut-off is to be made the latch handle of the auxiliary lever is pressed in and this lifts the main latch by means of the lifting bar E. The lifting of the main latch also frees the auxiliary latch finger F and gives it a freedom of movement between the two lugs 1, 1. The movement of the auxiliary lever to or from the main lever by the distance permitted by the lugs 1, 1, swings the lower end G so that its center is out of line with that of the lower end of the reverse lever at B. As both levers turn about this point the offset thus obtained is practically constant and is utilized to operate the valves of the air and oil cylinders, as will be described later.

There are two cylinders set tandem for the reversing gear. Air is used as a motive power and it is worked in a double-acting cylinder of 8-in. bore. The other, or oil cylinder, is 5-in. diameter. Both pistons are packed with leather cup packing, that for the oil being held by the followers only, while that on the air piston is held out by a spring ring. Packing boxes for the rod are placed between the cylinders and for the trunk piston rod at the air end, where there is a short connecting rod leading to the reverse lever. In operation, whenever the auxiliary reverse lever is in its normal position, the valves of both oil and air cylinders are blanked. This locks the gear for, with the oil cylinder filled, no motion can take place when the by-pass is closed. The connections show the operation of the valve. The valves are simple tapered plug valves: that for the air has a four way opening in addition to an exhaust cavity and that for oil has crossed passages so that the two ends of the cylinder are put in communication whenever the auxiliary reverse lever is pushed forward or back. For example, when the auxiliary lever is pushed forward the lower end of the arm G is drawn back turning the air cock so that the port 1 is opened to the passage 6. 3 is open to the air inlet 9 and the exhaust cavity 5 opens the passage 8 to the exhaust 7. Air is thus admitted to the rear of its cylinder and the motion is moved forward. At the same time the cross passage 10 is turned to allow oil to pass from 12 to 13. For reversing, the air is admitted to the front passage 8 through the port 4 and the by-pass of the oil cylinder is opened by 10.



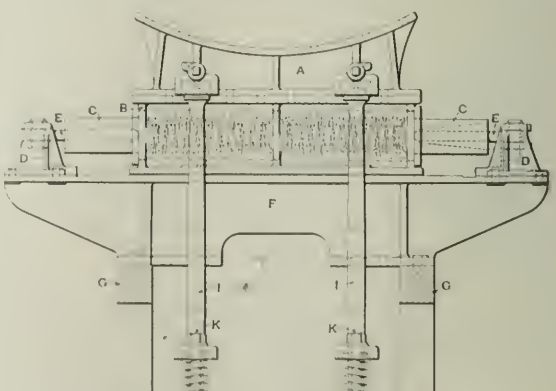
Exhaust Nozzle.



Exhaust Pipe.

By giving the auxiliary lever a slight angular position the passage of oil from one end of the cylinder can be checked to any extent and the moving of the gear be made slowly or rapidly as may be desired. When the gear is to be moved the auxiliary lever must be kept in motion as long as it is desired that the gear shall move, and when the desired notch in the quadrant has been reached, the lever is brought to its normal position relatively to the main lever, the movement stops at once, the ports are covered and the pistons locked.

These are the principal items of interest connected with the locomotive in that they are the details that are essential to permit the proper relative position of the frames on curves. The great size of the machine made it necessary to give close attention to every item of its construction in order that suitable proportions might be obtained, and as such each part of the engine is deserving of close study.



Centering Device for Front Frame Section; Mallet Articulated Compound Locomotive.

Turntable Deflection.*

In investigating a certain turntable it was desired to know whether it had an undue amount of deflection and to that end it was necessary to know the theoretical deflection. The writer was unable to find any ready method for determining deflection and worked out the following graphical solution. The problem was to find the deflection of the table at the guide rail when loaded with a locomotive weighing the same as the rated capacity of the table (in this case 150 tons) and set to balance the table as shown in Fig. 1. The principal dimensions of the table are also shown in this figure. For convenience in solving the problem only half of one end of the table was considered, hence we have to find the deflection of a cantilever beam with several concentrated loads and a varying moment of inertia, the loads being half the weights on drivers and truck. This is shown at the top of Fig. 2. For a rigid analysis both ends of the beam should be considered, due to the different moments obtained from the tender loading, but this is but a repetition of the work shown.

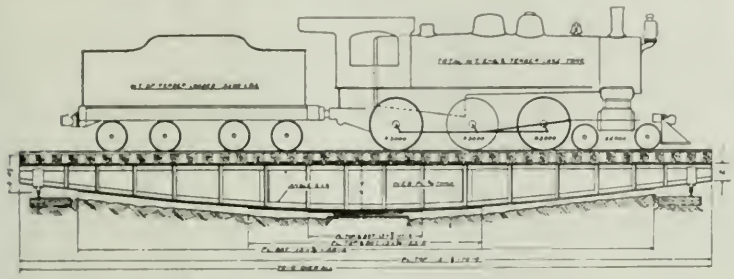


Fig. 1—Locomotive in Place on Turn Table.

Briefly, the process consists in obtaining first, the moments of inertia at the various sections where changes occur, in this case at the beginning and end of each top and bottom plate; second, the moments taken about the center and under each wheel; third, obtaining the value of the moments divided by the moment of inertia; fourth, integrating this value, and fifth, again integrating to obtain a value from which the deflection may be obtained.

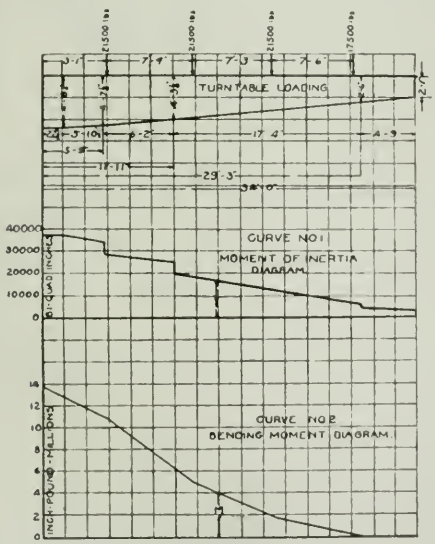


Fig. 2.

In the following:

M = bending moment in inch pounds.
I = moment of inertia in bi-quadratic inches.
E = modulus of elasticity in pounds per square inch.
d = deflection in inches.
C & C¹ = constants of integration.

Curve No. 1 shows the moments of inertia figured at the points indicated and laid down to a convenient scale. The I's were figured by the well known formulæ for built-up sections (method shown in appendix).

Moments were next figured, the latter being laid out at the center and under each wheel load between section 1 at end of table only being considered. This laid down to a convenient scale gave curve No. 2.

In the solution of the problem it is necessary to know the value of $\frac{M}{I}$ (see mathematical solution below), hence curve No. 3 shows graphically the result of dividing the M of curve No. 2 by the I of curve No. 1 and gives an $\frac{M}{I}$ curve from which values may be taken directly.

The next step calls for an integration of values already obtained. Curve No. 4 is a graphical result of such integration and is obtained from curve No. 3 by taking the number of squares under the curve to the right of any point and multiplying it by the value of one square in inches. In the example given one square had a horizontal or abscissae value of 24, while the vertical or ordinate value was 100, hence each square value was 2,400. On curve No. 4 each square was given an ordinate value of four squares of No. 3 or 9,600, the abscissae value remaining 24 as before.

Curve No. 5 is a graphical integration of No. 4, and is derived in the same manner as was No. 4, except that eight square spaces of No. 4 were used for one vertical space of No. 5. The units of $\frac{I}{M}$ diagram are lbs. ÷ (inches)². By integrating we have lbs. ÷ (inches)² for the units of curve No. 4, while further integration gives lbs. ÷ inches. By taking the value of E at 29,000,000 lbs., and dividing the value obtained from the curve at any point by 29,000,000 we get the deflection at that point in inches—the desired result. Mathematically this is shown by the following. (See Church's Mechanics, p. 310.)

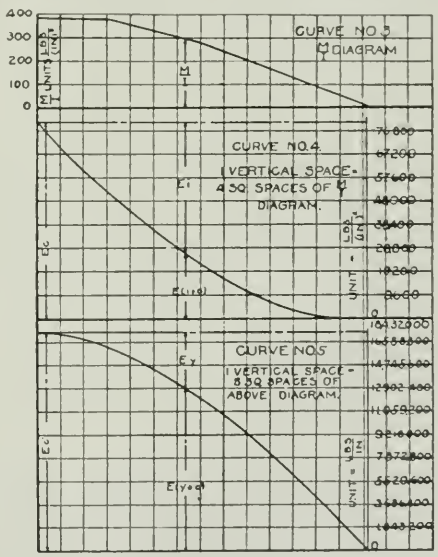


Fig. 3.

The turntable is considered as a cantilever with several concentrated loads and varying I's.

Since, from the moment diagram

$$E I \frac{d^2y}{dx^2} = M, \text{ then } E I \frac{(dy)\, d}{dx} = M dx$$

Integrating,

$$E I \frac{dy}{dx} + c = \int M\, dx, \text{ where } c = \text{constant of integration.}$$

$$\therefore \int M\, dx = E I (i + c), \text{ where } i = \frac{dy}{dx}$$

hence $M dx - E I c = E I i$, but

$$E I i = E I \frac{dy}{dx} \quad \therefore E I i\, dx = E I\, dy, \text{ integrating}$$

$$\int E I i\, dx = E I (y + c'), \text{ where } c' = \text{constant of integrations.}$$

Since the origin is at the right of the curve this reverses the signs.

*A. A. Kellogg, in *Purdue Engineering Review*.

The deflection at the center is zero.

This method of finding the deflection checked up in the case cited. The deflection by calculation was approximately 19-32 in., while the actual deflection, taken by an engineer's level, was $\frac{5}{8}$ in., when the table was loaded as shown.

Acknowledgment is due to a paper on "Car Bolster Stresses" by Prof. W. K. Hatt, of Purdue University. (*Railroad Gazette*, Dec. 23, 1898.)

APPENDIX.

Method of Obtaining I of Section.

I of web = 1-3 bh³ (Church's Mechanics, p. 94).

I of angles = 2 (I_g + F d²), where,

I_g = moment of inertia about gravity axis, from handbook.

F = area of angle from handbook.

d = distance from center line to center line of gravity of angle.

I of top plate = I_g' + F' d'², where,

I_g' = moment of inertia of plate (if small, this may be neglected).

F' = area of plate.

d' = distance from center line to center line of gravity of plate.

Rivet holes to be deducted from I of section:

Through angles and web = F'' d², where,

F'' = area of rivet hole.

d = distance from center line of section to center line of rivet hole.

Through top plate = F''' d''² where,

F''' = 2 (area 1 rivet hole).

d'' = distance from center line of section to center line of hole.

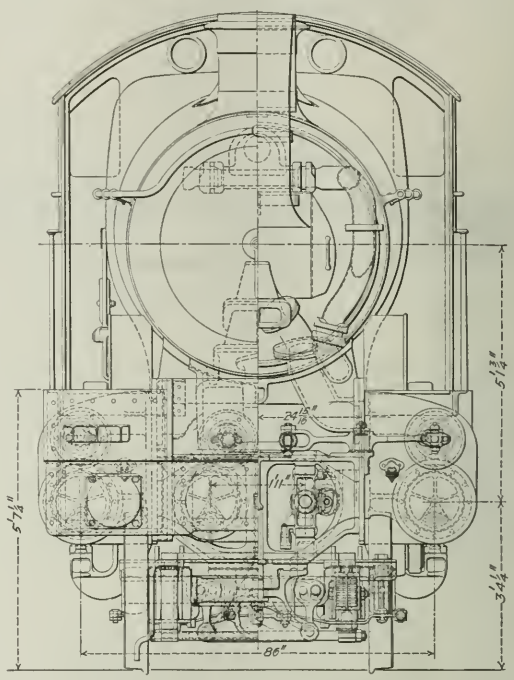
Total I of entire section = 2 [(I of web + I of angles + I of top plate) — (F d² of rivet holes.)]

Four Cylinder Simple Express Locomotives; Great Western Railway.

Through the courtesy of Mr. G. Jackson Churchward, Chief Mechanical Engineer of the Great Western Railway of England, we illustrate and describe herewith the latest type of locomotive built at Swindon Works for hauling express passenger traffic on that line. The wheel arrangement is 4-6-0, and there are four single-expansion cylinders placed two inside and two outside the frames, each pair of cylinders operating a separate pair of coupled wheels.

The inside cylinders are placed forward of the bogie center, and the outside ones to the rear. The inside cylinders drive the crank axle of the leading coupled wheels, while the outside cylinders are connected to the intermediate coupled wheels. The two cranks on each side of the engine, i. e., one inside and the other outside of the frames, are 180 deg. apart and at right angles (90 deg.) to the cranks on the opposite side. This arrangement greatly improves the turning moment, and as the two pistons on each side of the engine are always moving in opposite directions, a simplified form of valve mechanism is rendered practicable. In these engines the valve gear is of the Walschaerts type in duplicate, one set actuating a pair of piston valves 8 in. in diameter and of extra length, allowing the passages to the cylinders to be practically straight. Inside admission and outside exhaust are adopted, and the exhaust passage is an extension of the valve chest. The inside piston valve in both cases is actuated directly by the Walschaerts gear, and motion is conveyed to the outside valve by connecting the two valve spindles by a cross-lever having equal arms fulcrumed on the frames. Neither eccentrics nor return cranks are employed for operating the gear, motion being derived from the reciprocating movement of the inside crossheads, each of which carries a connection to its own combining lever and also a connection through a rod extending back and operating the link for the valve motion of the opposite side of the locomotive.

The two inside cylinders are cast in one piece with the smokebox saddle, but their center is considerably in advance of the saddle, this being a natural consequence of the location of the cylinders over the leading bogie axle. The boiler is of the Great Western standard type, viz.: coned throughout the length of the barrel and fitted with Belpaire type of firebox and extended smokebox.

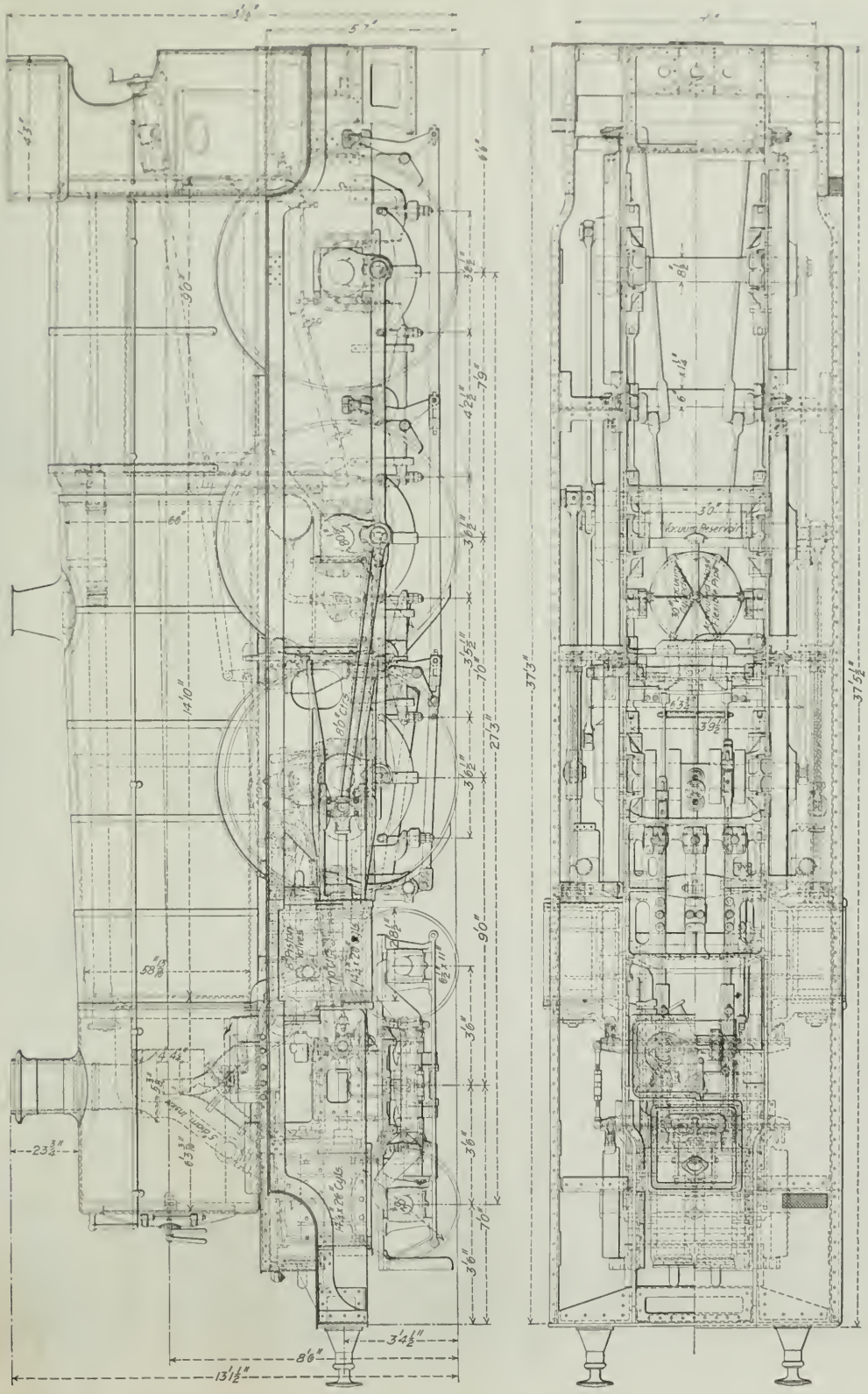


Half Cross Section and End Elevation.

No dome being provided, steam is collected by a pipe having branched ends, each of which has an upturned mouth near the front of the crown sheet on each side, the throttle valve being in the smokebox.

The crank pin end of the connecting rod for the outside cylin-

Four Cylinder Single Expansion Locomotive; Great Western Railway of England.



Plan and Side Elevation of Four-Cylinder Single Expansion Express Locomotive; Great Western Railway of England.

ders is of the solid bush type. The end of the crank pin has a fine thread cut on it and the cap is screwed on and secured by a threaded taper pin through it. The side rods are secured in the same manner.

These locomotives rank among the most powerful express passenger engines in Great Britain. With ample cylinder and boiler power, an adhesion weight of nearly 60 tons and a high working pressure, they possess all the necessary features toward success in the particular work for which they have been designed.

They have leading dimensions as follows:

Cylinders (four) diameter	14½ in.
Piston stroke	26 "
Bogie wheels, diameter	3 ft. 2 in.
Coupled wheels, diameter	6 " 8½ "
Bogie wheelbase	7 " 0 "
Coupled wheelbase	14 " 9 "
Total wheelbase	27 " 3 "
Boiler, diameter (front end)	4 " 10¾ "
" diameter (firebox end)	5 " 6 "
" height of center from rail	8 " 6 "
" length of barrel	14 " 10 "
Heating surface, total	2,142.91 sq. ft.
Grate area	27.07 "
Working pressure	225 lbs.
Weight in working order	171,584 "
Adhesion weight	131,710 "
Tractive power	23,775 "

The tender carries 6 tons of coal and 3,500 gallons of water. It weighs 40 tons when full.

Production of Lumber in the United States.

The Bureau of the Census, in connection with the Forest Service of the United States Department of Agriculture, has issued a bulletin showing the production of lumber, lath and shingles by states and species in 1906, 1905 and 1904. The figures cover returns from 21,077 mills in 1906, 11,666 mills in 1905 and 18,277 mills in 1904. The total lumber production (excluding lath and shingles) for the United States, in thousands of feet, board measure, was 37,490,067 in 1906, 30,502,961 in 1905 and 34,127,165 in 1904. The state showing the heaviest production of all kinds of lumber in 1906 and in 1905 was Washington, with 4,305,053 thousand feet in 1906 and 3,917,166 in 1905. In 1904, Wisconsin was the state of largest production, with 2,623,157 thousands; Washington was second, and Louisiana third. In 1906 there were 15 states whose production exceeded one billion feet of lumber, board measure. These states, arranged in order of production with the figures given in thousands of feet board measure, are as follows:

Washington	4,305,053	Texas	1,741,473
Louisiana	2,796,395	Pennsylvania	1,620,881
Wisconsin	2,331,395	Oregon	1,604,894
Michigan	2,094,279	California	1,348,559
Mississippi	1,840,250	North Carolina	1,222,974
Arkansas	1,839,368	Maine	1,088,747
Minnesota	1,794,141	Virginia	1,063,241
		Alabama	1,009,783

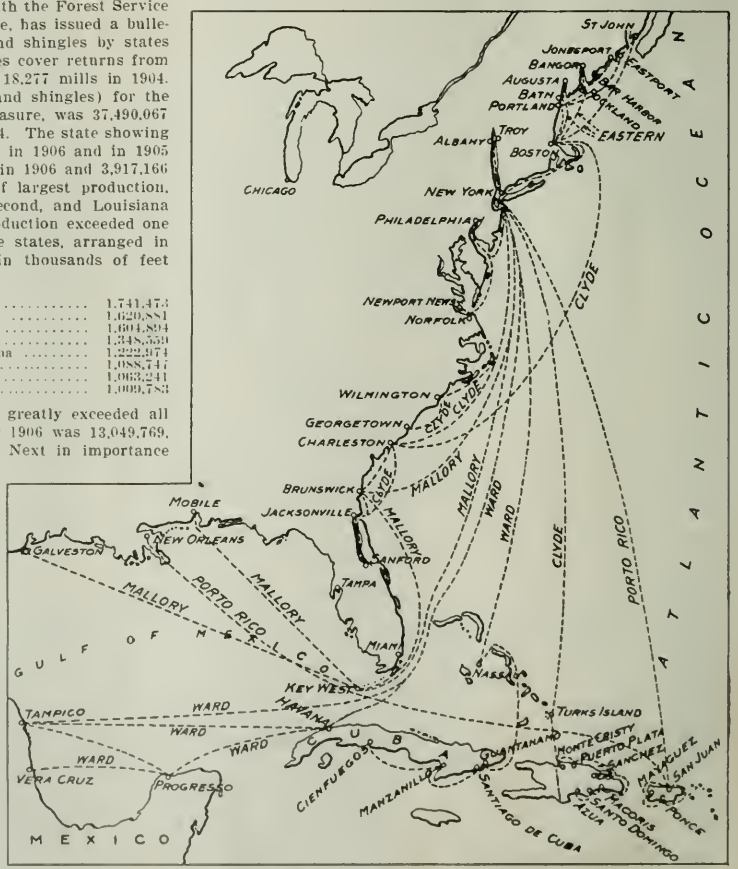
The production of yellow pine, of course, greatly exceeded all other kinds of lumber and the total figure for 1906 was 13,049,769, the unit being 1,000 ft. B. M. as heretofore. Next in importance comes Douglas fir, with 4,969,843. White pine is next with 4,582,102; then hemlock, 3,508,031; oak, 2,816,077; spruce, 1,615,940. These six kinds of wood were the only ones the production of which amounted to one billion feet B. M. or more. Of the lesser woods, maple was the most important, followed in order by cypress, poplar, redwood, red-gum, chestnut, basswood, cedar, birch, cottonwood and ten other specifically enumerated varieties. Louisiana leads in the production of yellow pine. The great Douglas fir states are Washington and Oregon, and, between them, they produced all but about 200,000 of the production. Minnesota and Wisconsin have a very large lead in the production of white pine. Pennsylvania, Wisconsin and Michigan are the chief hemlock states, while the production of oak is spread with some evenness over 11 states, and is found on a lesser scale in 26 others. Kentucky being the chief producer, with West Virginia next and Tennessee third. About a third of the entire production of spruce comes from Maine, with Washington a poor second and New York third. In New York, however, the figure given is for the year 1905, as the totals for 1906 are not yet available.

Looking at these summaries in another way, it is seen that Washington is a great producer of Douglas fir, spruce, cedar and yellow pine. Louisiana is the most important single producer of yellow pine and also much the largest producer of cypress. Wisconsin contributes white pine, hemlock, basswood, birch and a number of other lesser cuts; Mississippi, yellow pine, oak, red-gum and cottonwood; Minnesota, white pine, almost to the exclusion of other woods, but with some spruce and tamarack. Yellow pine furnishes almost the entire production of Texas, although some oak is manufactured, while California divides her cut between redwood, yellow pine, Douglas fir, oak, sugar pine, white fir and a number of other woods of less importance, and easily leads all other states in this relative diversity of production.

Yellow pine is now produced by 38 states and territories, and is the most widely produced lumber of all. Oak comes next and is manufactured in 37 states and territories; ash in 35; elm in 32, and white pine in 30, specifically enumerated, but the manufacture of ash and elm is of comparatively little importance, the total for both woods being 421,140 thousand feet. Hemlock, maple, spruce, poplar, basswood, cottonwood, beech and hickory are also cut almost all over the country, while redwood, the production of which is almost equal to the combined production of elm, ash and beech, is cut only in California. Sugar pine is cut in only two states, California and Oregon; tamarack in three, Michigan, Minnesota and Wisconsin; white fir in eight, and Douglas fir in ten.

The Consolidated Steamship Lines.

The routes of the various companies controlled by Charles W. Morse and his associates, and united as the Consolidated Steamship Lines, are shown on the accompanying map. It will be seen that they cover all the important Atlantic ports and the three most important Gulf ports, besides reaching the two largest ports of



The Consolidated Steamship Lines.

Mexico, Yucatan, Cuba, Santo Domingo, Porto Rico, and the Bahamas. The principal coastwise lines not included in the consolidation are the Old Dominion Line from New York to Norfolk, Va., the majority of whose stock is understood to be controlled jointly by the Southern Railway, Seaboard Air Line, Atlantic Coast Line, Norfolk & Western and Chesapeake & Ohio; the Ocean Steamship Company of Savannah (Savannah Line) from Boston and New York to Savannah, Ga., owned by the Central Railroad of Georgia; the Morgan

Line from New York to New Orleans and Galveston, owned by the Southern Pacific, the Merchants & Miners' Transportation Company, understood to be held, with the Boston & Philadelphia Steamship Company, whose property it operates, as a watch dog to prevent undue competition by the Morse interests with the New Haven road, and the Maine Steamship Co., formerly an independent line from New York to Portland, Me., but now presumably controlled by the New Haven road also. The Merchants' & Miners' services are between Boston, Norfolk, Newport News and Baltimore; Providence, Norfolk, Newport News and Baltimore; Norfolk, Newport News and Baltimore; Savannah and Baltimore; Savannah and Philadelphia; Boston and Philadelphia; Philadelphia, Fall River and Providence, and Savannah and Norfolk, and the company operates a fleet of 24 vessels. The Old Dominion fleet consists of five seagoing vessels, with an aggregate tonnage of 19,700, and nine river steamers. The Savannah Line has ten vessels, with an aggregate gross tonnage of 42,235; the Morgan Line has 19 seagoing vessels with an aggregate of 45,377 tons, approximately, and the Maine Steamship Company has three ships, aggregating somewhat above 8,000 tons, in addition to two sound steamers running on the newly affiliated Neptune Line.

In addition to these well-established concerns, the Brunswick Steamship Company has recently established an independent service between New York and Brunswick, Ga., with four 3,000-ton ships, and another ship is building. In the off-shore service, to which the Cuba and Porto Rico lines of the Consolidated Steamship Company belong, there exists the enormous independent fleet of the United Fruit Company, and subsidiary carrying lines; the Red D Line, the Munson Line, and several other concerns. It must not for a moment be assumed, therefore, that the Consolidated lines have a monopoly of coastwise traffic, although they operate something like half of the coastwise tonnage which is under the American flag.

The routes covered by the companies owned and operated by the Consolidated Steamship Lines are as follow:

Mallory Steamship Co.—*Texas Division*—Between New York and Galveston, Tex., via Key West, Fla.
Mobile Division—Between New York and Mobile, Ala., via Brunswick, Ga.

Hudson Navigation Co.—*People's Line*—On Hudson River between New York and Albany.

Citizen's Steamboat Co.—*Citizen's Line*—On Hudson River between New York and Troy.

Clyde Steamship Co.—*New York Division*—Between New York, Charleston, S. C., and Jacksonville, Fla. Between New York, Wilmington, N. C., and Georgetown, S. C.
Boston Division—Between Boston, Charleston, S. C., Brunswick, Ga., and Jacksonville, Fla.; freight only.
Philadelphia Division—Between New York and Philadelphia; freight only.

The Yale; Metropolitan Line.

Between Philadelphia, Norfolk, Portsmouth and Newport News, Va.
West India Division—Between New York, Turk's Island, Monte Cristy, Puerto Plata, Samana, Sanchez, Marcoris, Santo Domingo City and Azua.
St. Johns River Division—Between Jacksonville and Sanford, stopping at Palatka, De Land, Astor, Enterprise, and intermediate landings.

Eastern Steamship Co.—*Portland Division*—Between Boston and Portland.
Kennebec Division.—Between Boston and Augusta, Me., via Bath, Richmond, Gardiner and Hallowell.
Bangor Division—Between Boston and Bangor via Rockland, Camden, Belfast, Bucksport and Winterport.
Portland, Rockland & Machias Division—Between Portland and Rockland via Boothbay Harbor and other intermediate landings.
Boothbay Division—Between Bath and Boothbay, Pemaquid and various points on Sheepscot Bay.
Mount Desert and Blue Hill Division—Between Rockland and Bar Harbor landing at various points on Penobscot Bay.
International Division—Between Boston and St. John, N. B., via Portland, Lubec and Eastport. Also between Boston and St. John direct.

Metropolitan Steamship Co.—*Direct All-Water Route*—Via Long Island Sound and the Atlantic Ocean between New York and Boston; formerly freight only; passenger turbines added.

New York and Cuba Mail Steamship Co. (Ward Line).—Cuba Division—Between New York and Havana; and New York and Cienfuegos.
Mexico Division—Between New York and Vera Cruz; and New York and Tampico.

The New York and Porto Rico Steamship Co.—*New York Division*—Between New York and San Juan, P. R., between New York and Mayaguez and between New York and Ponce.
New Orleans Division—Between New Orleans and San Juan, P. R.
Porto Rico Island Division.—Between San Juan and Arecibo, Aguadilla,

The Havana; Ward Line.

Mayaguez, Guanica, Ponce, Jobos (Aguirre), Arcoyo, Humacao, Port Mulas (Viegues Islands), and Fjardo.

The following table gives in statute miles the length of the various routes:

Mileage of Consolidated Steamship Lines.

	Statute miles.		Statute miles.
MALLORY LINES:		International Division.. 351	
Texas Division.....2,225			1,223
Mobile Division 1,920		METROPOLITAN LINE:	
Georgia Division 914		New York and Boston.....	322
	5,059	WARD LINES:	
HUDSON RIVER LINES:		New York—Havana ...1,196	
People's Line 143		New York—Cienfuegos..1,640	
Citizen's Line 149		New York—Vera Cruz..1,978	
	292	New York—Tampico...2,009	
CLYDE LINES:			6,823
New York Division 1,420		PORTO RICO LINES:	
Boston Division 1,068		New York:	
Philadelphia Division .. 475		To San Juan, P.R....1,380	
West India Division....1,900		To Mayaguez direct..1,382	
St. Johns River Div.... 175		To Ponce direct 1,440	
	5,038	New Orleans—San Juan1,420	
EASTERN STEAMSHIP LINES:		Bet. various ports on Porto Rico Island .. 286	
Portland Division..... 110		Humacao—Port Mulas* 18	
Kennebec Division 150		Port Mulas—Fjardo... 18	
Bangor Division..... 234			5,944
Portland-Rockland Div. 167			
Boothbay Division.... 25		Total mileage 24,701	
Mt. Desert and Blue Hill Division 185			

*Viegues Islands.

The vessels owned by the Consolidated Steamship Lines are summed up in the following table:

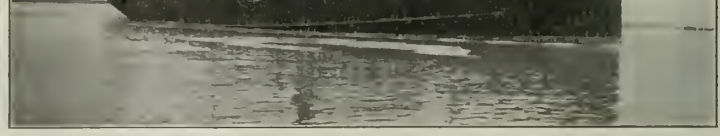
Steamships and Steamboats Owned by the Consolidated Steamship Lines.

	No. of vessels.	Gross tonnage.*
New York & Cuba Mail Steamship Co., (Ward Line)....	24	76,634
Clyde Steamship Company.....	25	55,145
New York & Porto Rico Steamship Company.....	12	32,618
Mallory Steamship Company	12	45,014
Eastern Steamship Company	19	23,542
Metropolitan Steamship Co.	6	18,103
People's Line (Hudson Navigation Company).....	4	7,951
Citizen's Line (Citizen's Steamboat Company).....	4	3,938
Total	106	262,945

*Gross tonnages in this table as supplied by the company; not checked.

The largest of these ships are the "Saratoga" and "Havana," of the Ward Line; 6,400 tons gross, twin screw, built in 1907 and 1906, respectively. The "Brazos," building for the Mallory Line, is to be above 6,000 tons; the "San Jacinto" is 6,096 tons, and the "Denver" 4,539. In the entire fleet controlled there are six vessels with a gross tonnage of 5,000 or larger. These represent a very great increase in size and speed from the characteristic coastwise vessel built before the Spanish war. The opening up of Cuban and Porto Rican trade since 1898 has been noteworthy, and the existing fleets engaged in traffic with these islands bear witness to it. An elaborate study of American coastwise development was printed in the *Railroad Gazette*, Aug. 15, 1902, in which it was shown that in 1892 there was only one steamer of 4,000 tons in regular coastwise service between United States ports, while the typical ship of the period had a gross tonnage rather under than over 3,000. The 3,000-ton ship still prevails on the coast, but the Morgan Line now has three 6,000-ton ships, two 4,800-ton ships and eight 4,600-ton ships, and the present tendency is to build boats of about 6,000 tons for the best services.

Next to the Morgan Line, the most important line on the coast is the Ward (if we except the group of lines forming the United Fruit tonnage), and this is the principal Consolidated holding. The Clyde, Mallory and Metropolitan lines have been prominent on the coast for a great many years, and Clyde's "John S. McKim," built in 1844, was one of the pioneers of steam coastwise service in this country. As is well known, the new 23-knot triple-screw turbine steamers "Yale" and "Harvard" have recently been added to the Metropolitan fleet. They are the fastest merchant vessels under the American flag, and maintain a 15-hour all-water service between New York and Boston. It is unfortunate that the new owners of these properties should have found it necessary first to load up the original lines with new capital and then issue a sufficient amount of collateral trust bonds and Consolidated Steamship stock to exchange for the values thus created. As a result of the first part of this process, the vessels are capitalized at the enormous total figure of $326.48 per ton, and this figure is obtained by taking the sum of the underlying capitals only. The holding company capital would work out at a much higher figure, which scarcely needs to be discussed. By comparison, it may be noted that the fleet of the Royal Mail Steam Packet Co. (179,668 tons) is capitalized at the rate of $54.29 per ton, approximately, and the Union Castle Mail Steamship Co. (260,634 tons) at $49.77.



The San Jacinto; Mallory Line.

African Railroads in Algeria and Tunis.

The question of routes for communication in Algeria was one of the most difficult to meet during the period of the French conquest. In 1830 it was reported that there was not a single road, for it is well known that the routes of travel used by the Arabs were hardly wide enough for a single horseman. The first roads were, therefore, built by military authority, while the first railroad program for Algeria was not drawn up until 1857, and then it was by a decree issued in accordance with a proposition from Marshal Vaillant. Three years afterwards the work was begun and in 1862 the line from Algiers to Blida was opened for traffic. This was followed by the construction of the other lines that now form the system of the Mediterranean colonies of France.

The topography and character of the soil control the location of the railroads. Algerian commerce is one that is dependent, for the most part, on agriculture, to which should be added an extract industry that is still in the early stages of its development. So that the productive zone of the Tell has developed in a strip of variable width, lying along the coast from east to west. Although the sea affords an excellent highway along this strip and the coasting traffic has developed the cities of the litoral and kept them in communication with each other, it is, nevertheless, important that they should be placed in communication with the valleys and plains lying back of them in this region. Hence the project of a railroad nearly parallel to the coast from the Tunisian frontier to that of Morocco, a project which has been enlarged since 1881 by the extension of the line to Tunis about 985 miles from Goulette-Tunis to Tlemcen. Some of the valleys, which unfortunately do not run into each other, have indicated in advance the general line of the road, and have served, in a way, to partially facilitate building it. Such valleys are those of the Medjerda, Seybouse, the West Sahel and Chelif, so that the road cannot be strictly parallel to the coast. It was also turned aside by the massive mountains of Kroumirie, Babor and Djurdjura. In short, the road is not parallel to the coast for the same reasons that the lines from Marseilles to Toulon and from Port-Vendres to Barcelona are not.

In the second place, each of these plains or valleys along the maritime region must be approached through its port, which, at the same time, has his own supply business and its own commercial output to attend to, from which it follows that lines have been built at right angles to the coast from Guelma to Bone by the valley of the Seybouse, 34 miles; from Constantine to Philippeville, 54 miles; from Beni-Mansour to Bougie by the West Sahel, 55 miles; from Tiaret and Relizane to Mostaganem by the valley of Demena, 125 miles, and from Perregaux to Arzeu from Ain-Temouchent to Oran, 43 miles. We may add the local line from Oran to Arzeu, 27 miles, and the roads from Tizi to Ouzou, 33 miles; from Blida to Berrouaghia, 51 miles, and from Bone to St. Charles, 62 miles. These roads serve the richest region in the whole colony. They obtain traffic from cerials, fruits, grain, wine and some mineral products, such as the phosphates of Tebessa. There is also a large passenger traffic.

But though the elevated high lands are in a way less richly endowed with natural resources it is nevertheless worth while to give that territory the advantages of convenient means of transportation for the sake of the alfalfa territory on the south side of Saida and the palm groves of Biskra. The high plateaus on the extreme southern side of Algeria, especially those of the southwest, have, throughout all times, been inhabited by a population that was

the least submissive of any in the colony. There has been, therefore, a political and strategic interest in giving to the corps of occupation a means of rapid communication with this less pacific and more suspicious section of the country. Hence, beyond the high lands it has been profitable to unite the region of the Tell with the oasis of the Algerian Sahara, Figuig, El Goléa, Ghardaia, Ouargla and Touggourt, where the date plants are marvelously developed, and where the traditional carpet industry still occupies several thousand artisans. By the lines which it has been proposed to build it is finally expected to enrich the Mediterranean ports with the commerce of the caravans from the desert and from the Soudan, and it is believed that by attracting traffic from the Trans-Sahara by way of Figuig, Morocco can be held under French influence. It is for these reasons that these lines penetrating into the interior have been undertaken. Into the department of Constantine three lines have been built, one towards Tedessa, 79 miles, on the Tunisian frontier and the center of the flourishing phosphate industry, whose products, thanks to the railroad, find an outlet at Bone. A second towards Ain-Beida, 58 miles, and a third towarda Biskra, 125 miles, bringing an important passenger traffic into this city, which is a source of revenue for it, and is also a valuable means for exploiting the palm industries of the Rir. The Biskra line is now to be extended to Ouargla. On the west, however, principal line of penetration is that which pushes in from Aezeu-Perregaux to Saida and Ain-Sefra. This was finished in 1887 and serves for exploitation of the alfalfa products of the high lands of South Orania, while its strategic and political importance seem now to have exceeded its commerce since the Oases of Touat and Tidikelt were occupied in 1900, and especially since the recent operations against Figuig and the difficulties that have arisen in Morocco.

In addition to this, the line has been still further extended towards the south since 1900. In 1901 it ran as far as Duveyrier; in 1902 to Beni-Ounif, at the gates of Figuig, 397 miles from the Mediterranean, creating a true center of population and of commerce. On the 16th of last October the Minister of the Interior, M. E. Etienne, opened the last extension to Beehar. An old project was to run the line to Igli, but French political interest is evidently pushing on the rails on to Kenadsa and probably beyond.

A prolongation of the Grand Central Road from Tunis to Tlemcen on towards Morocco is also being built, and a law of the 29th of December, 1903, authorized the building of a trunk line from Tlemcen to Lalla-Marnia on the Morocco frontier, whence it can be extended at any time still further west towards Fez, Mequinez and the Atlantic. It will thus serve as an efficient means for the pacific entrance into Morocco.

Finally, the two lines which were recognized in 1900 to be of great public advantage, namely, that from Ain-Mokra to Jemmapes, 40 miles; and that from Ain-Beida to Henchela, 30 miles, have been finished. The influence of the Algerian system is quite manifest, and for a long time there has been a general demand for a real connection between Ain-Beida and Tebessa and between Biskra and Ouargia; between Setif and Bougie, Tenes and Orleansville, as well as double track for the Grand Central over the Boura-Aumale-Affreville, which has a length of about 150 miles from east to west. The main system of railroads in the Mediterranean colonies takes no account of this lack. For a comparatively small sum the existing roads, which are about 1,900 miles long, could be extended so as to make connections with each other, such as the Paris, Lyons & Mediterranean, the Eastern Algerian, Western Algerian, the line from Bone to Guelma and the State Railroad. The multiplicity of the companies increases the general expenses and prevents the undertaking of large projects, and frequently leads to a false spirit of jealousy between them. For example, Philippeville has for a long time complained that by means of reduced rates the Eastern Algerian has drawn off the traffic which naturally belongs to it to Algiers or Bougie, and it is only recently that the company has begun to make through rates and run connecting trains. As all the roads do not have the same gage, it follows that there must be frequent transferring of passengers and trans-shipment of freight, which are unceasing causes of delay and expense. This is due to the fact that the first Algerian lines were built at a time when the narrow gage system was not contemplated at all, and when they wished to give the colony a system based on the large metropolitan roads of the more thickly inhabited countries. The Grand Central Railway was built with a gage of 4 ft. 8½ in. and should be finished throughout with the same gage. Recently the spurs which make direct connection with it have been built to that gage.

With the exception of the one from Biskra, all of these branch lines have the standard gage. The others that penetrate into the interior, which were built after the Grand Central, have profited by the experiences with the narrow gage, and have, for the most part, been built with a narrower gage, that is, from 3 ft. 3⅜ in. to 3 ft. 5 in., by which greater economy in rapidity of construction has been obtained.

Finally, all the railroads, which are given a certain annual subsidy by the state, under the form of guaranteed interest, have a natural tendency, although it is not in accord with public welfare, to obtain these subventions in construction rather than by an improvement of their service. Consequently they have failed to agree to any lowering of rates and improving of rolling stock. A minimum amount of income is quite sufficient for them and they expend it to-day in attempting to exploit new enterprises rather than to increase their current revenue.

A portion of these shortcomings will be very slow in disappearing. The law of December 19, 1900, gave Algeria a separate civil service and budget, and it reserved for the general government the right to purchase the existing lines, to modify their constitution and to extend them. The recent trip into Algeria of M. Gouthier, Minister of Public Works of the former cabinet, seems to have had for its object a study, on the spot, of these serious questions. On the 30th of May, 1906, a plenary assembly of the financial delegations decided upon the proposition of the government to purchase the East Algerian Railway and have it exploited by the colony.

The Tunisian railroad system, although connected with that of Algeria and forming a part of it, has fewer defects. As in Algeria, the main line in Tunis has a number of important branches. The large military port of Bizerte has been connected with Tunis, 73 miles, and from Tunis itself lines have been built out towards Zaghouan, 53 miles; Hammamet-Sousse-Kairouan, 129 miles, and Moknine, 30 miles from Sousse. All of these lines have been built by the same company, namely that of Bone-Guelma. The branch line from Bizerte, which runs along the coast and connects directly with the Grand Central, is the only one which has a gage of 4 ft. 8½ in.; the others have a gage of 1 ft. 3⅜ in., or one meter.

Further south, Sfax, which, in 1897, was opened as a deep-water port, has been connected with Gafsa and Metlaoui, 151 miles, by the Gafsa Phosphate Company which, in a few months, and without any assistance from the state, has built the whole line; this road will also be of meter gage, and is one of the finest industrial enterprises in the whole regency. Finally, as authorized by the law of April 30, 1902, the Tunis government has borrowed $8,000,000 for the extension of its railroad lines, and is now either building or has in contemplation lines between Bizerte and Nefzas, Tunis-Pont-du-Fahs and Kef, the same point, and Kalaa-es-Senam, in order to reach the rich region of Moktai, Kairouan and Sbiba, and, by a prolongation of the Sousse-Kaironan and the Sousse-Sfax lines, to connect the southern line between Sfax and Gafsa with the Tunisian system. A trunk line, which will be of strategic importance, will also connect the road leading to Nefzas and Bizerte with the trunk line of the Medjerda and Algeria. It is interesting to note that the greater portion of these new Algerian or Tunisian lines owe their existence to the discovery of rich mineral deposits. There is also a striking proof of the development of the extract industry in the Barbary states, which were, up to this time, exclusively agricultural. In Tunis there was the prospect of the mines south of the Sfax-Gafsa lines that were considered before the high plains and plateaux at the center had developed their value to any extent. The Kalaa-es-Senam line was built because they wished to exploit a new phosphate deposit which had been discovered in the Moktan region. The Nefzas line is intended for the transportation of the minerals along that road. This economical transformation of the colonies has its counterpart in the development of the ports; Bougie, and especially Bone, which the fortunes of Algeria and Oran have eclipsed, are now taking on a new lease of life, and the Nefzas mineral resources have given to Bizerte the essential conditions of a prosperous port and an attractive point for a heavy tonnage. The future of Bizerte as a coal depot depends upon this road.—*Moniteur Industriel.*

Twenty-fifth Anniversary of the Abt Rack-Road.

In the early part of August was celebrated the twenty-fifth anniversary of the Abt rack-road system of traction. Twenty-five years ago the Harz mountains were suffering from the lack of railroad facilities to transport to market their store of timber, building stone, lime and ore. The examination of the various economic problems connected with building a railroad into the heart of the mountains was intrusted to Albert Schneider, manager of the Halberstadt-Blankenburg Railroad. After careful examination he recommended building a standard gage, thus providing for free interchange of cars at all junctions. He insisted on the superior advantages of the standard as compared with the narrow gage, subsequent results bearing out the correctness of his position, and proving that in following his recommendation no mistake was made.

The serious problem that confronted Mr. Schneider was to build a standard gage road without too great a length of line. For its solution Mr. Schneider turned to Roman Abt, who had been associated for many years with Riggenbach, the inventor of the ladder rack. To meet the requirements of the Harz railroad, Abt designed the rack-road that bears his name, and a locomotive for combined adhesion and rack traction, a system of construction that has since found application in all parts of the globe.

On Aug. 1, at a reception to Mr. Abt at the home of Privy Councellor Schneider in Harzburg, the latter presented to Mr. Abt, now

President of the Gotthard Railroad, a cup, a beautiful sample of the goldsmith's art, the cover of which bore an image of St. Christopher, thus typifying that Roman Abt had, by his invention, carried him and his project across difficulties to success. Excursions over the road were followed by a banquet at Blankenburg at which the mayor announced that the city authorities had named a street in honor of Roman Abt.

Recent State Railroad Legislation.*

The past year bears many resemblances to the period of the Granger agitation. Railroad legislation by the states, however, has been far more widespread. Not only the states in the central and far West but those in the supposedly more conservative Atlantic seaboard region have taken a large part in passing railroad laws. In their number and in the wide range of subjects with which they deal, if not in their severity, the laws affecting railroads passed at the recent sessions of the state legislatures are entirely unprecedented. It has been calculated that the number of such laws passed within the last year is about three hundred. Ten state legislatures alone at their recent sessions passed 177 different laws affecting railroads.

The legislation deals with almost every department and innumerable details of railroad operation and management; from reduction of passenger fares to dusting of passengers cars; from establishing railroad commissions more powerful than any ever before created to requiring railroads to run only eight-wheel cabooses.

Twenty states have passed laws reducing passenger fares, this last not including Ohio, which reduced passenger fares to two cents a mile in the spring of 1906. Arkansas, Georgia, Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Nebraska, Oklahoma, Pennsylvania, Virginia, West Virginia and Wisconsin have fixed passenger rates at two cents a mile, though certain of these have slight exceptions to this requirement, such as providing that small railroads may charge more. The governor of Kansas has recently intimated that he will call a special session of the legislature unless the Railroad Commission acts to secure a two-cent fare. North Carolina has established 2¼ cents a mile as the legal rate on roads 60 miles long or over; Alabama, 2½ cents a mile on roads over 100 miles long. In South Dakota the Railroad Commission has been ordered to make a valuation of the road, and then proceed to establish rates at not over 2½ cents a mile. It is to be observed that such reductions have been made, not on the basis of density of population or of travel, but indiscriminately; in the West and South, as well as in the thickly populated states of the eastern seaboard.

Freight rates have been reduced by the legislatures of Alabama, Michigan, Minnesota, Missouri, Nebraska, Nevada, North Carolina and, through the Railroad Commission, in Georgia, Iowa, Kansas and Texas. Iowa has also made an appropriation for an investigation of freight rates, under which if an interstate rate is lower than an Iowa rate, the latter will be considered prima facie unreasonable—this in face of the generally higher expense of handling local than through traffic.

Next in importance to these rate reductions are the so-called "reciprocal demurrage" laws, which provide that a railroad which does not furnish cars when demanded by a shipper must pay a penalty for each day that the cars are not available. Such laws have been passed in Alabama, Colorado, Indiana, Kansas, Minnesota, Missouri, Oregon, South Dakota, Texas, Vermont and Washington.

Another set of laws which, though often entirely justified, bear heavily on the operating expenses of railroads, are those limiting or regulating the working hours of employees. Such have been passed in Connecticut, Indiana, Kansas, Maryland, Minnesota, Missouri, Montana, Nebraska, New York, North Carolina, South Dakota, Texas and West Virginia. In many cases they will involve rearrangement of the operating divisions, sometimes with consequent changes and abandonment of facilities already in existence.

Laws of the same general class, though usually dictated by the labor unions rather than by necessity, are those fixing the minimum number of men to be employed in a train crew, which has been prescribed by law in Arkansas, Indiana, Kansas, Texas and South Dakota. A set of enactments also tending to raise the cost of railroad operation, are those extending the railroad's liability as an employer for accidents to employees, due to negligence of fellow-employees or in part to contributory negligence by the injured party. The employer's liability has been broadened in Iowa, Kansas, Michigan, Nebraska, Oklahoma, Pennsylvania, South Dakota and Wisconsin. There are also two states, Indiana and Minnesota, in addition to Massachusetts, which has had such a law for about a year, in which the use of the block system is now compulsory on the order of the Railroad Commission.

Many new railroad commissions have been established, most of which are "strong," that is, have the power to make rates. Alabama is to have a commission of three members, elected by popular vote. Colorado's new commission of three members was to have taken office on June 10, but the commissioners have been enjoined from exercising their functions. In Michigan, there are to be three commissioners, instead of one. Montana, Nebraska, Nevada, New Jersey and Pennsylvania have established railroad commissions. The New Jersey and Pennsylvania commissions do not have the rate-making power. In Arkansas and Iowa the powers of the existing commissions have been greatly enlarged. New York leads all the states in the strength of its new commissions. The New York commissions, in fact, mark a distinct step in advance in the regulation of railroad corporations.

These general groups cover the most important of the new railroad measures. Besides, there are a great number of other miscellaneous provisions affecting railroads. Fair distribution of freight cars under heavy penalties; the building of private sidings; the establishment of joint passenger stations at the intersection of two or more lines; the recording and investigation of railroad accidents; payment for confiscation of coal for railroad use; the registration of railroad lobbyists; the use of safety appliances; the placing of telephone pay stations in railroad stations; the improvement of train rules; the blocking of frogs and switches, and the use of electric headlights, are all required by one or more of the new laws. Still others prohibit a railroad from transporting its own products or manufactures except for its own use; require railroads to be fenced on both sides; fix the minimum age of night telegraph operators and towermen; bring express companies and private car lines under the power of the railroad commission; increase (in six states) the taxation of railroads, and require the carrying of passengers on freight trains. In Kansas any railroad officer or employee failing to do this last is liable to imprisonment as well as fine. Vermont has made any train employee found intoxicated liable to imprisonment for one year, besides subjecting a railroad company to $3,000 fine for employing trainmen known to have drinking habits. These are merely instances of the miscellaneous laws on railroad subjects. Some of them are obviously in the direction of a better standard of railroad operations; some of them are meddlesome and unjust.

In spite of the fact that many of the most important of the new laws are and for some time will be under determination by the courts, it is possible in the large to reckon the causes and results of this great anti-railroad legislative sweep. There is no doubt that there was much justification for it. By discriminating contracts, by selfishly influencing legislation, by petty but obnoxious regulations, and by arbitrary exercise of power, the railroads as a class—there were, of course, striking and satisfactory exceptions—laid up for themselves a store of pent-up hostility whose flood-gates have of late been thrown open. This hostility was increased by ignorance of railroad problems.

As with all too long delayed reforms, the pendulum swings too far. There is no doubt that many of the railroad laws recently passed are most unjust. They will hurt the railroads and eventually and in consequence the communities which adopted them. They have already resulted in abandonment of many railroad improvements. It will take time to get rid of the dross in the new legislation—the politics, the demagogery and the injustice; but there should remain from the refining process, the gold—higher standards of railroad operation, a franker relation between railroads and the public, and the elimination of the railroads from politics. Added to this will be the contingent advantages of the wisdom brought by the widespread investigation of rate problems under court direction and the knowledge gained from experiment and experience in railroad regulation.

This is the bright side of the anti-railroad legislation of the past year. Most of it, whether justified or not, is severe in its effect on the net earings of railroads; much of it, unjust; yet as its result there should come a period of fairer dealing and better understanding between the railroads, their patrons and the State.

*From an article in the *Boston Evening Transcript* by Hugh Rankin, Associate Editor of the *Railroad Gazette*.

Foreign Railroad Notes.

The Pilgrims' Railroad to Mecca has now more than 500 miles of track laid. There are 1,000 miles more to build to reach Mecca.

An official investigation of conduct of traffic on the part of the Siberian Railroad east of Lake Baikal, made for the Minister of Railroads, has brought to light an astonishing condition of things. Enormous quantities of freight have been delivered to persons to whom it was not consigned, and in many cases the actual consignees have recovered for the loss of the freight which it was pretended had not arrived. This has been going on since 1904, and the total loss is said to amount to the incredible sum of $5,000,000. The discovery, after all, was made by accident. A policeman fished out of the Angara river a bundle of documents, which turned out to be a report of a previous inspector, which some interested party had stolen, and, as he supposed, made away with.

GENERAL NEWS SECTION

NOTES.

Suit will be begun in the courts by the Green Bay & Western Railway to test the two-cent passenger law passed by the last Wisconsin legislature.

On Sunday, September 29, the number of freight cars passing Lewistown Junction, Pa., on the Middle division of the Pennsylvania Railroad, was 8,630, or nearly 600 cars more than the best previous day's record.

Dwight C. Morgan who, with 20 engineers to assist him, has been engaged for a year and a half in making a valuation of railroads in Minnesota, announces that the results will probably be known within a year.

A member of the State Railroad Commission of Washington is in St. Paul, Minnesota, to arrange for a conference of the commissioners of the states through which run the railroads between St. Paul and the Pacific coast, with a view to considering uniform action on freight rates.

At San Francisco, September 27, the Grand Jury in the Federal court returned indictments against the Southern Pacific Company and the Pacific Mail Steamship Company for violation of the Interstate Commerce law in making discriminatory rates on freight from Asia to Chicago and New York.

Press despatches from Toledo, September 28, report a strike of railroad clerks in that city which is said to have been participated in by about 400 men. The roads named are the Wheeling & Lake Erie, the Toledo, St. Louis & Western, the Ohio Central, the Hocking Valley, the Michigan Central and the Pere Marquette.

The railroads of Nebraska failed in their effort to secure from the Federal court an injunction restraining the officers of the state from enforcing the reductions in rates recently ordered, but the counsel of one of the companies says that the roads will continue their efforts to secure a judicial decision on the validity of the laws.

The New York Central has taken off 10 trains from the Yonkers branch of the Putnam division and has reduced the number of cars in many of the trains which are still running. These trains are run to accommodate the local traffic between Yonkers and New York city, and it is said that this traffic over this line has fallen off.

The Missouri Pacific, answering a suit of the Attorney-General of Missouri, declares that ownership by the company in coal mining companies and an elevator company are necessary to the proper conduct of the business of the road; that is to say, necessary for a regular supply of fuel and for the proper accommodation of grain shippers.

The state railroad commissioners of Massachusetts have called upon the Boston & Albany to report, for the three weeks ending October 19, all passenger train delays of over 10 minutes, except those on runs of less than 25 miles. Business men of Boston and other cities have made many complaints of exasperating delays and long continued annoyances.

The Huntingdon & Broad Top Mountain, which originates a considerable quantity of coal for New England, has notified shippers that it will hereafter charge them $2.50 each on cars going to points on the New York, New Haven & Hartford. This, evidently, is a precautionary measure, to guard against loss by reason of difficulty in collecting car service from the New Haven road, which has withdrawn from the per-diem.

The Illinois Traction System, operating interurban electric roads in Central Illinois, is said to have abolished the use of oil lamps for tail signals on cars, and to have adopted instead electric lights, which are fed through storage batteries, thus insuring the continuity of the lights even if the power current should be cut off. This company has also adopted the use of red flags instead of green for the day-light tail signal.

Governor Comer, of Alabama, has written letters to all the members of the legislature of that state advising them that he is going to call a session about November 2. The Governor's principal object appears to be to secure compliance by the Louisville & Nashville and the Central of Georgia with the rate-laws recently enacted in Alabama, all of the other companies in the state having put the reduced rates in force.

The Duluth, South Shore & Atlantic Railroad hereafter will carry no baggage on passenger trains except travelers' proper belongings in the true sense of the term. Boxes of provisions, bags of potatoes, cans of oil and the like will be carried only by freight. The new order is to prevent the demoralization of the passenger service which has attended the transportation of hunters each fall for many years. With their bulky and awkward baggage it has been impossible to maintain schedule time.

On the Galveston, Harrisburg & San Antonio caution signs have been set up 500 ft. from every curve of 4 deg. or more for the purpose of warning engineers against running through the curve at excessive speed. These signals are set 7 ft. from the rail on the engineer's side, on posts. The blades are fish tailed and are painted yellow, while the supporting posts are painted white on the front, and the sides and back brown. First class trains are to reduce the speed to not more than 30 miles an hour, and all other trains to 18 miles an hour.

On September 25 the Attorney-General of the United States, acting on information gathered by the inspectors of the Interstate Commerce Commission, ordered the prosecution of 37 railroads for 287 violations of the safety appliance law. Besides a number of prominent railroads which have been prosecuted before, there are several small lines in the list, as, for example, the Chesapeake Beach, the Detroit & Toledo Shore Line, the Louisiana Western, the Nevada-California-Oregon, the St. Clair Tunnel Co., and the Williamsport & North Branch.

The steamer "Harvard," of the New York and Boston through line, reached New York on Monday afternoon last nine hours behind time, having been delayed that much in starting from Boston harbor on account of a high wind. According to one statement the wind was blowing 85 miles an hour. Some of the passengers demanded to be taken back to Boston, but the captain said that that could not be done. The steamer arrived in New York at about the time that she should have begun her eastward journey, and the eastward passengers had to wait about three hours before they could start.

The circulating "newspaper library" of the Southern Pacific, established some years ago for the benefit of the track-repair men and their families in the desert regions of Arizona and other parts of the Southwest, now has 200 distributing centers, to which 4,000 newspapers, magazines and books are supplied every week. The packages of papers are thrown off at the section houses, a distinctive whistle signal being given by the engine of the train which brings them. The distribution of the papers to the several families is in most cases managed by a woman, the section master's wife, we suppose.

During the present month the Railway Mail Service Department is to weigh all mails on all routes. Congress having made a special appropriation of $300,000 for this purpose, with a view to securing a more accurate basis of compensation than by the weighing at different times in different parts of the country, as has been the custom. It is also said that the Postmaster-General, supported by the President and the Attorney-General, has decided to count Sundays in the number of days used as a divisor in ascertaining the average weight per day; that is to say, the total quantity carried on a given route during a week of seven days is to be divided by seven to get the daily average, instead of being divided by six, as heretofore.

The new law of the state of New York, limiting the working hours of telegraph operators, went into effect on October 1 (the same date on which a similar law went into effect in several other states). A New York City reporter finds that several of the roads are unprepared to comply with the law, and the reason appears to be that competent telegraph operators are very scarce. Someone on the New York Central estimates that that company will have to increase its force by about 1,000 men. A press despatch from Poughkeepsie says that the New York Central has rescinded its order making a reduction of $2.50 or more a month in the wages of operators whose hours have been reduced from 12 to eight. It is said that 460 operators, presumably those who recently struck and left the service of the Western Union and Postal Telegraph companies, have left New York city to take situations in other places, and that 300 of these are now working for railroads. Forty of the strikers are now employed by wireless companies.

Cost of the Grand Trunk Pacific in Eastern Canada.

At the time the Grand Trunk Pacific Railway project was before Parliament four years ago, it was estimated that the eastern division from Moncton, N. B., west to Winnipeg, Man., 1,800 miles, would cost in the neighborhood of $100,000,000. But with the increased cost of labor and of material of all kinds it is probable that the outlay will be fully 25 per cent. more than was expected. Labor which was then available at $1.50 and $1.75 per day is now $2.25 and $2.50. Ties that were to be had in abundance a year or two

ago at 30 cents each, are now bringing 60 and 75 cents, while in some instances the contractors have been unable to obtain sufficient supplies at any price. Rails are dearer, food is more expensive, everything, in fact, that enters into the execution of this enterprise, is increasing in price.

A considerable part of the eastern division across Northern Ontario is through a region so remote as yet from existing railroads that construction would be very costly. To put parties in the field throughout the whole 1,800 miles from Moncton to Winnipeg would involve much greater outlays than the transcontinental commissioners feel justified in incurring.

The Railroad Regulation Movement.*

As a result of legislation already enacted, railroads are now subject to vastly more regulation and are conducted with far more publicity and are held to a far stricter accountability than any other form of capital or enterprise. There is no serious wrong which a railroad can do that is not susceptible of substantial correction, and generally such correction can be accomplished by public officers without expense to the individual. Therefore it would seem that all that is required is for the public authorities to enforce the numerous laws already in effect. Strange to say, however, the principal talk is about further railroad regulation.

Railroad regulation is the political field most easily cultivated and most fruitful in results to the politician. It is human nature to be distrustful and critical with respect to great wealth, and this distrustful and critical sentiment has generally settled especially on the railroad, for in most communities the railroad is the most tangible and obvious form of accumulated wealth.

But the political advantage of attacking the railroads is a commodity which is consumed in the using. The politician who scores by securing railroad regulation feels that to continue his success he must score again by securing still further railroad regulation. His rivals feel that they must find other ways to score in the same game so as to restore their prestige. Competition is said to be the life of trade, but competition among the politicians is proving almost the death of the railroad trade.

Striking illustration of the political competition in railroad regulation is shown by the unwillingness of Governors and legislators to leave the state commissions the administration of the subjects within the jurisdiction of the commissions. Apparently there is fear lest the commissioners get political credit which others are anxious to appropriate. Thus we find in states where the commissions have ample power to reduce rates and have the machinery for making thorough investigation to ascertain whether rate reductions are proper that the legislators, with the approval of the Governors, rush in to make reductions on their own account and without investigation. Governor Hughes' veto of the 2-cent rate bill in New York was a striking exception—an exception which proves the rule.

Passenger travel is a luxury to a much greater extent than is the transportation of freight. It is absolutely necessary for people to have fuel, and food and clothing, but it is rarely absolutely necessary for people to travel. Therefore, from the public standpoint, passenger rate reduction is even more unimportant than are freight rate reductions. Passenger business is far less profitable to the railroads than is the freight business. Therefore, from the railroad standpoint, passenger rate reduction is much more unjust than freight rate reduction. Yet passenger rate reduction is the form of rate legislation which has proved most popular with legislatures. The only explanation is that a reduction in passenger rates is more obvious to the voter and therefore has more political advantage.

For several years the railroads have been struggling to meet a demand for transportation which has increased far more rapidly than it has been possible to increase facilities. The most earnest and persistent efforts have been made to meet the demand; the difficulties have been enormous. Probably no class of persons in the country has been under such a severe and prolonged physical and mental strain as railroad officers and employees. My experience is that railroad officers have striven more faithfully than any other class in the country to comply with both the spirit and the letter of the laws regulating them.

Yet the railroads have had no credit for their efforts, or for what they have accomplished. The public has been talked into a remarkably hysterical frame of mind. It is generally accepted that the psychology of the crowd is a different thing from the psychology of the individual. If then we look at the public as a separate entity, we have the condition of a very nervous person who is beset by a multitude of physicians, each of whom is suggesting some different form of disease which the person has and some different sort of cure. We know the unfortunate results which always follow in the case of a nervous individual when he comes under the influence of even one physician who is an alarmist. We are beginning now to realize how a similar condition may exist with respect to the public as a whole with reference to the railroads.

Railroad companies, generally speaking, are earning less than a fair return on the value of their property. The Atchison, Topeka & Santa Fe in the year ended June 30, 1907, the most prosperous in its history, earned only 6½ per cent. on its total capitalization. The par value of its capital is not believed by its officers after a careful study of the problem to represent any more than the present value of its property. What other business in its most prosperous year would earn as small a percentage?

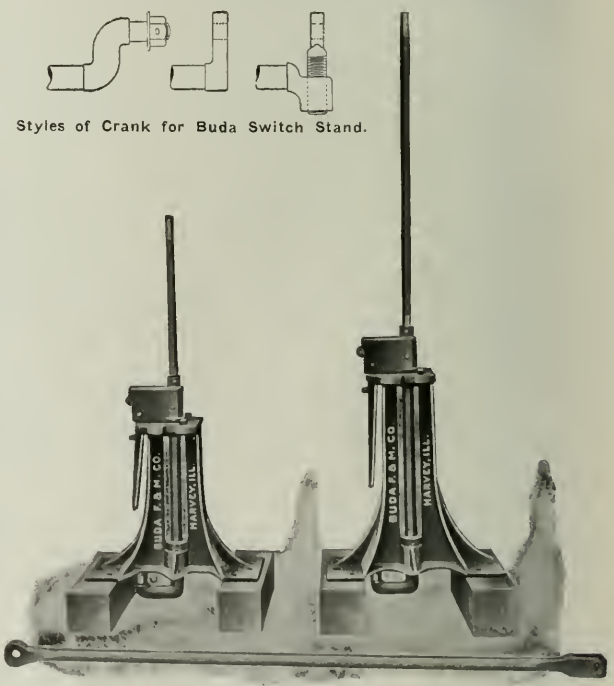
Railroad agitation will never cease as long as the politicians believe it is profitable. It will cease to be profitable when the public fully understands the present conditions and their consequences. We have heard in the past a great deal about undigested securities. We are now suffering from undigested railroad laws. Before passing more laws the Federal Government and the states ought to take time to understand and enforce the laws they have. If they do not, the ingenuity of politicians can forever suggest new laws to pass. In a word, I say to each of you as good citizens and in the public interest fully as much as in the railroad interest, do your best to discourage the professional maker of anti-railroad laws, and do your best to encourage the administrator of the laws already made to study the facts thoroughly and then enforce the laws accordingly. What the public needs is a fair investigation of the facts and intelligent enforcement of the laws already passed.

*Abstract of an address by Walker D. Hines, General Counsel of the Atchison, Topeka & Santa Fe, before the Traffic Club of New York.

A New Form of Switch Stand.

A new high and low form of switch stand has been added to the 50 or more styles which the Buda Foundry & Manufacturing Co., Chicago, makes. This form is built to meet the demand for a

Styles of Crank for Buda Switch Stand.



New Buda Switch Stand.

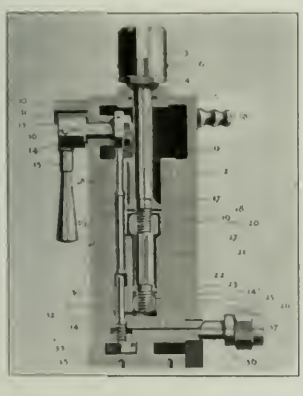
stand combining lightness and strength. The frame, the lever and the housing over the latter are malleable iron. The housing protects the lever against snow and ice, and also makes a convenient place for the switch lock. The mast and crank are wrought steel. The illustration shows the style having the crank of the turned-up toe form, with which it is impossible to remove the switch rod when the stand is locked. The rod can be taken off only when the stand is in an intermediate position. Other designs of cranks are provided, as shown in the small cut. The turned-up or turned-down toe has the switch rod shown with the stands. Where the stand has a horizontal rigid crank, or adjustable crank, as in the other designs, the connecting rod has a jaw at each end. By extending the crank below the base the use of a straight rod is permitted, which is considered an advantage. The stands may be had either two-way or three-way. The frame has no bolts, avoiding the possibility of its being tampered with.

Price's Automatic Stop.

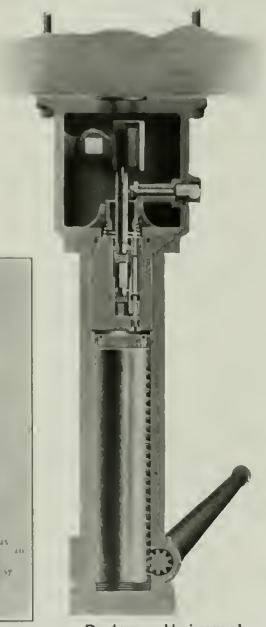
An automatic stop devised by Prof. H. W. Price, of Toronto University, is in experimental use on six miles of the Intercolonial Railway near Moncton, N. B., and two locomotives are equipped with the apparatus. There are no visual signals on this section of the road and the arrangement is essentially an apparatus for applying the air-brake, in case an engine overruns the point where it should stop. When the stop signal operates, it blows a whistle in the cab of the locomotive. The trial equipment is on single track and is controlled automatically, through track circuits, the same as visual automatic block signals.

The New Dudgeon Universal Jack and Hydraulic Pump.

The first hydraulic jack was patented by Richard Dudgeon in 1851. Improved forms were brought out by him in 1873 and 1884, and all of these types are still made. Recently a jack has been designed which embodies a number of new features intended to meet the demand for a compact light-weight jack, easily operated and controlled and combining great power with high speed. It has a double pump, which enables the ram to be run out under a light load with twice the speed of the single pump. Under a heavy load a quarter turn of the valve handle throws out the large pump and gives the action of a single pump jack. The special feature of this jack, however, is the assembling of all the valves in one valve chamber and the reduction of their number from the usual arrangement of three-pressure valves and two suction valves to one pressure valve and two suction valves, of which only one is used at a time.



Dudgeon Universal Force Pump.



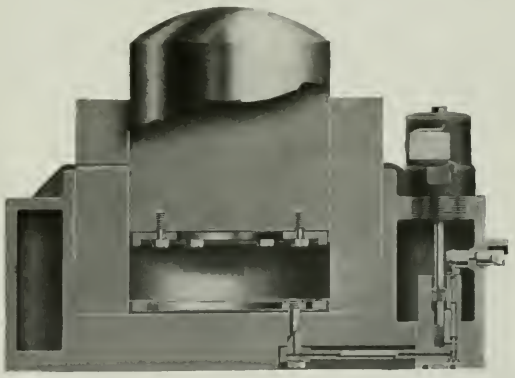
Dudgeon Universal Beam Jack.

The accompanying sectional view of a portable hydraulic force-pump shows all of the essential features which are embodied in the new types of jacks. The arrangement of valves and pumps is very similar, but in the jack the pump and valves are built inside of the movable ram, which is raised by discharging the fluid through the bottom of the ram into the cylinder. In the jacks the valves are controlled by the valve handle on the head by means of a spring-mounted push tube on which the valve cam bears.

As will be seen from the illustration the three valves are mounted in tandem, one over the other, in a single valve case on one side of the pump cylinder. The two top valves are suction valves and are free to move on or off their seats, while the single pressure valve at the bottom is normally closed by a spring. When the valve handle is turned to the left to a horizontal position all three valves are free to seat. This is the position for using both pumps. On the up stroke of the pump the liquid is drawn from the reservoir in the head past the two upper valves and into the upper and lower cylinders through the small ports at the bottom of these cylinders. On the down stroke the upper valve is seated, cutting off the supply reservoir and the liquid displaced by the two pump plungers flows past the two lower valves into the discharge passage. When only one pump is wanted the valve handle is turned vertically downward and the cam on the inner end of the valve handle shaft forces the upper valve off of its seat. The liquid in the upper cylinder churns back and forth past the upper valve, but the middle valve is still operative and prevents the return of the liquid from the small bottom pump. To release the pressure the handle is turned horizontally to the right, causing the cam to force all three valves off of their seats, which allows the liquid to flow back into the reservoir at the top. The reduction in pressure can be graduated to any required degree and can be instantly arrested by returning the valve handle to the vertical position. The pump illustrated weighs only 31 lbs. and is designed for working pressures up to 1,500 lbs. per square inch.

The only differences in the construction of the jacks is the addition of a push tube inside the ram surrounding the piston rod and resting on a stiff spiral spring on top of the cylinder. The top end of this tube bears against the valve handle cam and the lower end bears against the top valve spindle. A pin is also provided on the piston rod head which bears against the top end of the push tube when the pump handle is forced clear down. This allows the jack to be lowered in the usual way by the pump handle without turning the valve handle. The valve chamber, being on one side of the cylinder, is always submerged, and the jack can be used in a horizontal position with a full run-out equally as well as in a vertical position. The valves are easily removed by taking out the ram and unscrewing the bonnet under the pressure valve. If for any reason one or more of the valves should stick or obstructions lodge on the seats, they can be forced off by the valve handle and the pump operated by a few quick strokes. The liquid churning through the valves would then remove any obstruction or dirt on the seat.

Two special types of jacks made with this construction are also shown in the illustrations. One is a 500-ton ram and force-pump combined which was made for lowering to its seat a 500-ft. truss bridge which was floated into position. The other is a new type for straightening shafts or for use where a downward movement of the ram is required. The pump is mounted in the barrel between the ram and the reservoir and the ram is returned by a rack and pinion arrangement at the lower end of the casing. The reservoir flange is provided with bolt holes for attaching the jack to the bottom of the beam, as shown. A large number of other special types of jacks are made on this principle. Richard Dudgeon, 24 Columbia street, New York City, is the maker.



500-Ton Hydraulic Ram and Dudgeon Universal Force Pump Combined.

Freight Car Situation in the Northwest.

The following notes on the railroad situation in the Northwest are published in the newspapers as the conclusions of Interstate Commerce Commissioner F. K. Lane:

(1) The railroads have added to their equipment as many cars and engines as could be expected of them during the past year, and with few exceptions their equipment facilities are adequate, or would be if eastern roads would make reasonable prompt returns.

(2) In this respect the railroads of the Northwest have done better than those of most other sections. Great Northern has in the past 18 months increased its equipment facilities, for illustration, more than any other railroad with 6,000 miles of road, with the exception of Pennsylvania.

(3) The acute car congestion last winter was due to causes other than equipment supply to a much greater extent than is generally supposed.

(4) Last winter was the worst climatically within the memory of living operating officials. No precaution against such conditions is adequate.

(5) Traffic congestion has already begun and is now acute in Montana and on the coast.

(6) Congestion throughout the Northwest may be as severe as

a year ago for short periods, but the general situation will be better for the following reasons:

(a) Presumably a normal winter, or at least a less severe winter than last.

(b) More equipment and power and other facilities, including spurs, double track in spots, sidings, etc.

(c) The benefit of extraordinary efforts a year ago to meet an extraordinary situation, shippers as well as carriers having learned new tricks.

(d) Less traffic, the grain crop being smaller and many large industries curtailing output, to say nothing of the postponement of new enterprises.

(7) High prices for grain will cause a larger early rush of grain traffic than last fall, though somewhat later in starting, the crop season being late. This will support the volume of general traffic to the country until the first of the year, the purchasing power of farmers being fully equal to that of a year ago.

(8) A sharp decline in tonnage is expected early in the new year.

(9) There is danger of another fuel famine, but not as distressing as that of last winter.

(10) Lumber traffic on the coast is congested because it has outgrown the facilities of the Hill and Harriman lines and the mills cannot create an ingoing traffic in proportion to their output.

(11) Completion of the St. Paul's Pacific extension will afford only slight and temporary relief to the growing traffic of the Western country. All transcontinental lines will have to be double-tracked before very long.

(12) As an offset to the more favorable operating prospects than those of last year there are reciprocal demurrage and other restrictive provisions imposed on the railroads which will tend to aggravate a car congestion.

(13) The situation has been complicated by the unrest and inefficiency of labor and the exorbitant and sometimes unreasonable demands it makes on the railroads.

The territory which raised the most wheat last year is prairie country where snow storms and blizzards are most embarrassing to the railroads. The most prolific sections this season are in the valleys and on timbered areas where a rough winter does the least harm.

Adams Express Company Officers.

George F. Baker, President of the First National Bank of New York, has been elected a member of the board of managers of the Adams Express Company, succeeding Caleb S. Spencer, of Boston. The Board of Trustees, provided for in a recent vote by the shareholders, has been organized as follows: L. C. Weir, B. W. Rowe, Charles Steele, Dumont Clarke and G. F. Baker. William M. Barrett has been appointed Vice-President in charge of the Pennsylvania, New England and New York departments. Edward A. Taft has been appointed General Manager of the New England department, Henry E. Huff General Manager of the Pennsylvania department, G. D. Curtis General Manager of the Western department, and Joseph Zimmerman General Manager of the New York department, including the bureau of traffic and the bureau of tariffs.

Disastrous Collision Near Bellaire, Ohio.

In a butting collision between a passenger train and a freight on the Baltimore & Ohio at Shicks, Ohio, near Bellaire Junction, on September 28, seven passengers and two trainmen were killed and 15 persons were injured. The cause of the accident is given in the newspapers as the misplacement of a switch by an operator in a signal tower.

The Railroad Department of McGill University.

The department of railroads of McGill University, Montreal, is to broaden its work this year. V. I. Smart, who has been Signal Engineer and Assistant Engineer of Maintenance of Way of the Chicago & Eastern Illinois, is to have charge of the department of railroad engineering, including the theory and practice of location and construction, maintenance and operation. Signaling, a new course of instruction, is also to be established under Mr. Smart. The railroad department is to have a laboratory of its own in its new building. Clarence Morgan, formerly Treasurer of the Rutland Railroad, is the head of the department.

"Pay-as-You-Enter" Street Cars for Chicago.

The Chicago City Railway Company is having built, and expects to receive during October and November, 300 cars which will be arranged for testing the "pay-as-you-enter" feature, which originated, and is in general use, in Montreal. Should the results with these 300 cars justify the adoption of the scheme, the remainder of the company's standard equipment, comprising about 500 double-truck cars, will be adapted to this feature. This will require only lengthening the platforms and rearranging the doors. The entrance portion of the rear platform will accommodate 20 passengers, and it is hoped that this will be ample to avoid delay, even at busy corners. Overcrowding of cars is to be prevented by the conductor, who from his post on the rear platform will notify intending passengers to take the next car, when his is fully loaded.

TRADE CATALOGUES.

Signal Lamps and Lanterns.—Catalogue No. 120 of The Adams & Westlake Co., Chicago, presents recognized standards for signal lamps and lanterns made by this company. The large number of special styles also made, which meet the demand for patterns other than standard, are omitted from the catalogue. Beginning with an illustrated description of the "Adlake" non-sweating balanced-draft, the book covers the various kinds of lamps for steam and electric railroad use, telegraph train-order signals, lanterns, miscellaneous lamps, lamp parts and switch and signal box locks. All colored signals, lenses, etc., are printed in their appropriate colors. There is an appendix containing the signal rules of the Standard Code. The book is 6 x 9, bound in cloth, and has 200 pages.

Paint.—The National Paint Works, owned by Elliot & Cheesman, Williamsport, Pa., has published the seventh edition of "The Review of Technical Paints for Metal," by F. P. Cheesman. The pamphlet takes up various paint troubles and tells how to avoid them. It describes different kinds of paint and their advantages and disadvantages, and then discusses coating for reinforced concrete and cement and the methods of painting bridges, elevated railroad structures, power plants, steel cars, etc. Different paints made by the National Paint Works are then described in detail and instances given of the structures on which they have been used.

Ore Handling Cranes.—The Brown Hoisting Machinery Company, Cleveland, Ohio, has just issued a pamphlet on locomotive grab-bucket cranes for handling ore, coal, etc. The standard bucket supplied has a rated capacity of 24 cu. ft. of ore. The pamphlet is illustrated with scale drawings of the crane mounted on two bogie trucks and on a four-wheel rigid truck, and with half-tones of the crane in operation under various conditions showing its flexibility.

Metallic Packing.—The H. W. Johns-Manville Company, New York, is distributing a pamphlet describing Morris metallic packing, for which the company has exclusive selling rights. It is made by the Morris Metallic Packing Company, Philadelphia, Pa. The pamphlet shows different varieties of it as applied to valve stems, reciprocating rods and very large rods; also for high-pressure marine service.

Chicago, Burlington & Quincy.—The passenger department of this company is distributing picture postal cards showing beautiful views along the Mississippi river.

MANUFACTURING AND BUSINESS.

E. W. Buechling has been appointed to the new office of Assistant Manager of Sales of the Pittsburgh Automatic Vise & Tool Co., Pittsburgh, Pa.

The Consolidated Mining & Steel Company will, it is said, spend about $700,000 putting up a large iron and steel plant near Guernsey, Wyo. F. O. Olsen, Pittsburgh, Pa., is interested.

Cars began running September 28 on the electric street railway system of St. Petersburg, installed by the Russian subsidiary company of the Westinghouse Electric & Manufacturing Co., Pittsburgh, Pa.

Lee Holliday has been appointed Signal Engineer and Agent of the Union Switch & Signal Co., Swissvale, Pa., and will have charge of the Southwestern district, with headquarters at St. Louis, Mo., succeeding F. G. Ashton, resigned.

J. W. Lawler, formerly Superintendent of the foundry department of the Madison Car Works, has been appointed Superintendent of the iron and foundry department of the St. Charles plant of the American Car & Foundry Company, New York.

The United States Steel Corporation has bought, probably through the American Steel & Wire Co., the National Steel & Wire Co., of New Haven, Conn., which was recently sold for $650,000 in bankruptcy proceedings. The National Steel & Wire Co. has two large plants and is capitalized at $5,000,000.

The McKenzie, Holland & Westinghouse Power Signal Company, Limited, has been incorporated in England by Westinghouse interests and owners of certain British signal patents. Half the stock is held by the Westinghouse Brake Company, Limited, of London.

The new company will build a plant adjoining the Westinghouse Brake Company's shops at King's Cross, London.

J. E. Ham, formerly with the Hazard Manufacturing Co., Wilkesbarre, Pa., has been appointed representative of the Waterbury Company, New York, for the introduction of its higher grades of insulated wires and cables. Mr. Ham's office will be at the Waterbury Company's branch office, 108 La Salle street, Chicago, Ill.

The Betts Machine Co., Wilmington, Del., makers of heavy machine tools, are still busy with ordered work although there is a falling off in railroad inquiries. The following are among recent shipments: One 84-in. tire mill, with universal chuck table, to the Richmond Works of the American Locomotive Co., one 8-ft. boring and turning mill to the Great Northern, at Devil's Lake, Minn., one 8-ft. boring and turning mill to the Georgia Railroad at Atlanta, Ga.; one 52-in. car wheel borer, motor-driven, to the Mississippi Central at Hattiesburg, Miss.; one 15-in. slotter, motor-driven, to the Davenport Locomotive Works, Davenport, Iowa; four 15-in. slotters to the Rendville, Mass., shops of the New York, New Haven & Hartford, one 6-ft. boring and turning mill to the Chicago, Milwaukee & St. Paul at Dubuque, Iowa; one motor-driven No. 2 horizontal boring machine to the Brooklyn Heights Railroad, Brooklyn, N. Y.; one 8-ft. boring mill, one No. 2 horizontal boring machine and one 84-in. planer, all motor-driven, to the Southern Railway at Knoxville, Tenn., and six motor-driven 66-in. tire mills to the Schoen Steel Wheel Co., McKee's Rocks, Pa.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad conventions and engineering societies, etc., see advertising page 24.)

American Society of Civil Engineers.

At the meeting of this society, October 2, two papers were presented, one on Reinforced Concrete Towers by D. W. Krellwitz, and one by C. W. Smith on Reinforced Concrete Pipes for Carrying Water Under Pressure. Both of these papers were printed in the August proceedings.

American Railway Association.

Announcement is made that the fall meeting of this association will be held at the Waldorf-Astoria, New York city, on Wednesday, October 30, 1907. It was originally intended to hold the fall meeting at Norfolk, Va., on Oct. 23, but on account of the important nature of the business to be considered and the fact that a larger attendance can be secured at New York than at Norfolk, the President of the association, with the unanimous approval of the Executive Committee, at the request of a large number of members, has decided to call the meeting as above noted at New York city on Oct. 30.

American Society of Mechanical Engineers.

At a meeting of this society to be held in the Engineering Societies Building, New York, October 8, the subject will be "Industrial Education." College technical courses and student apprenticeship courses will be discussed at length. A paper by Prof. John Price Johnson on the "College Technical Courses and Apprenticeship Courses" offered by manufacturing establishments will be read. An address will also be delivered by Dr. Henry S. Pritchett, President of the Carnegie Foundation, and one by Prof. Dugald C. Jackson, of the Massachusetts Institute of Technology, and President of the Society for the Promotion of Engineering Education.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Boston & Albany.—A. H. Smith, Vice-President and General Manager of the New York Central & Hudson River, has been elected also Vice-President and General Manager of the Boston & Albany. Edgar Van Etten, Vice-President of the New York Central & Hudson River and of the Boston & Albany, heretofore in charge of the Boston & Albany, remains at Boston as Vice-President but no longer has charge of the operating department. He will perform such duties as may be assigned to him by the President and Senior Vice-President of the New York Central & Hudson River. J. H. Hustis, General Superintendent of the Western district of the New York Central & Hudson River, has been appointed Assistant General Manager, with headquarters at Boston. See Boston & Albany under Engineering and Rolling Stock Officers.

Chicago & Alton.—Edwin Hawley has been elected Vice-President; T. H. Hubbard, Vice-President of the Toledo, St. Louis & Western, has been elected Chairman of the Board of the Chicago & Alton. T. P. Shonts, President of the T., St. L. & W., has been elected Chairman of the Executive Committee of the C. & A. J. S. Mackie, Secretary of the Colorado & Southern, has been elected Secretary and Assistant Treasurer of the C. & A. and F. H. Davis, Treasurer of the Minneapolis & St. Louis, has been elected Treasurer of the C. & A.

Colorado Southern, New Orleans & Pacific.—See Eunice, Lafayette & Abbeville.

Delaware & Hudson.—W. H. Williams, Assistant to the President, has been elected Third Vice-President.

Eunice, Lafayette & Abbeville.—George A. Clark, formerly Vice-President and General Manager of the Colorado Southern, New Orleans & Pacific, has been elected Vice-President and General Manager of the Eunice, Lafayette & Abbeville, which is about to be built.

Houston & Brazos Valley.—C. H. Brightwell has been appointed Auditor, with office at Velasco, Tex., succeeding P. F. Combs, resigned.

New York Central & Hudson River.—See Boston & Albany.

Orange & Northwestern.—J. J. McEwen, Jr., has been appointed Auditor, succeeding T. C. McCampbell, resigned. J. O. Sims, Jr., has been appointed Treasurer, succeeding W. W. Reid, resigned.

St. Louis, Rocky Mountain & Pacific.—A. W. Newman has been appointed Assistant Secretary.

Toledo Railway & Terminal.—Leslie Reddish, assistant chief clerk to the General Manager, has been appointed Car Accountant, succeeding Albert Beck, resigned to go into other business.

Tonopah & Tidewater.—The general offices have been moved from Oakland, Cal., to Los Angeles.

Operating Officers.

Alabama Great Southern.—See Cincinnati, New Orleans & Texas Pacific.

Boston & Albany.—See Boston & Albany under Executive, Financial & Legal Officers.

Chicago, Rock Island & Pacific.—R. C. St. John, Trainmaster of the Pine Bluff district of the Arkansas division of the St. Louis, Iron Mountain & Southern, has been appointed Trainmaster of the Memphis district of the Arkansas division of the Chicago, Rock Island & Pacific.

Cincinnati, New Orleans & Texas Pacific.—W. S. Andrews, Assistant to the General Manager, has been appointed General Superintendent of Transportation of this road and of the Alabama Great Southern, with office at Cincinnati, Ohio.

Erie.—T. J. English, Superintendent at Youngstown, Ohio, has been appointed Assistant to the General Manager. F. J. Moser, Superintendent at Huntington, Ind., succeeds Mr. English. E. C. Allen, Assistant Superintendent at Galion, Ohio, succeeds Mr. Moser.

J. H. Klein, Trainmaster at Huntington, Ind., has been appointed Trainmaster of the Chicago division, succeeding H. D. McClelland, transferred. D. I. Jones, chief despatcher, succeeds Mr. Klein.

Grand Trunk.—D. Cromble has been appointed Assistant to the General Transportation Manager, with office at Montreal, Que., succeeding A. A. Tisdale, resigned to go to another company. M. S. Blaiklock, Superintendent of the Eastern division, has been appointed Engineer of Maintenance of Way, with office at Montreal. H. E. Whittenberger, Superintendent of the Kansas City Southern at Pittsburgh, Kan., succeeds Mr. Blaiklock, with office at Montreal.

Kansas City Southern.—See Grand Trunk.

New York Central & Hudson River.—The office of J. P. Bradfield, Assistant General Manager, has been transferred from New York to Buffalo. L. H. Van Allen, Superintendent of the Buffalo division, has been appointed General Superintendent of the Western district, succeeding J. H. Hustis, promoted. S. R. Payne, Superintendent at Rochester, N. Y., succeeds Mr. Van Allen. T. W. Evans, Assistant Superintendent at Jersey Shore, Pa., succeeds Mr. Payne. See Boston & Albany under Executive, Financial and Legal Officers.

St. Louis, Iron Mountain & Southern.—See Chicago, Rock Island & Pacific.

Southern.—W. M. Deuel, Superintendent at Rock Hill, S. C., has been appointed Superintendent of Terminals at Atlanta, Ga. E. M. Newell, Superintendent of the Mooresville division, succeeds Mr. Deuel, and the Mooresville division is merged with the Winston-Salem division. F. P. Pelter, Superintendent of the Chattanooga division, has been appointed Superintendent of the Nashville division, and the Chattanooga division is merged with the Atlanta and Knoxville divisions.

Traffic Officers.

Chicago, Burlington & Quincy.—A. C. Maxwell, chief clerk to the General Freight Agent of the Lines West of Missouri River, has been appointed General Agent at Keokuk, Iowa, succeeding J. H. Jarnett, who takes Mr. Maxwell's former position.

Grand Trunk.—See Grand Trunk Pacific.

Grand Trunk Pacific.—John W. Loud, Freight Traffic Manager of the Grand Trunk, has been appointed also Freight Traffic Manager of the Grand Trunk Pacific.

Mexican Central.—The office of Passenger Traffic Manager formerly held by W. D. Murdock, who resigned because of ill health, has been abolished and the duties of that office will hereafter be performed by the General Passenger Agent.

Tonopah & Tidewater.—George I. Hughes has been appointed General Eastern Agent at New York. F. M. Jenifer has been appointed General Agent at Goldfield, Nev.

Engineering and Rolling Stock Officers.

Ann Arbor.—See Detroit, Toledo & Ironton.

Baltimore & Ohio.—L. E. Haislip, Assistant Division Engineer of the Pittsburgh division, has been appointed Assistant Engineer of the Wheeling division, succeeding J. J. Smiley, resigned. T. H. Brown succeeds Mr. Haislip.

Bangor & Aroostook.—O. Stewart, Superintendent of Motive Power and Equipment, has retired after 60 years of railroad service. H. Montgomery, Assistant Superintendent of Motive Power and Equipment, succeeds Mr. Stewart, with office at Milo Junction, Me., and his former position has been abolished.

Boston & Albany.—R. D. Smith, Mechanical Expert of the Lake Shore & Michigan Southern, has been appointed Assistant Superintendent of Motive Power of the Boston & Albany, with office at Albany, N. Y., in charge of Boston & Albany matters and such other duties as may be assigned to him.

Chicago, Rock Island & Pacific.—E. E. Chrysler, general foreman at Chickasha, Ind. T., has been appointed Master Mechanic at that place.

Detroit, Toledo & Ironton.—W. G. Wallace, Superintendent of Motive Power of this road and of the Ann Arbor, has resigned.

Erie.—E. I. Dodd, Mechanical Engineer of the Pullman Company, has been appointed Assistant Mechanical Superintendent of the Erie, with office at Meadville, Pa.

Florida East Coast.—O. M. Carter, formerly Captain in the engineer corps of the United States Army, has been appointed Consulting Engineer of the Florida East Coast in connection with the extension across the Florida keys.

Grand Trunk.—See this company under Operating Officers.

Hocking Valley.—W. L. Mattoon, Division Engineer of the Zanesville & Western and of the Corning division of the Toledo & Ohio Central, has been appointed Principal Assistant Engineer of the Hocking Valley and the Zanesville & Western, with office at Columbus, Ohio, succeeding Parker S. Cott, resigned to go to the Sunday Creek Coal Company at Athens, Ohio. D. C. Holtzbery, Division Engineer of the Eastern division of the Toledo & Ohio Central, succeeds Mr. Mattoon, with office at Columbus, Ohio. P. R. Black succeeds Mr. Holtzbery, with office at Bucyrus, Ohio.

Lake Shore & Michigan Southern.—See Boston & Albany.

Seaboard Air Line.—J. J. Hanline has been appointed Master Mechanic at Atlanta, Ga., succeeding A. J. Poole, promoted.

Toledo & Ohio Central.—See Hocking Valley.

Zanesville & Western.—See Hocking Valley.

Purchasing Agents.

Michigan Central.—See New York Central & Hudson River.

New York Central & Hudson River.—S. B. Wight, Purchasing Agent of the Michigan Central, has been appointed Purchasing Agent of the New York Central & Hudson River, succeeding Dexter Fairchild, resigned.

LOCOMOTIVE BUILDING.

The Texas Railroad Commission has notified the railroads of that state that they must get additional locomotives.

The Fo-Kien Railway, China, has ordered two six-wheel tank locomotives from the American Locomotive Company.

The Mexican Sugar Refining Company, El Potrero, Vera Cruz, is said to have ordered three locomotives from the H. K. Porter Company.

The Harriman Lines, as reported in the *Railroad Gazette* of September 20, have ordered 30 mogul locomotives, 10 Atlantic locomotives, 43 consolidation locomotives, 24 ten-wheel locomotives and 18 six-wheel switching locomotives from the American Locomotive Company.

CAR BUILDING.

The National of Mexico, it is said, is contemplating buying some all-steel postal cars.

The Mexican Central, it is said, is thinking of buying some all-steel passenger coaches.

The Philadelphia Rapid Transit, it is said, will order 200 Montreal type street cars within a few weeks.

The Texas Railroad Commission has notified the railroads of that state that they must increase their rolling stock.

The Chicago, Rock Island & Pacific has ordered one compound steam motor car from the American Locomotive Company.

The Southern denies having ordered 500 freight cars from the American Car & Foundry Company, as reported in the *Railroad Gazette* of September 27.

The Las Vegas & Tonopah has ordered four cabooses from the Pullman Co., for February, 1908, delivery. These cabooses are in accordance with the San Pedro, Los Angeles & Salt Lake standard.

The New Orleans Great Northern has ordered from the Western Steel Car & Foundry Co. 200 steel underframe composite gondola cars of 80,000 lbs. capacity, 200 steel underframe flat cars of 80,000 lbs. capacity, 300 all-wood box cars of 60,000 lbs. capacity and 65 all-wood stock cars of 60,000 lbs. capacity.

RAILROAD STRUCTURES.

Brandon, Man.—The Canadian Pacific and the city officials have agreed to jointly build a bridge at First street. The question is yet to be decided whether it will be a steel or reinforced concrete structure.

Cheyenne, Wyo.—Local reports say that the Union Pacific will put up a new roundhouse to cost $40,000 and a coal chute to cost $50,000.

Greencastle, Pa.—The Cumberland Valley, it is said, will put up a passenger station here.

Mobridge, S. Dak.—The Chicago, Milwaukee & St. Paul has about finished the pier work on the bridge here. The force is to be transferred to Chamberlain, where a steel bridge is to be built.

Naco, Mex.—Colonel Epes Randolph, of the Southern Pacific, is quoted as saying that the shops of the Cananea, Yaqui River & Pacific at this place will be finished and equipped as originally planned, and that the report that these improvements are to be abandoned is without foundation.

New Orleans, La.—The Texas & Pacific, it is said, is planning to spend a large amount of money improving its terminals and putting up a new passenger station here.

New York, N. Y.—The Interborough Rapid Transit Company, it is said, has filed plans for enlarging the car inspection station and storage house at Seventh avenue and 148th street. A brick addition 60.3 ft. x 96 ft. with a steel frame and steel roller doors is to be added.

North Battleford, Sask.—A contract is reported let to Newman & Co., of Regina, at $100,000 for the superstructure of the bridge to be built over the Saskatchewan river here.

San Angelo, Tex.—The Orient Construction Company is to build a steel bridge 150 ft. long over Jackson creek.

Toledo, Ohio.—The new two-story steel and brick in-bound freight house, 50 ft. x 600 ft., being built for the Lake Shore & Michigan Southern, was to be opened for business October 1st, and the out-bound freight house is expected to be finished about the first of next year.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

Alabama Western.—See Illinois Central.

Arkansas, Louisiana & Gulf.—An officer writes that contracts have been let to the Southern Development Co. and work is under way on this proposed line from Monroe, La., northeast to Bastrop, thence north via Rolfe Junction, Ark., to Hamburg, 57 miles, with a branch from Rolfe Junction west to Crossett, five miles. The work is easy; no cuts will exceed 20 ft. in depth and no fills will be more than 25 ft. high. The maximum grade is ½ per cent. compensated for curvature, and maximum curvature is 3 deg. The work

includes a steel bridge and an aggregate of about one mile of pile bent trestles at various points, ranging in length from 28 ft. to 600 ft. About 20 miles of grade work is finished and several of the pile trestles are in place. Track laying to begin October 1. William A. Otis, President; J. M. Parker, General Manager, and E. T. Hood, Chief Engineer, Monroe, La.

Atchison, Topeka & Santa Fe.—Final surveys are reported made for building a line to Burro mountain, N. Mex. The line is to be built from near Silver City and will branch into two divisions at the Mangus divide near Oak Grove Hill, one branch going to Tyrone and the other following the divide via the Comanche, Klondike and Copper Gulf camps to Leopold.

Bloomington Southern.—See Illinois Central.

Canadian Northern.—President William Mackenzie is quoted as saying that this company will build a line this year from Saskatoon, Sask., southwest 30 miles; also that the final plans for the joint terminals to be built at Winnipeg by this company and the Grand Trunk Pacific at an estimated cost of $3,000,000 have been approved.

Cananea, Yaqui River & Pacific.—See Southern Pacific.

Chicago & Milwaukee (Electric).—Announcement is made that this road will be opened for through traffic to Milwaukee by the middle of November.

Chicago Southern.—Track laying is reported finished on this road, which is to run from Chicago Heights, Ill., where connection is to be made with the Chicago Terminal Transfer, south 114 miles to the Indiana state line, at which point connection is to be made with the Southern Indiana, which runs to Terre Haute. (July 12, p. 53.)

Colorado Roads.—A company has recently been formed in Denver to build a tunnel about five miles long through James Park. It is said that when the work is finished the tunnel is to be leased to the Denver, Northwestern & Pacific. The incorporators include T. F. Walsh and C. B. Kountze, of the Colorado National Bank; D. Sullivan, of the Denver National Bank; D. H. Moffat, W. G. Evans, J. W. Springer and others.

Cumberland Valley.—A two-mile connecting line being built jointly by this company and the Philadelphia & Reading at Shippensburg, Pa., is nearing completion. Grading has been finished. This line will be used for exchange of freight.

The belt freight line of this company around Greencastle, Pa., will shortly be put in service.

Denver, Northwestern & Pacific.—See Colorado Roads.

Dillsburg & Wellsville.—Incorporated in Pennsylvania with a capital of $75,000 to build a line from a connection with the Dillsburg & Mechanicsburg branch of the Cumberland Valley at Dillsburg, Pa., southeast to Wellsville, 7½ miles. It has not been decided whether the line shall be operated by steam or electricity. The directors are: A. C. Hetrick, President, Wellsville; R. J. Belt, J. Milligan, W. D. Brougher, I. J. Selple, J. N. Logan, E. W. Shapley, D. W. Beltzel and S. G. Bushey.

Due West Railway.—An officer writes that this company, which is building a line from Donalds, S. C., on the Southern, south to Due West, 4½ miles, has grading finished and the ties laid. (June 7, p. 819.)

Gauley & Birch River.—Incorporated in West Virginia with $300,000 capital to build a line from the mouth of Muddlety Creek in Nicholas county, north via Hookersville to a point near the mouth of Big Birch river in Braxton county, 25 miles. The names of the incorporators are not given. The office of the company is to be at Summerville.

Great Northern.—President L. W. Hill, of this company, is quoted as saying that a good deal of old extension work is nearing completion, the most important being the cut-off between Great Falls, Mont., and a connection with the Chicago, Burlington & Quincy at Billings. Grading on this line is to be finished this year and it is expected to be in operation early next year.

Grand Trunk Pacific.—The Grand Trunk Pacific Construction Company, which has the contract for building 150 miles of this line east of Abitibi river, Que., has sublet some of the work to the J. H. Reynolds Construction Company. Work is to be started on this section early in the spring.

Treat & Johnson, of Winnipeg, who have the contract for building 51 miles of line for this company between Winnipeg, Man., and Portage La Prairie, will sublet some of the work. (June 28, p. 949.)

Gulf, Colorado & Santa Fe.—Surveys are reported being made by this company for a line from Timpson, Tex., east to Center, 18 miles.

Illinois Central.—The report of this company for the year ended June 30, 1907, shows that work has been continued on the Memphis & State line, which is to be a double-track railroad from Woodstock, Tenn., to East Junction, about 15.84 miles, to relieve the congestion of traffic in Memphis by sending freight trains around that city.

The line to Birmingham, Ala., will be ready for use Nov. 1. Trackage rights will be used over the Mobile & Ohio from a point near Jackson, Tenn., to Corinth, Miss., 55 miles, and over the Northern Alabama from Haleyville, Ala., to Jasper, 49 miles, over the Kansas City, Memphis & Birmingham, 41 miles from Jasper to Birmingham. The connecting links built were from a point south of Jackson, east to a connection with the Mobile & Ohio, three miles, and from Corinth, Miss., southeast to Haleyville, Ala., 80.23 miles. The line in Mississippi is being built under the name of the Mississippi & Alabama, 42.41 miles, and that in Alabama under the name of the Alabama Western, 37.82 miles.

The Bloomington Southern has built a line from the connection of the Indianapolis Southern near Bloomington, Ind., to stone quarries, 2.13 miles. This was put in operation in June.

Under the name of the Memphis Railroad & Terminal Company, a company was organized in Tennessee to build a union passenger station in the city of Memphis. The estimated cost of this work is about $3,000,000, and is to be divided between the ten lines entering Memphis.

Indianapolis & Northwestern Traction.—General Manager C. C. Reynolds is reported to have said that this line is to be extended from Crawfordsville, Ind., west to Danville, Ill., 45 miles, to a connection with the McKinley syndicate lines.

Interborough Rapid Transit.—The New York City Board of Estimate and Apportionment has appropriated $850,000 to lay additional subway tracks north from 96th street and Broadway. The plans call for one new track on the east side from 96th street to 102d street, and two on the west side from 96th street to 101st street. The improvements are being made to obviate the necessity for the express trains to cross the local tracks.

Lorain & Ashland.—This company, which last year built a line from Lorain, Ohio, south to Wellington, 22 miles, has rights of way for an extension from Wellington south to Loudonville, on the Pennsylvania Lines West, 39 miles. Recent reports say that the line is to be extended south to the Ohio river probably at Gallipolis, 90 miles south of Wellington, and from this point a line is eventually to be built either by this company or by the Virginian Railway southeast to the northern terminus of that line at Deepwater, W. Va., about 75 miles. There would then be a through line from the lakes to the Atlantic seacoast at Norfolk, Va. (July 5, p. 27.)

Memphis & State Line.—See Illinois Central.

Memphis Railroad & Terminal.—See Illinois Central.

Mexican Roads.—Arrangements are reported made for building a line from Balsas, Guerrero, on the Mexican Central, west to the Port of Zihuatanejos on the Pacific coast, about 125 miles. Henry I. Willey, a mining engineer of Mexico City, is promoting the project. It is said that the Rothschild interests have bought a large tract of land adjacent to the port of Zihuatanejos and are back of this project.

Mississippi & Alabama.—See Illinois Central.

Missouri Southern.—This company has under consideration the question of building a branch from Boyd, Mo., or Tip Top southwest to Van Buren, 10 miles, and eventually further south and west of that place.

Mount Vernon & Eastern.—Incorporated in New York with $1,000,000 capital to build a line from Mount Vernon, N. Y., northeast to Lewisboro, near the Connecticut state line, about 35 miles. The directors include: Oakleigh Thorne, C. Bruce, H. K. Woods and others interested in the New York, Westchester & Boston.

New York Subways.—Bids were recently opened by Bridge Commissioner Stevenson for supplying and installing the electrical equipment of the tracks to extend from the Manhattan terminal over the Williamsburg bridge. The bids were: F. E. Gore, of Gore & Hoey, $343,000; Daniel Moran and the Snare & Trieste Company, joint $396,000. The work is to be finished by January 1.

New York, Westchester & Boston.—See Mount Vernon & Eastern.

New Orleans Great Northern.—This company, it is said, is now operating the extension of its main line north of Angie, La., to Columbia Junction, Miss., 20 miles.

Northern of Maine.—This company has been incorporated with a capital of $500,000 to build a line from the terminus of the Bangor & Aroostook at Fort Kent west to a point opposite the mouth of the St. Francis river; also to build from Fort Kent northeast through Frenchville, Madawaska and Grand Isle to Van Buren, 45 miles, connecting at that point with the Bangor & Aroostook. (March 15, p. 388.)

Northwestern Pacific.—See Southern Pacific.

Oklahoma City Railway (Electric).—Incorporated in Oklahoma to build electric line from Guthrie, Okla., south to Norman and Yukon; also a line from Spencer or Choctaw City west via Oklahoma City to Yukon, a total of about 150 miles. Directors include: A. H. Classen, H. M. Brauer, E. H. Cooke and J. M. Owen, all of Oklahoma City. The company already has a line in operation from Oklahoma City to Britton, which is being extended to Guthrie.

Oregon Railroad & Navigation.—See Oregon Short Line.

Oregon Short Line.—Work is reported under way on a line from Huntington, Ore., at the junction of the Oregon Railroad & Navigation Co.'s line, north along the Oregon-Idaho state line following the Snake river to Lewiston, Idaho, on the Washington state line. At this point connection is to be made with the Oregon, Washington & Idaho, which is building a line west to Texas Ferry, Wash., opposite Riparia, on the O. R. R. & N. Such a line would give the Union Pacific an almost level grade all the way, with two or three exceptions, from Granger, Wyo., to Portland, Ore. The present line of the O. R. R. & N. from Huntington west to the Columbia river grades.

Pennsylvania.—The work which this company has been carrying out on the Pittsburgh division for the new main line between Southwest Junction, Pa., a mile east of Greensburg, east to Beatty, about seven miles, has been finished. The new line, which is known as the Donohue cut-off, has four tracks in place of the two tracks on the old line. From George to Beatty, about five miles, the line is almost straight. On this section a 1,200-ft. tunnel was eliminated, six 4-deg. curves being replaced by two 1-deg. curves, grades reduced and several grade crossings are now carried overhead.

Along the Susquehanna river, from Benton Station, Pa., to Safe Harbor, more than 13 miles, the Columbia & Port Deposit tracks have been elevated at a cost of $1,250,000. This work was done to escape floods when the dam across the river at McCall's Ferry is finished, which will raise the level of the water 60 ft. At the site of the dam the new tracks are 25 ft. above the old roadbed, but the maximum grade northbound is only three-tenths of 1 per cent., with a temporary run down grade of one-half of 1 per cent. at Benton.

Peoples' Railway & Construction Company.—It is reported that Megargle & Co., of New York, will build part of the proposed line from Tyler, Tex., northwest to Canton, about 40 miles, the work to be finished within 18 months. (Sept. 20, p. 340.)

Philadelphia & Reading.—An officer writes that a temporary freight yard is being put in at 19th and Indiana streets, Philadelphia, preliminary to the main work of track elevation.

See Cumberland Valley.

Richmond & Tottenville (Electric).—A company is being formed under this name in New York to build an electric line to connect Richmond, S. I., with Rossville, Kreischersville and Tottenville, about 10 miles. The proposed line is to be laid with 90-lb. rails and will cost about $100,000. T. B. McGovern, 25 Broad street, and C. G. Kolff, 50 Broadway, New York, are said to be interested.

Rio Grande, Sierra Madre & Pacific.—President H. R. Nickerson, of this company, is quoted as saying that extension work on this road will be started as soon as the rainy season is over. The plans call for a line from Nueva Casas Grandes, Chihuahua, southwest via Santa Elena and Ocampo, to a point on the Pacific coast either at Guaymus or at Topolobampo, 300 miles. (July 19, p. 82.)

Shelby County (Electric).—This company, it is said, is building an electric line from Shelbina, Mo., to Salt river, five miles, to which point grading has been finished and track laying is soon to begin. The line is eventually to be extended north via Shelbyville to Bethel, 18 miles. J. D. Dale, of Shelbyville, and other residents of that place are interested in the project.

Southern Pacific.—Contracts are reported recently let for building a section of the Northwestern Pacific projected from Willits, Cal., north to Eureka, 290 miles. The line, which is being built jointly by the Atchison, Topeka & Santa Fe and the Southern Pacific, is finished from Eureka south to Pepper, 50 miles. (March 15, p. 392.)

It is said that the Cananea, Yaqui River & Pacific is making surveys for a branch from Cananea, Sonora, northwest to Nogales, on the Sonora division, about 80 miles.

Southwestern Interurban of Mangum.—Incorporated in Oklahoma with $1,000,000 capital to build lines from Mangum via Francis to Hollis, 37 miles; from Mangum to Granite and Coldell, 40 miles, with a branch from Granite to Hobart, 15 miles, and from Mangum to Altus, 27 miles. The incorporators include: W. T. Funderburk, E. E. Pinkerton, D. J. Doyle, H. M. Ferguson, T. P. Clay and R. C. Echols, all of Mangum.

Union Pacific.—Double-track work now under way on this road, and which it is expected will be finished about the first of the year, will give this company a double-track line from Omaha west to Watson's ranch, three miles west of Kearney and 196 miles from Omaha. (June 7, p. 819.)

See Oregon Short Line.

Virginian Railway.—See Lorain & Ashland.

Winnebago Traction Company.—This company, operating 40 miles of electric lines in Wisconsin from Oshkosh north to Neenah and from Oshkosh west to Omro, which was recently placed in the hands of a receiver, is to be reorganized, and improvements to cost about $300,000 will be carried out. Of this, $200,000 is to be used in building an extension from Omro southwest to Berlin, 12 miles.

Waco, Hamilton & Brownwood.—Surveys are being made by this company for its proposed line from Waco, Tex., west to Brownwood, about 120 miles. (July 19, p. 84.)

RAILROAD CORPORATION NEWS.

Boston & Maine.—At the annual meeting on October 9 the stockholders are to be asked to approve an issue of $6,000,000 bonds to take up floating debt. It is understood that part of the new issue will be used to refund the $4,000,000 6 per cent. one-year notes recently sold.

Chicago & Alton.—See Toledo, St. Louis & Western.

Erie.—Gross earnings for the year ended June 30, 1907, were $53,914,827, an increase of $3,912,193; net earnings, $15,747,788, an increase of $1,617,991. The largest proportionate increase in earnings was from coal traffic. The increase in the cost of maintenance of equipment was rather less, proportionately, than in maintenance of way and conducting transportation. Taxes increased about 40 per cent., mostly on property in New Jersey.

The New York Public Service Commission, Second district, has been holding hearings on the application of the Erie to issue dividend warrants. The issue is being opposed on the ground that it would amount to the railroad's borrowing money from the stockholders without their consent. (Aug. 30, p. 248.)

Metropolitan Street Railway.—Adrian H. Joline and Douglas Robinson, Receivers of the New York City Railway, have been appointed also Receivers of the Metropolitan Street Railway. Minority stockholders of the last named company have formed a protective committee.

Minneapolis, St. Paul & Sault Ste. Marie.—The directors have decided to immediately offer $1,400,000 preferred stock and $2,800,000 common stock at par to present stockholders. One share of new preferred stock and two shares of new common stock are to be issued for every 15 shares of either class of old stock already held. (Sept. 20, p. 340.)

National of Mexico.—Speyer & Company, New York, are offering, at a price to yield 7¼ per cent., the unsold balance of the $10,000,000, 1½-year, 5 per cent. notes maturing April 1, 1909. About $7,000,000 of the notes have already been sold. These notes took the place of the notes originally maturing on October 1, 1907, which were extended for a year and a half. (September 13, page 308.)

New York City Railway.—H. H. Vreeland, President of this company, has been appointed General Manager for the Receivers.

New York, New Haven & Hartford.—The annual report for the year ended June 30, 1907, shows gross earnings of $55,601,936 against $52,984,322 in 1906. Operating expenses were $37,850,081, as compared with $35,222,586 for the previous year, and net earnings were $17,751,854 against $17,761,735. Net earnings of the company's street railroads this year were $3,615,899; from steamship lines $635,127, and income from other sources $2,077,874, making the total income for this year $24,080,755. Deductions from income this year were $15,187,714, as compared with $9,752,115 last year, and net income this year applicable to dividends $8,893,041, as compared with $10,185,377 last year.

Toledo Railway & Terminal.—A verdict for $1,865,021 against this company has been given to the Commonwealth Trust Company, St. Louis, Mo. This sum is the difference between the principal and interest due on the bonds held by the trust company and the $2,000,000 realized from the foreclosure sale.

Toledo, St. Louis & Western.—The directors have ratified the arrangement by which the company gets control of the Chicago & Alton.

Canadian Pacific.—The stockholders have authorized the issue of $8,000,000 additional 4 per cent. debenture stock, of which $101,519,411 is now outstanding. The new stock is to pay for new steamships and several recent extensions and additions. The stockholders are later to be asked to authorize the issue of the remaining capital stock, about $28,000,000 common and $32,000,000 preferred.

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EDITORIAL ANNOUNCEMENTS.

THE BRITISH AND EASTERN CONTINENTS edition of the Railroad Gazette is published each Friday at Queen Anne's Chambers, Westminster, London. It contains selected reading pages from the Railroad Gazette, together with additional British and foreign matter, and is issued under the name Railway Gazette.

CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.

ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

OFFICERS.—In accordance with the law of the state of New York, the following announcement is made of the office of publication, at 83 Fulton St., New York, N.Y., and the names of the officers and editors of The Railroad Gazette:

CONTENTS

VOL. XLIII., No. 15. FRIDAY, OCTOBER 11, 1907.

The electrification of part of the Rochester division of the Erie, which is described in detail elsewhere in this issue, is in some respects more interesting than some of the larger electrification schemes which have received so much attention recently because the road is typical of 75 per cent. of the railroad mileage in the United States. It is single track road running through an agricultural country with a large city at one end and a few small towns along its route. The steam passenger service before electrification consisted of three trains each way a day between Mt. Morris and Avon, and six trains each way been Avon and Rochester. There were only four stops for trains between Avon and Rochester, 19 miles, and five between Avon and Mt. Morris, 16 miles. The electric trains have 28 stops, 22 being flag stations. There are now eight trains each way a day between Mt. Morris and Rochester, and three additional trains each way between Mt. Morris and Avon, connecting with through steam trains to and from Rochester. The all-important question "Does it pay?" is best answered by the following statement of passenger revenue between Rochester and Mt. Morris for the two months of July and August in 1906 before electrification and in 1907 after electric operation was begun on June 27:

Month.	1907.	1906.	Increase. Per cent.
July	$14,175.72	$10,735.20	34
August	15,317.00	11,461.68	34

In these red-lettered times curious are some of the anomalies that arise in the relations of the railroads to civics and politics. In Massachusetts one of the two great parties has just split in twain ostensibly, at least, over the question of the merger of the Boston & Maine system, and has furnished the first instance of a great party schism on such an issue in the nation's annals. Or traveling westward in the trail of Dean Berkeley's star of empire one finds the fledgeling state of Oklahoma and her new constitution. Oklahoma is in that condition of newness, when, if the historical precedent of the other far western states were worth anything, she should be craving railroads and trolleys at any price and leaving corporation baiting to a future when there would be more corporations to be baited. But under the force of the pervasive epidemic she puts two cent passenger fares into her organic law, provides an elective commission and gives it power to regulate public service charges. Yet she veers also toward virtue by adopting a constitution that prohibits stock watering. Here again, by contrast with another commonwealth we find a paradox. Oklahoma, youngest of the states, sets her cherubic face sternly against corporate hydraulics. But how many weeks have passed since the legislature of Connecticut, after two centuries and three-quarters as colony and state and in late years a sufferer from trolley overcapitalization, overruled some 20 vetoes of her Governor aimed at precisely that evil? The new and the old state have each ratified policies exactly the reverse of what would be inferred from civic experience, railroad history and antecedent conditions. Verily when our times are written up by the men of a new era they will find some things that turn logic upside down and make shriek theories of human motive and conduct.

"Alarm and resentment" are felt among trainmen in Canada because, it is said, the Government is too active in prosecuting conductors and enginemen on criminal charges in connection with collisions; and deputations of trainmen from a half dozen prominent cities have been to the Attorney-General with a protest. The plea of the protestants is that the men who have been brought before the courts are not criminals but have only committed errors of judgment. The action of the Government is said to be producing a general "feeling of nervousness." The Attorney-General is quoted as saying that the statutes will or should be changed so that some of the weight of the law will fall on men "higher up." Everyone must sympathize with these nervous trainmen, for it is true that in most cases "error of judgment" is a correct description of offenses of the kind referred to. But these errors produce such terrible results that society has defined them as crimes. This is a crude way of curing the evils aimed at but it is the best that the legislatures have yet discovered. To get an idea of the attitude of people generally on this subject, let any trainman imagine his own wife or mother killed in a collision in Europe or Mexico caused by the "error of judgment" of some trainman. As long as the right or trial by jury remains, however, we cannot believe that any trainman will be punished very severely in America for errors of judgment; for it is always easy to show that other persons, either fellow employees or men "higher up," contributed to the mistake. Juries are disinclined to punish one man when others equally guilty cannot be reached. Unfortunately, too, a good many errors amount to gross negligence, for which the dullest man has no excuse, howsoever strong may be the charge against the superintendent or the fellow employee. But, while the trainman usually can make but a poor show of being oppressed, society on the other hand may well ask whether such a situation as that in Canada does not evidence a deplorable inefficiency in the law. Errors of judgment are not cured or prevented by criminal laws. Gross negligence is not usually punished, even if a clear case is proved. Producing a state of nervous-

ness does little if any good, and it may do much harm, for trainmen need to be calm. The only rational way to make conductors, enginemen and others adequately careful is to apply the slow, detailed methods of good discipline and instruction which educate men to carefulness. Abundant experience has shown the futility of everything else. Canada will do well to turn attention to the officers, as distinguished from employees, if it can thereby make progress in the discipline and training of men; but it is not likely to find a criminal statute an effective means to this end.

Equipment depreciation and renewal is the subject of a careful study of practical equipment accounting by William Mahl, head of the accounting departments of the Union Pacific System and the Southern Pacific Company, which is printed on another page. It is a particularly important subject at this time, when the Interstate Commerce Commission has under consideration the final rules to be adopted for maintenance of equipment accounts. Mr. Mahl speaks out of an experience unusual in length and opportunities for studying accounting problems at first hand. His argument is based on the uniform practice of the Southern Pacific Company since 1890. As against any theoretical system of depreciation he puts himself on record as follows from his 17 years' experience in direct management of equipment maintenance and renewals:

"There has been a fairly approximate average annual charge for equipment vacated per locomotive or per car in service. This charge fixes a unit by which an estimate may be formed of the extent to which a railroad company is making good the depreciation of its equipment. There will be as much difference among the railroads in this charge for depreciation as there is now in the average cost per annum for maintenance of way and structures per mile of road, or for the average cost of repairs per locomotive or per car per annum—in fact, in any cost of operation, and rightly so, because the conditions are not alike on any two properties.

"Appreciating all the difficulties and cost which the keeping of the equipment accounts as contemplated by the commission will impose upon the railroads without any practical compensation therefor, it is to be hoped that the commission will amend its rules by omitting altogether the provision for "Depreciation," and amend the provisions for "Renewal" to represent the current cost of replacing all equipment vacated. This change will furnish the commission with reliable data about the depreciation which has been carried into the operating expenses of the railroads and enable it to order adjustments suitable to each case if any should be necessary."

Mr. Mahl believes that all practical purposes which the Commission has in separating the equipment account into three divisions, "repairs," "renewals" and "depreciation," can be accomplished by employing the two divisions "repairs" and "renewals" as has been done by the Southern Pacific Company for many years. By this system the current cost of replacing the particular type of locomotive or car vacated, less the scrap value, is charged to operating expenses, and this same amount, together with the cash received as the scrap value, credited to a replacement fund, which is used to pay for new equipment of whatever capacity and design bought. In this way the integrity of the capital account "equipment" is maintained, while the actual depreciation during the year is made good from the year's income. The cost of new equipment beyond the amount to the credit of the replacement fund is, of course, charged to capital account. This method is based upon the value rather than the number of the equipment which as the dollar is the general unit of railroad accounting is the more accurate method. Mr. Mahl believes that under this system equipment is adequately maintained over a series of years with the greatest simplicity in accounting methods. The Commission's purpose in planning its new rules is admittedly to find out whether each railroad is under-, over- or exactly maintaining its equipment, facts which obviously cannot be determined from the information which has been furnished by many railroad companies in the past. Yet, if all railroads made as careful returns on this subject of equipment maintenance as do the Southern Pacific and the Union Pacific, would it not be possible for the Commission to arrive at this same information as accurately as by requiring the additional division of "depreciation" in the equipment account, particularly as the percentage of the original cost of equipment which should be set aside as depreciation is as yet entirely undetermined?

FREIGHT CLAIMS.

The suggestion recently made in these columns that the freight agent at every large station should be competent to handle damage claims as skilfully as the general claim agent himself (or, what is just as good, should have a clerk experienced in that work) is being carried out on one large western road, and we are informed that the good results of the change are already manifest. In some cases there is a marked improvement in celerity as well as in the quality of the work done, for most agents are overworked and they sometimes leave claims correspondence unattended to for days.

From this time forward the settlement of freight claims is also likely to be bettered materially, so far as interline claims are concerned, by the time-limit rule lately adopted by the Freight Claim Association. This went into effect September 1. It provides that:

"Settling carrier shall investigate claim to establish validity and apportion liability.

"Inquiry may be addressed direct to agent of interested carrier whenever practicable, and to the freight claim officer only after failure to obtain information from agent, or when necessary from nature of inquiry.

"When agent of another carrier fails to answer within 20 days from date of inquiry, copy of inquiry, with request for reply, shall be sent by express, postal mail, or messenger, to freight claim officer of delinquent carrier. When answer is not received within 30 days to such request or to a direct inquiry to freight claim officer regarding a paid claim, paying carrier may, provided liability is not in its opinion located, charge full amount of claim to delinquent carrier, or if there are two or more delinquent carriers, then to delinquent carrier nearest paying carrier in direction of destination, and shall forward all papers relating to the claim to such delinquent carrier, who shall take the place of settling carrier, and make further investigation and distribution of amount of the claim."

We understand that the majority of the member roads have accepted this rule. It will be observed that the maximum time a claimant must now wait to get his money is 50 days, or, adding the time used up in "lost motion," say two months. This is much better than the indefinite delays, months long, to which he has been compelled to submit heretofore. This should be a welcome improvement to claimants, and help greatly in promoting the friendly feeling for which the conscientious claim agent strives.

In discussing, on August 9, this matter of using all legitimate means to secure and retain the friendliness of patrons, it was suggested that small claims which appeared to be valid, or that were presented by reputable people, be paid at once, without subjecting them to the delay incident to an investigation. In commenting on this point in a later issue, Mr. Calkins, Freight Claim Agent of the New York Central, suggested the possibility of a violation of the interstate commerce laws in following such a practice. That, it seems to us, can easily be avoided. In fact some roads already follow such a policy. They get around the difficulty mentioned by inserting a proviso that should the amount, upon investigation, prove incorrect, adjustment will be made by payment of the difference by the party benefiting in the first instance. We understand that, as a rule, claimants willingly repay the excess where investigation shows they have received too much, thus manifesting their appreciation of the practice. It would be legal, we should think, to insert in bills of lading a clause reserving the right to disregard exact equity in settling small claims. There would be no violation of substantial equity—or at least none worse than occurs unavoidably in hundreds of freight transactions every day—and the law should approve what equity approves.

Aside from the effect which a policy of promptness has in making friends for the road, it has another important advantage in lightening the burden on the claim office machinery by reducing the number of claims awaiting settlement. For example, one Chicago road of about 9,000 miles usually has in its claim offices in course of settlement about 10,000 claims, and every day 700 to 750 new ones are filed. To lighten this load would tend to lubricate the whole clerical machinery of the freight department.

The number of small claims is greater now, proportionately, than ever before. For this several causes are responsible. One is the new severity of the interstate commerce law. Under the old conditions the enjoyment of rebates and other special privileges caused the favored shipper to overlook small losses and damages in many instances; or, more properly, not to regard them as losses. But the abolition of these pleasant conditions, in conjunction with the present agitation and general feeling against railroads has changed this attitude, and shippers and consignees now find causes for filing claims which formerly they failed to notice at all. As a further result of these conditions, bureaus and agents making a business of soliciting doubtful claims for collection have become much more active. They even take up claims long outlawed by the statute of limitations. A further factor is the latter-day practice of large industrial concerns having traffic officers, who give special and constant attention to the matter of freight claims. All this, of course, necessitates largely increased forces in the claim offices and elsewhere, and greater expense to the roads.

The longer a claim is delayed in settlement the more inertia it seems to accumulate and the greater its effect in clogging the office machinery; so that whatever may be the reasons why claims are numerous the only sure way for the claim agent to keep them out of his dreams at night is to take care that they do not remain on

his hands over night, out of hand, out of mind. In thus striving to promote his own peace of mind, he is taking the best means of promoting the interest of his employer.

PENALTY IN CORPORATE MISDOING

The unprecedented condition of the affairs of corporations which has come to pass during the last twelve month, attended by a shrinkage of some $3,000,000,000 in gross market values of securities, especially of railroads in this country alone, has naturally given rise to many theories of causation. Some point to the world-wide character of the symptoms. But in that larger analysis they only deepen a problem which is perplexing the best statists of Europe. Limiting the case to an overland one finds three theories foremost. One is the excess of business over capital. Another is the interference of federal and state authority with forms of active capital, notably that form invested in railroads, and a third is the abuse in the employment of capital. The more rational view of the situation undoubtedly includes all the last three causes annexing the fourth, or world cause, as an outside influence, though one not to be ignored in times when great trading nations are closely tied in fiscal bonds. But with the latter cause, when it comes to remedial theories, we have not much to do, at least not through the agency of federal or state lawmaking save as affected by the customs tariff and questions of reciprocity.

In the search for remedies the question of penalty for corporate misdoing is becoming one of growing prominence and of not decreasing difficulty. The difficulty rests on a double base: First, there is the complexity of the statutes themselves and the mazy procedure of courts which ill-define responsibility and befog the application of the penalties. But the worst obstacle is what one may call the unjust incidence of the penalty. A railroad corporation violates a federal law relating to discrimination in rates and is fined heavily. Upon whom does the penalty fall? Upon the managers? Not at all, save as it may operate as a moral and deterring force. Does it fall upon the corporation? Only as an intermediary organism. In its final and practical incidence the penalty descends upon a body of stockholders scattered, unorganized, unresponsible for the penalized act and innocent as unborn babes. In the domain of nebulous and impossible statistics it would be interesting if we had returns that would show how much of the recent shrinkage of $3,000,000,000 in securities had fallen upon the directly and indirectly guilty, how much upon the guiltless and guileless. We do not know; but that the innocents carry all but a small fraction of the loss is a statement that stands with its own saying.

For some of the railroads technically at fault there must also be offered a minor plea in abatement. Let us illustrate by a familiar and general fact that involves a principle. In this country there are a considerable number of believers in the extreme doctrine of free trade. They hold all protective tariffs in the nature of a governmental crime invading the natural rights of the individual. But, bitterly as they may hate protection, they do not advocate any sudden dash into free trade. They have seen the federal government in partnership with a system which, unjust as they believe it to be, has fostered industries which have a right not to be ruined by a catastrophic and abrupt change of tariff policy; and, it may be added, the government would be seriously and justly blamed were it to adopt any such radical change. But in its attitude, action and policy toward railroad corporations has not the federal executive and legislative branches adopted just such a sudden and calamitous shift? By their lethargy, their lax enforcement of existing law, their executive and statutory lapses did they not stimulate the very misdoing which they now, in a sudden revergence of virtue, seek to undo; and were railroad corporations and managers, finding the federal authority thus in a kind of tacit partnership with an evil, so much to blame as if the same authority had been consistently assertive? To state legislation and its enforcement the same illustration applies. Not until many moons after the fact did even law-abiding Massachusetts invoke its own laws on the subject of street railway consolidation; other states are still sleeping on their statutes; while many other commonwealths have just wakened too suddenly, revived dormant laws and passed others too severe, which, in the main, fling upon the far away and innocent stockholder the burden of any corporate misdoing.

All this is now in the past tense, except as it may modify penalty for earlier guilt. The real question, in the case of corporate violation of law, is the fixing of penalty hereafter to fit both the crime and the criminal. The strong tendency of opinion to-day is obviously in favor of the personal instead of the corporate penalty; the reaching down of punishment through the person to the corporation, but so as to apply the corrective without punishing the stockholder, and, in the case of distributive responsibility for offence, the rigid application of the legal maxim that he who commits crime through others is a criminal himself. Yet even here one finds another of those resistants which technical law—to the confusion of laymen—seems perpetually opposing to practical justice. How long is it since the federal government itself and its executive head, so hot foot now after corporate evils, urged successfully in a rebate case that the prosecution—and, of course, any consequential penalty—must lie against the railroad corporation and not against its manager who happened in the meantime to have become a cabinet officer? That matter of individual responsibility must be clarified in the courts before the theory of personal penalty can be established and applied. But in that direction it now seems as though public opinion, later to be crystallized in law, were slowly outworking. It will almost certainly be the alternative remedy if the penalty, laid on the corporation, proves inadequate as a check.

It will, of course, be urged—in fact, if we are not mistaken, has been urged by President Roosevelt himself—that the suffering of the stockholder when his corporation is punished is a natural and inevitable incident like the hardship of a blameless family when the father is convicted of crime. But in public aspects the cases vary widely. In the one case the penalty visits the real offender, in the other not only non-offenders in the corporation penalized, but of other corporations that are innocent. It is the difference between a limited and specific application of law to an individual crime with immediate civic benefit and the penalizing of a vast group of law-abiding citizens with immediate financial—and public—injury. The immediate injury may, of course, in the end be beneficent as a cure of corporation ills. But the policy is a painful one shot through with the ills of the blameless investor and reaching such a dimension of fiscal calamity that the remedy, even if effective in the end, begins to seem worse than the disease. It rests with our lawmakers and our juriscults of the higher type to discover the way in which corporate misdoing may be penalized without a fine of $3,000,000,000 on the nation and without the visitation of the sins of the guilty few upon the heads of the guiltless many.

New York, New Haven & Hartford.

The New York, New Haven & Hartford Railroad property has, in its swift evolution during the last three or four years, become perhaps the most interesting of the railroad systems of the land. Its earlier traditions of arch conservatism have been supplanted by a policy of bold advance. It occupies a peculiar situation territorially and in its industrial environment. It is positive, not to say assertive, in its relations with the other great roads. It has branched out greatly in its marine business and stands as a pioneer and leader in taking and operating street railway lines on a great scale. Its swift pace, fiscal and physical, however varies one obstacle in any analysis of its annual report. So fast is it making history that annual returns three months old so antedate later facts of importance as to have a savor of the antique. One hardly catches sight of President Mellen's observation car before it has disappeared in the distance. But by joining his annual report with the events of the months next following the fiscal year one can get an impressive view of a picturesque railroad landscape whether seen in detail or entirety.

The very first entry of the report, "earnings from passenger department $26,758,929," has its pith of meaning. Early in the year 1906 Mr. Mellen announced a progressive reduction of passenger rates to two cents a mile on his system. The new rate was to begin on some of its branches in western Connecticut, work eastward and finally take in the whole system, the through New York-Boston rate reduction coming last and beginning with November of 1906. The regular fiscal year ending with June 30, 1907, covers seven months during which this reduction has applied to the New Haven's full mileage (2,006), and for five months, averaged, has applied to the major part of it. The official forecast, based merely on the passenger business of the fiscal year 1905-6, showed a loss, as now recalled, of some $700,000. Instead of such a loss passenger earnings have risen $1,506,805, or from $25,252,124 to $26,758,929—and this with an additional track mileage of less than four miles and upon a system where the use of mileage books at the two cent rate had been exceptionally large. Even allowing for normal increase of regular passenger business and somewhat for development of excursion traffic, the results of the reduced rate as applied to a system with dense passenger travel is extremely vivid and striking. It seems singular that President Mellen has not emphasized this matter in his report until one remembers that there are some re-

versed interests as regards the two cent rate in his own board of directors.

Taking up first the operating results of the steam system alone there is to be noticed the persistency with which passenger receipts jostle those from freight, a feature which demarcates the New Haven among the larger railroad systems of the country. The passenger department brought in $26,758,929 as stated; the freight department $28,386,704. The difference between the two was $1,627,775. In the previous year the difference was $1,994,994. The natural volume of the New Haven's huge passenger business between New York and Boston and reaching laterally the living centers of population in southern New England thus begins again to expand and tend toward overreaching new traffic on freight lines of the system like the Highland division and the increased through freight business. In a remote way it goes to justify the phrase of an old-fashioned New Haven director years ago who extolled the passenger business as "freight which handled itself" as contrasted with the freight which had to be handled. The net earnings from operation of the steam road, $17,751,854, tally very strikingly with the $17,761,735 of the year before. Here the New Haven feels the now trite railroad story of increased cost in operation, of labor and materials and, in its case, as a debtor road in car demurrage, there is to be added the higher per diem charge. Actual operating expenses increased from $35,222,586 to $37,850,081. While gross earnings increased about 5 per cent., operating expense ran up to an increment of about 7 per cent., though the rise in operating ratio from 66.477 per cent. to 68.073 per cent. is not so impressive in those figures. For reasons to be stated later this ratio of operating experse is a matter to be watched closely. This year the net earnings from operation only of street railways ($3,615,899), obviously considerably offset in the interest account, and earnings of the steamship lines together with minor income carry total income to $24,080,755, which fixed charges reduce to $8,893,041 net. Crediting the company with dividends on stock owned by subsidiary companies the surplus over dividends is $1,988,053 compared with $3,718,285 the year previous.

Looking closer into the dividend payments it will be seen that the fiscal year's last quarterly dividend of 2 per cent. was paid on $121,878,100 of capital stock, of which $24,797,700 is held in the treasury of subordinate companies of which the New Haven owns all the stock. It seems to be practically the same as regular treasury stock. But if all this stock is issued, the net income of the main company from all sources of $8,893,041 lacks $957,207 of meeting the then dividend requirement. This minor text brings to the foreground the whole subject of the maintenance of future dividends which in some quarters, spite of Mr. Mellen's repeated denials, has been questioned and which, in connection with the coming issue of new stock to the potential amount of about 354,600 shares, has served to depress the market value of the outstanding shares. Such an issue, if made in full and in the hands of the public, would add nominally $2,836,800 more to the dividend requirement.

But just here come a long series of very important offsets. The company, by its figures in the report, holds 109,948 shares of Boston & Maine stock for which its own shares to an equal number were issued in exchange. The number of Boston & Maine holdings since the end of the last fiscal year has probably been somewhat increased. But taking them as they stand in the report the treasury stock looks very much like a block to be used chiefly in the final liquidation of the Boston & Maine merger, at least as a matter of present or past intention. But whether that particular group of shares is used in the merger or not, that merger by exchange means an addition of $1 per share instead of $8 to the dividend requirement, and would add to it but about $190,000 instead of $1,520,000, reducing the dividend requirement by the difference, or $1,330,000. This would leave a balance over dividends of about $373,000 on outstanding capital of $121,878,100 and reduce to say $2,500,000 the increased requirement when all the forthcoming stock is issued, which will not be until July 1, 1909. In time alone the company since the close of the last fiscal year will thus have had two years in which to fill that fiscal gap.

But there are yet other factors more concrete than mere time. It is true that the fixed charges of the company, especially those represented by leases and interest, have very greatly increased. Those two items for the last fiscal year show an increase of $4,396,203, which at 4½ per cent. capitalizes into a principal of about $98,000,000. At the special stockholders meeting May 31st of the present year, only a month before the close of the fiscal period, President Mellen stated that the amount of money spent by the company during his administration of about 3½ years amounted to about $157,000,000. Probably about $10,000,000 have been added since. Of this about $100,000,000 have gone into securities of other companies; about $40,000,000 into new equipment, real estate, additional tracks and the electric plant on the lower New York division; and the remainder of about $27,000,000 has been spent in positive physical improvements, advances to leased lines, the insurance fund and other forms of capitalization. As to the investments in securities of other companies President Mellen stated officially some months since that $97,750,000 were paying the interest on their cost—in other words one financial hand was washing the other. As illustrations may be taken the Ontario & Western investment of $13,105,185, costing about $45 a share and returning $1.50 per share; the original investment of some $10,000,000 in the New Haven city street railway system returning $400,000 a year, more than covering $350,000 a year of interest on the debenture purchase bonds; and many purchases of the shares of dividend paying subsidiary roads. Of the remainder investment of say $67,000,000, some of it denotes forthcoming profit and some does not; but much the larger fraction falls into the former category, notably the new trackage above New York, betterment of roadbed, removal of "funnels" like that at New Haven, and the new bridges, all carrying out the Mellen Northern Pacific policy of increased train-load and soon to be available after tying up much capital for several years. To the same class of agencies for future business belongs the purchase of new rolling stock, now coming in rapidly and which includes some 17,000 cars and 137 locomotives, all of the up-to-date standard—additions which have a direct bearing hereafter on a solution of the acute car demurrage controversy.

An impressive example of the tied up capital of the company soon to be released and give returns appears in the Central New England account which is published in the report. In the year 1905, before the New Haven secured control of the line its gross earnings were $979,439. In 1906 under New Haven control the earnings had risen to $1,679,449, and the last report now shows their increase of $2,153,366. To the operating expenses of the Central New England ($2,584,413) are charged the high cost of the repair of the Poughkeepsie bridge resulting in a balance deficit over all of $380,499. The early completion of work on the bridge—costing in all $1,500,000—must shift this deficit into a handsome surplus on a property out of whose total securities of $11,630,500—bought at a very low price—the New Haven owns $9,280,623. Indeed the coming prosperity of the line is such that the New Haven faces a somewhat irksome problem in settling with the minority holders before the regular policy of consolidation can be applied to the property.

To meet, then, an increased dividend requirement rising progressively up to the mid-year of 1909 to about $2,500,000, the New Haven should have (1) increased net revenue due to higher train load and diminished ratio of operating expense, and (2) largely increased income from investments non-productive heretofore and immediately to become productive. Besides fresh operating efficiencies such sources of added income as the Central New England, the coast line traffic, increase of business of the electrics, New York terminal electrification and new trackage may be cited as well as the closer welding of the whole system into an operating unity. The adverse factors of the future in the situation are three. One is prospective expenditure for improvements of the Boston & Maine when taken in. A second is the minor one of the Morse steamship rivalry; and a third, of much more importance, is recession of "prosperity" which would quickly affect the industrial conditions of New England. This last is the only real cloud athwart the New Haven's horizon otherwise all but clear. If the business for which the New Haven has been for years preparing does not come the general "recession" will find the New Haven, along with the other railroads of the country, with a good deal of "hay out," to use the rural term. But it will be in a better position to face the emergency than most of the great railroad systems. And the company has never been in a position calling for very serious enforcement of economies, a fact which suggests larger latitude for that purpose, albeit the economies might have to be brought out through some labor troubles.

The situation summarized shows the New Haven in the position of the farmer whose fields are just ripening for the harvest after his capital has been put into the planting and culture. That the necessity will arise of reducing dividends, allowing for every possible adversity, seems a contingency very far removed indeed.

Three other topics of the report are of prime interest and import (1) the electrics, (2) the Boston & Maine merger, and (3) the policy of centralization. Taking up these subjects in the order of their immediate moment, the report drops the old head of the Consolidated Railway Company, the holding corporation now technically non-existent, and there is substituted a statement of "earnings and operating expenses of street railway lines" respectively $10,638,057 and $7,022,158, with a balance over operation of $3,615,899. These returns are very incomplete. They do not include full figures for the year on the Connecticut and Rhode Island systems; and they exclude entirely the returns on some 550 miles of electric trackage in Massachusetts, including the Worcester, Springfield and Berkshire systems; nor do the fixed charges above operation appear in the report to show net loss or gain. The facts are that the New Haven Company now owns or controls street railway lines in Connecticut, Massachusetts, Rhode Island and New York state with a trackage of almost exactly 1,500 single-track miles; with capitalization in market values certainly not less than $100,000,000; gross earnings yearly of about $16,000,000; and probably a deficit of some

magnitude as indicated by the words "A deficit in the returns from their operation was estimated to result for a short term immediately following the acquisition" of the Connecticut Railway & Lighting Company's plant and the Rhode Island trolley system. The technical fiction of non-ownership still excludes the Massachusetts lines from the returns. But it is to be hoped that, as soon as possible, for the information not merely of shareholders but of the world, this great venture of a steam railroad corporation into street railways may be kept as a separate entity and its results, physical, financial and operative, be set forth fully. It is unique in the annals of transportation and of world wide interest and value especially now that it is reaching out into the express and freight business and has vast potential interblendings of steam and electric service. The same clarified and separative treatment should

New York, New Haven & Hartford.

characterize the annual returns of the navigation properties of the company now much expanded and covering new coast line business.

In his official references to the Boston & Maine merger Mr. Mellen repeats in substance his recent public utterances. The situation may be tersely stated: Out of some 300,000 Boston & Maine shares of capital stock outstanding the New Haven Company now holds through trustees probably not less than 120,000—enough for moral, if not practical, control, and sufficient also to check absolutely any future control of the Boston & Maine by rival railroad interests. In the difference of dividends of the two companies the New Haven is paying $120,000 a year which may be called the price—and a low one—of its present position of vantage; and it is saving $180,000 a year by postponement of the merger and exchange of the remainder of 180,000 shares of the Boston & Maine. Hence a "stand pat" attitude of the New Haven company awaiting the subsidence of the political tempest in Massachusetts and the dominance of reason over the frothy rhetoric of platforms and the stump.

The New Haven's broad and deep policy of centralization of properties and separate corporations goes on apace stretching in all directions of its many and diversified interests. During the fiscal year seven lines, steam and electric, were merged in the parent corporation, including the Providence Terminal and the Boston & New York Air Line, and there have been other important mergers since, including the first steps in the consolidation of the maze of holding companies of the Rhode Island trolley roads. The ultimate, still on the horizon, is absolute unity and centrality. It has the disadvantage of disguising the losses and gains of some of the branch interests of the great and complex system, but, provided it leaves clear the workings and outcomes of the electric and navigation properties, the policy spells simplicity, new economies and is sane railroading.

Other features of the report are suggestive and some of them new. The schedule of physical improvements and their stages, some 43 in number, fill alone two pages and a half and index the coming economies by operating efficiency. They include the Harlem six-track construction the costly improvements at New Haven, Providence and Waterbury, the Highland division new tracking, with its tunnel between Terryville and Bristol, the elimination during the last year of 27 grade crossings, the Readville repair shop completed the New York division electrification and other improvements too many to be rehearsed. Incidentally may be mentioned the failure to sell more than $1,000,000 of the preferred 4 per cent stock of the New England Investment & Security Company except at unadvisable prices, the acquisition of the coast steamship properties; and—though not referred to in the report—the extended option of the New York Central on the Ontario & Western at purchase price not likely, for obvious reasons, to be taken up. The description of the street railway lines owned and leased in Connecticut and Rhode Island alone shows a single-track mileage of 951 miles and 2,637 cars. The Massachusetts lines would add half as much again to those figures. For the first time appears a full statement of the insurance fund, amounting to $1,077,846, an increase for the year of $81,366. There are other new features of the report of a railroad corporation whose gross earnings, with the Boston & Maine system absorbed, will reach $150,000,000 a year or go beyond it; but which, far above any question of mere magnitude, in the unique-

ness of its policy and problems is an economic object of absorbing interest.

Annexed are the principal results of the year's operation and the change in the summaries of the general balance sheet:

	1907.	1906.
Mileage worked	2,006	2,056
Passenger earnings	$26,758,929	$25,252,124
Freight earnings	28,386,704	27,247,118
Gross earnings	55,601,936	52,984,322
Maint. way and structures	5,479,089	5,614,978
Maint. of equipment	5,638,784	5,668,524
Operating expenses	37,850,081	35,222,586
Net earnings	17,751,854	17,761,735
Net income	8,893,041	10,185,377
Balance sheet total	374,770,119	239,486,335

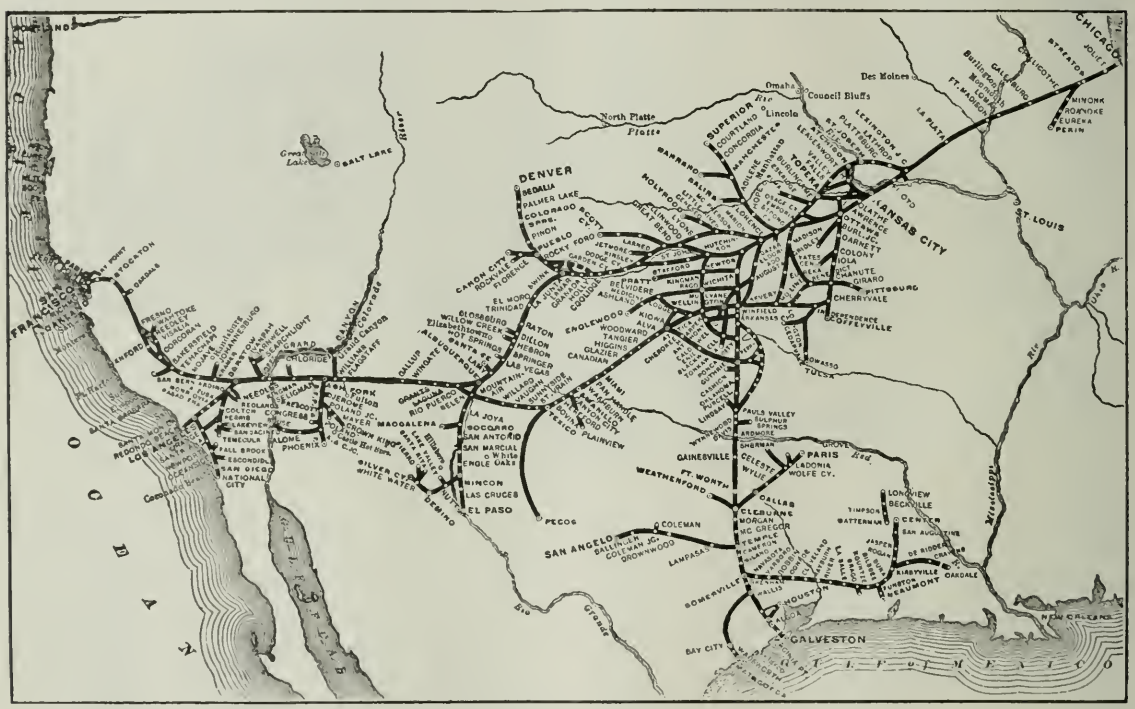
Atchison, Topeka & Santa Fe.

The Atchison, Topeka & Santa Fe again comes forward with a year's record of tremendous progress. That the record of the road since its reorganization in 1896 is nothing short of marvelous is no news, but it is a fact which is constantly receiving added proof. The development has been well rounded, harmonious and general. Not only earnings, gross and net, and surplus for dividends have increased—this last from about $50,000 in 1897 to over $21,000,000 in 1907—but the mileage and influence of the company have been constantly spreading over new sections of the southern half of the great territory west of the Mississippi river and, along with this, the standards of excellence in permanent way have been rising. To-day the Atchison instead of being a lightly built and ill-maintained collection of roads from Chicago to a point nearly 500 miles short of San Francisco, with branches mainly in the bankrupt state of Kansas and in Texas, little more prosperous, is a splendid through route from Chicago to Los Angeles and San Francisco, all the way over its own rails, with thousands of miles of branches and feeders in Kansas—now most prosperous, Texas—a fast growing empire in itself, the new state of Oklahoma, New Mexico, Arizona and California. Instead of being several hundred miles south its interests extend to the north of San Francisco,

where it has during the last year, together with the Southern Pacific, organized the Northwestern Pacific Railway to carry on railroad development in the coast country of northern California. That its policy of expansion is still under way, may be judged from the fact that on June 30, 1907, the company had under construction and nearly ready for operation, 488 miles of new railroad.

It is not to be supposed that the growth in earnings has been only as fast as the growth in mileage. Gross earnings in the year ended June 30, 1897, with 6,444 miles operated, were $30,600,000, or $4,752 per mile of road. Last year the operated mileage had increased to over 9,200 and gross earnings to $93,700,000, or $10,103 per mile of road. This is the first time that gross earnings per mile of road have been $10,000 or over. This 11-year comparison shows not only the great gains in earnings which have come from new lines and new territory, but also the very much greater earning power of the old lines.

The earnings' increases during the last year were large. Passenger earnings rose to $21,200,000, which lacks little of the total freight earnings of the 1897 year, and is an increase of $2,500,000, or 13 per cent. over the previous year. Freight earnings rose from $56,500,000 to $65,500,000, a gain of $9,000,000, or 16 per cent. Mail, express and miscellaneous earnings together increased about $1,400,-



Atchison, Topeka & Santa Fe System.

000. Altogether this makes a total increase in gross earnings of $12,900,000, or 16 per cent.

Operating expenses were $8,900,000 larger than in 1906, of which increase $5,500,000 was in conducting transportation and $2,300,000 in maintenance of way and structures. This left net earnings of $34,800,000, as against $30,800,000 the year before, an increase of $4,000,000, or 13 per cent.

Fixed charges and taxes took about $1,000,000 of this increase. The net income, therefore, was about $3,000,000 larger than in 1906. The dividend rate was 4 per cent. in 1906; the first semi-annual payment in 1907 was 2½ per cent., and the second, 3 per cent., so that the common stock is now on a 6 per cent. basis. Owing to these increases in the dividend rate and an increase of $1,000,000 in the amount of common stock outstanding, the year's dividend payments were larger by about $1,500,000 than in the year before. A new policy was used—or rather a more complete application of an old one—in dealing with the surplus after dividends. This was about $7,950,000 in 1906 and $9,800,000 last year. In 1906, in addition to a small appropriation to the fuel reserve fund, $4,500,000 was set aside for improvements written off, leaving a surplus of $3,200,000 to be carried to profit and loss as the year's final surplus. Last year, besides a similar small appropriation to the fuel fund, $9,600,000, or almost the whole of the surplus after dividends was set aside for improvements, leaving only a nominal final surplus for the year to be carried to the profit and loss account. This is in sharp contrast with the action of the Chicago & North-Western, for instance, which this year abandoned its years-old policy of making a direct appropriation for betterments out of current income. The Santa Fe made what amounted to a further income appropriation by writing off from the book value of "railroads, franchises and other property," $200,000 in cash, the net profits of land sales from the Santa Fe-Pacific land grant, a transaction which does not appear at all in the income account. The total expenditures chargeable to capital account, were $24,200,000, but the deductions out of income reduced this capital charge for the year to about $14,000,000.

The Santa Fe analyzes its maintenance expenditures in some detail. Maintenance of way as a whole, increased faster than the increase in mileage operated, so that the maintenance expenditure per mile of road was considerably larger last year than in the year before. As recently as 1902 only $782 a mile was so spent. This had risen to $1,479 in 1906, while last year $1,648 was spent per mile of line. The maintenance of way cost was largely increased by extensive relocation and reconstruction to reduce grades and curvature. Where, in carrying out this process, parts of the road as originally built were abandoned the cost of construction of the railroad or property abandoned was charged to maintenance of way, while only the additional cost of the new construction was charged to capital account. To state definitely the method followed in such particular circumstances is an exceedingly desirable feature of a railroad report which the Santa Fe has long fulfilled.

The increase in maintenance of equipment was about $850,000. Including a proportion of unlocated maintenance of equipment expenditures chargeable to superintendence, shop machinery and tools, stationery, and other expenses, the unit maintenance costs were $3,037 per locomotive, against $3,101 in 1906; $963 per passenger train car, against $887 in 1906, and $103 per freight car, against $101 in 1906. The same expenditures per revenue freight car mile were exactly the same in the two years, while per locomotive mile and per passenger car mile they were considerably larger. Working out the cost of repairs and renewals according to our usual method, the maintenance cost per locomotive was $2,623, against $2,695 in 1906; $830 per passenger car, against $772 in 1906, and $89 per freight car, against $90 in 1906. These equipment maintenance charges are liberal, particularly as the Santa Fe is generally recognized to have an unusually efficient shop organization.

With an increase of 16 per cent. in revenue freight ton-miles there was an increase of 9 per cent. in both freight-car and freight-train mileage, while the average revenue per freight train mile

increased 6 per cent. The average revenue train load was 320 tons, a gain of 6 per cent. The average carload increased in the same proportion. For the first time in the history of the road the average haul per ton of freight was over 400 miles, having increased from 394 miles to 403 miles during the year. The ton-mile earnings were larger by a very slight percentage.

The passenger earnings, as already mentioned, showed a large increase. With 12 per cent. more passenger miles, the passenger car and passenger train mileage each increased 6 per cent., as did the average passenger revenue per passenger train mile. These figures all show a large increase in the business with a greater economy in handling it.

Almost all classes of freight tonnage increased, the principal exceptions being corn, packing house products other than dressed meats, stone and sand, and forest products other than lumber. There was a large increase in tonnage of agricultural products carried, which rose from 24 per cent. to 25 per cent. of the total tonnage. Two large increases, one under this head, suggest the effects of some of the new extensions as well as the general development of the company's territory. The new lines in Texas must be responsible for part of the increase in the tonnage of cotton, which rose from 176,000 tons in 1906 to 419,000 tons last year. Similarly, the Arizona & California branch from the Ash Fork-Phoenix line west to the Colorado river—a region rich in minerals—must have brought some of the increase in tonnage of ore and bullion which rose from 385,000 tons in 1906 to 530,000 tons last year.

Several new lines were opened for traffic during the year. The Arizona & California has now been extended to Parker, on the Colorado river, 107 miles from its junction with the Phoenix line. It is to be carried across the river and northwest to a junction with the main line at Bengal, Cal. The branch from Barnwell, Cal., to Searchlight, Nev., 23 miles, was opened for traffic on April 1. The line from Kiowa, Kan., via Medicine Lodge, to Belvidere, 49 miles—originally projected as an extension of the Denver, Enid & Gulf, which is now operated as part of the system—was finished during the year. The easternmost extension of the system south of Kansas City, the line from Kirbyville, Tex., eastward, has been put in operation as far as Cravens, La., 57 miles, and track laying is in progress beyond Cravens to Oakdale, La. The branch from Canyon City, Tex., to Plainview, 57 miles, was opened for traffic February 18, 1907. Two small railroads in the beet sugar district of the Arkansas valley in Colorado were bought during the year. They had 68 miles of line in operation at the close of the fiscal year.

Most important of all the new construction was the completion of the Belen cut-off from Texico, N. Mex., west to Belen, 250 miles. Its extension from Belen to Rio Puerco, 19 miles, is nearly finished. Heavy work is now in progress to reduce grades and curvature of the line between Texico and Wellington, Kan., the connection on the east of the new cut-off. By June 30, 1908, it is hoped to transfer all of the transcontinental freight business to the new low-grade line thus created, via Wellington, Texico, Belen and Rio Puerco.

The Phoenix & Eastern Railroad, which runs from Phoenix east along the Gila river to Winkleman, about 100 miles, was sold during the year to the Southern Pacific Company at cost and interest—$2,190,176. Against this there was a net amount of $1,554,474 spent for securities of the Northwestern Pacific Railroad, besides advances of $451,985 to the Grand Canyon Railway.

There were offered to the shareholders by a circular dated May 1, 1907, $26,056,000 of a new issue of 10-year 5 per cent. convertible bonds, a higher interest rate than on previous convertible issues. The stockholders subscribed for $9,943,000 of these and the remaining $16,113,000 was sold to J. P. Morgan & Co. As these transactions took place in July or later, they do not appear in the accounts of the year. The need for issuing these bonds is evident from the item of cash on the balance sheet, which stood at $17,300,000 a year ago, against $8,200,000 on June 30, 1907. In contrast with many other companies it is notable in this connection that no notes or bills payable of the Santa Fe or of any of its auxiliaries are outstanding.

President Ripley sums up the business of the year and the outlook for the future, the latter in an unusually brief and clear presentation of the facts of the present business situation as affecting railroads. His remarks on these two subjects are quoted in full as follows:

> The year was one of extraordinary business prosperity. The rapid colonization of the southwest, the bountiful crops, the discovery and development of mineral deposits and the growth of miscellaneous business, due to the general increase of wealth, all contributed to the increase of traffic on your lines. At times the increase in the volume of traffic was so large that the company's equipment and other facilities were overtaxed and it became impossible to move traffic promptly and satisfactorily. The congestion of traffic on some of your lines and the necessity of moving traffic as speedily as practicable without regard to economy of operation, caused a material increase in operating expenses. On the other hand, climatic conditions were unusually favorable. Your company has begun the new year with its properties in excellent physical condition and with largely increased equipment.
>
> In order to enable the railroad companies of the United States to furnish the additional transportation facilities required by the rapid growth of the country in population and business activity it will be necessary to expend many hundred millions of dollars of additional capital. The power of the railroads to obtain this additional capital has been greatly impaired by loss of confidence of investors in the stability and security of railroad investments, and this loss of confidence has been caused, in great measure, by the unfriendly attitude of a large part of the press, and by the arbitrary action of legislatures and railroad commissions in reducing rates and imposing burdensome restrictions, often without investigation or consideration of the consequences.
>
> The public, apparently, has failed to appreciate that capital invested in railroads yields very moderate returns, having regard to the prevailing rates of interest and to the profits upon capital employed in other kinds of business, and the people, also, has failed to perceive that the whole country is interested in maintaining the prosperity and financial credit of the railroad companies. Few companies in the United States have been more prosperous than your company. Yet even during the year ending June 30, 1907, which was the most prosperous year in its history, net earnings averaged but 6.5 per cent. on the entire capitalization, which is believed to be not in excess of the cost of reproducing your company's properties at the present time. Interest and dividend payments for the year averaged less than 4.6 per cent. on your company's bonds and stocks. For the last 10 years the average net earnings were but 4.82 per cent. on the entire capitalization and the average interest and dividend payments were but 3.71 per cent. on the bonds and stocks. Even these results could be obtained only through the expenditure of enormous sums for construction of extensions and for improvements and additional equipment. During the last 10 years the sums so expended for improvements and additional equipment and for new construction, without counting further large sums expended in purchasing previously constructed branches and extensions, amounted to more than $110,000,000, while the aggregate sums paid to the holders of the preferred and common stock amounted to less than $75,000,000.
>
> It is hoped and believed that the public will soon realize that its recent attitude toward railroad companies in general has not been just to their stockholders and bondholders, and also that unless the confidence of investors in the security and stability of railroad investments is restored, it will be impossible to obtain the additional railroad facilities which are necessary to the development of the country. Under existing conditions, however, your directors have deemed it prudent to suspend various extension projects which were contemplated, and to limit the company's capital expenditures to the completion of improvements to which the company is already committed.

The results for the last two years are given below:

	1907.	1906.
Mileage worked	9,273	8,434
Passenger earnings	$21,171,629	$18,677,817
Freight earnings	65,500,309	56,506,587
Mail, express and miscellaneous earnings	7,011,468	6,616,606
Gross earnings	93,683,407	80,801,010
Maintenance of way and structures	15,286,063	12,949,812
Maintenance of equipment	11,779,847	10,932,033
Conducting transportation	20,538,964	24,089,628
Operating expenses	58,867,901	50,008,485
Net earnings	34,815,506	30,792,525
Net income	21,168,724	18,268,170
Dividends	11,363,723	9,786,910
Betterment appropriation	9,791,226	4,718,985
Year's surplus	13,776	3,227,314

The figures for the fiscal year ended June 30, 1906, are not the same as shown in the last annual report, but are revised to cover lines of the system as now constituted.

Boston & Maine.

Long the railroad ruler of northern New England, itself a consolidation of consolidations, the Boston & Maine is likely soon to be joined with the New York, New Haven & Hartford in a railroad merger which will unite most of the railroads of all New England. To quote President Mellen, of the New Haven, in the annual report of that road printed on another page, "The Boston & Maine is probably as little competitive and is more supplementary and complementary to our system of roads than any other railroad property with which we are now engaged in business." The two roads fit naturally into each other at a succession of different points, and the consolidation, if it comes about, should be of great value to New England in unifying its through lines of transportation.

It was in last February that the first definite rumors came that the Boston & Maine was likely to pass to the control of some other road. For a time it appeared that the New York Central & Hudson River was to be the purchaser. Its annual report issued late in April showed that the Vanderbilt company had invested in over $500,000 Boston & Maine stock. Besides this the American Express Company, controlled by the Vanderbilts, held $3,000,000 stock of the New England road. Soon, however, the burden of probability turned to the New Haven and the *Railroad Gazette* of May 17, 1907, crystallized these rumors into a semi-official prophecy. The final announcement of the facts came early in June through publication of correspondence dated June 4 between Governor Guild of Massachusetts and President Mellen.

The present status of the merger is that the New York, New Haven & Hartford owns not quite $11,000,000 of the $28,000,000 common stock of the Boston & Maine, or a little less than 40 per cent. This amount of stock has already been exchanged for an equal amount of New Haven stock so that the Boston & Maine stockholders who have made the exchange are now getting 8 per cent. instead of 7 per cent. dividends. Meanwhile the whole matter is

held up until next year by the law passed last June forbidding, until the next legislature acts, any further steps toward carrying out the merger.

If he gets control, there is no doubt that President Mellen will apply his well-known "Northern Pacific" policy of general improvement to the Boston & Maine. It needs it. The Boston & Maine is not to-day a first class modern railroad in roadbed or equipment. It has many steep grades on its northern lines, little double track, and is not well ballasted. Some of its locomotives and cars are modern and efficient but a great many of the equipment numbers are filled with antiquated rolling stock. By the end of this year only 286 miles, or about 13 per cent. of the lines, will be block signaled, although the work of equipping 881 miles more at an estimated cost of about $1,000,000 has been begun and is to be completed within three or four years. As a result the road has recently had two or three destructive passenger train wrecks. The annual report of a year ago specifically stated that the lack of needed facilities for locomotive repairs had during recent years become so acute that some of the locomotive repair work was done at outside shops at excessive cost, while at times of special wear and tear, locomotives, badly needed, were kept long out of service while awaiting their turn for repairs in the company's own overcrowded shops. Work was to have been begun last April on the new shops, but the present report does not show that anything further has been done toward providing these needed facilities.

There is one simple ratio, a touchstone of the efficiency of railroad operation, which sums up in itself, directly or indirectly, the Boston & Maine's weaknesses. This is the proportion of gross earnings which is used in the essentially non-productive expense of conducting transportation. Conducting transportation cost on the Boston & Maine last year was 50.6 per cent. of gross earnings, or as much as the Great Northern and Union Pacific managed to get along with in 1906 to cover their total of regular operating expenses, general expenses, maintenance of way and maintenance of equipment, besides conducting transportation. A fairer comparison is the New Haven property with its similar situation and traffic. Conducting transportation in 1907 required 45.5 per cent. of gross earnings on that road—which is considerably less than 50.6 per cent. The Boston & Maine can hardly be, naturally, a more expensive property to operate, for although it suffers from somewhat more severe winter weather, it has nowhere nearly as high a proportion of passenger traffic—whose conducting transportation costs are high, if the statements of railroad managers about the unprofitableness of the passenger business mean anything—as the New Haven, on which passenger traffic makes up nearly one-half of the total. Furthermore, on much of its passenger business the Boston & Maine charges from 2¼ to 3 cents a mile, while 2 cents a mile is the uniform highest rate on all lines of the New Haven system. The meaning of the conducting transportation proportion on the Boston & Maine is not hard to grasp. Half of all the money that is spent for operation produces no lasting result. It may be entirely necessary for a man in moderate circumstances to spend half of his income on food and lodging; for a great railroad it is wasteful and inefficient.

An idea of the character of the northern Boston & Maine lines may be gained from a pamphlet published nearly a year ago dealing with the New Hampshire mileage of the road. Its criticisms may not all be just but they are at least suggestive and not disproved by the general impression gained from traveling on the road in that state. This statement showed that of the 1,100 miles of main track in New Hampshire only 81 miles have second track; that there were few block signals; that there were on the average 48 ft. of wooden bridges per mile, and that as recently as 1905, 27 out of 39 bridges rebuilt were rebuilt of wood; that grades were prohibitive of economical operation; that there was no rock ballast; that passenger-train service was little better than 10 years ago; that mail service, particularly newspaper trains, was very poor; yet that the passenger rate in New Hampshire was 3 cents a mile, against 2¼ cents in Massachusetts.

In general the facts of the case appear to be that the Boston & Maine is in very much the same situation as was the New York, New Haven & Hartford four years ago when President Mellen came to it from the Northern Pacific. The New Haven then had not kept up to the times in improvements to the line and in new equipment and in consequence its operation was inefficient and expensive. All this has to-day been changed and is still further being changed so that the New Haven is becoming more and more efficient as a transportation machine. It is, of course, as yet an open question whether the absolute merger of the two roads will meet with general public approval and be carried out, but if it is, it is safe to say that by the application of similar methods to the Boston & Maine, similar successful results can be obtained from that property.

There are two striking facts in the record of last year's operations on the Boston & Maine, one is the great increase in the cost of operation, the other the fact that, although the total traffic increased, the tonnage of 32 out of the 42 groups of commodities listed decreased. Under the first head, conducting transportation increased by over $2,150,000, the operating pay roll alone being $1,800,000 greater than in the preceding year. Under the second head there were decreases in tonnage of the following classes of traffic:

Agricultural implements	Lime
Brick	Live stock
Bark	Meats, dressed
Boots and shoes	Metal, bar and sheet
Coal, anthracite	Mill products, other than flour
Cement	Ores
Coke	Packing house products—except dressed meats.
Cotton	Petroleum and other oils
Domestics (cotton and wool)	Poultry, game and fish
Flour	Rails, iron and steel
Fruit and other vegetables	Stone, sand and other like articles
Furniture and household goods	Sugar
Grain	Tobacco
Hay	Wines, liquors and beers
Hides and leather	Wool
Iron, pig and bloom	

The increases in tonnage were in the following:

Coal, bituminous	Naval stores
Ice	Paper
Lumber	Potatoes
Merchandise	Wagons, carriages, tools, etc.
Miscellaneous	Wood pulp.

The total tonnage, not including company coal, was 21,765,551 tons, against 21,050,054 tons in 1906.

Gross earnings for the year were $41,100,000, against $39,200,000 in 1906, a gain of just under $2,000,000, or 5 per cent. Of this increase about $1,500,000 was in the earnings of the freight department. The gross earnings per mile of road increased from $17,419 to $18,282.

There was a decrease of $478,000 in maintenance of way and structures and an increase of $225,000 in maintenance of equipment. Per mile, maintenance of way cost $2,144, against $2,353 in 1906. Repairs and renewals cost $1,275 per locomotive, against $1,235 in 1906; $425 per passenger car, against $365 in 1906, and $50 per freight car, against $56 in 1906. These maintenance of equipment figures go far to bear out the statement that the road's equipment, as a whole, is not up to modern standards. They are small for each class of equipment. There must be taken into account, however, the $742,000 spent out of operating expenses for new equipment. Capital account was charged with over $4,000,000 during the year for additional equipment and contracts have been made for still more locomotives and cars to cost $4,500,000. All of these are to be delivered by the early spring of 1908. The large expenditures of these two years for new motive power and rolling stock should go far to bring up the general standard of the locomotives and cars.

Conducting transportation expenses are listed in more detail than by most companies. It has been said that both the Boston & Maine and the New Haven are in reality, from a freight standpoint, nothing more than switching roads for New England as a great manufacturing center. It is suggestive that while $955,000 was spent for freight engineers and firemen, $531,000 went to engineers and firemen of freight switching locomotives. In the same way fuel for road freight locomotives cost $2,400,000, against $1,000,000 for fuel for freight switching engines. The cost of switchmen and yardmen was almost exactly the same as that of all road engineers and firemen, passenger and freight. The cost of fuel has greatly increased during the year, from $4,500,000 in 1906 to $5,300,000 last year. In general, wage payments to freight employees have increased more than to passenger men. The expense of $408,000 for crossing tenders suggests the large number (and incidentally the good protection) of grade crossings. There was $660,000 spent during the year in doing away with these, making a total net expenditure for elimination of grade crossings to June 30, 1907, of $3,800,000. The terminal character of much of the road's mileage is again suggested by the item of freight station service for which $2,300,000 was spent, against $2,000,000 in 1906. The Boston & Maine has to bear a heavy burden in the matter of per diem charges. The freight car service expense was $945,000 last year, against $841,000 in 1906. The expense of advertising during the year increased nearly 75 per cent., due in part, no doubt, to the coming to the road of a new and aggressive General Passenger Agent. Taken as a whole the proportion of conducting transportation to gross earnings greatly increased; from 47.6 per cent. in 1906 to the 50.6 per cent. last year.

The average net earnings per revenue train-mile have slowly but steadily decreased during the last four years. From 49 cents in 1904 the net return has been one cent less each year until it stands at 46 cents in 1907. The average passenger journey is 18 miles, which shows how the commutation travel around Boston overshadows the through business. The Boston & Maine, except for its Boston-Portland lines, lacks the great strength of the New York, New Haven & Hartford in having a through line between two very important cities, or a long through line with heavy travel.

The company owns two electric railroads; one, the street railway at Portsmouth, N. H.; the other, the road from Concord, N. H., to Manchester and Penacook. Together they have 46 miles of line and carried 3,500,000 passengers last year.

There was an increase in the freight haul from 89 to 99 miles during the year. It would be interesting to know exactly what caused this change. Judging from the tonnage statistics, it was probably due more than anything else to the movement of bit-

uminous coal. The bituminous tonnage increased from 1,700,000 tons to 2,400,000, a gain of 40 per cent., and it is probable that at the same time a longer haul was received.

The greater cost of operation is perhaps most accurately seen by the increase in the average cost per locomotive-mile. Averaged against this unit fuel cost 16.4 cents against 14.9 in 1906, and wages 7.7 cents against 7.3 cents, the total cost per mile run was 31 cents, against 29 cents in 1906. On a total of 32,700,000 locomotive-miles, this average increase of 2 cents a mile means a great deal.

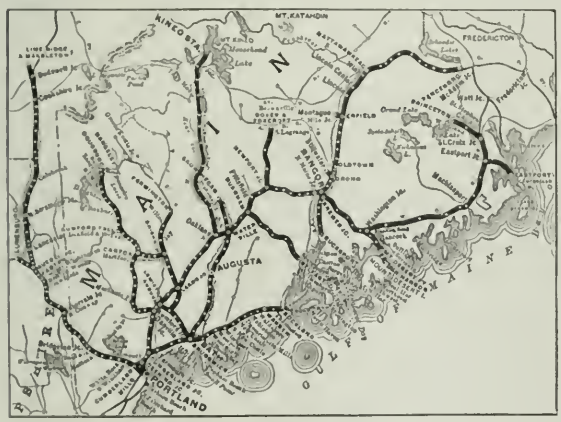
One-year 5 per cent. notes were issued during the fiscal year which, on June 30, stood at $3,700,000. These have just been refunded by an issue of $4,000,000, one-year 6 per cent. notes. The reason the company makes such short term note issues which in consequence bear a higher rate of interest, is that the approval of the Massachusetts Railroad Commission is necessary for a security issue which is to run more than one year.

The principal results of operation were as follows:

	1907.	1906.
Mileage worked	2,228	2,228
Passenger earnings	$13,581,164	$13,291,581
Freight earnings	25,212,813	23,717,913
Gross earnings	41,125,257	39,214,203
Maint. way and structures	4,905,227	5,383,302
Maint. of equipment	3,564,246	3,329,013
Conducting transportation	20,830,959	18,665,030
Operating expenses	30,226,729	28,276,941
Net earnings	10,898,528	10,937,262
Net income	3,310,865	3,128,347
Betterments and new equipment	1,234,918	1,076,427
Year's surplus	132,615	217,274

Maine Central.

The Maine Central, which is controlled by the Boston & Maine through ownership of over 50 per cent. of its capital stock, owns all of the Maine mileage in the Boston & Maine system north of Portland, and, in addition, a line from Portland through the Crawford Notch of the White Mountains to a connection with the Quebec Central, just south of Lime Ridge in the province of Quebec. During



Maine Central.

the past year it has been extending its control of the railroads of Maine, where it already owns most of the railroad mileage. The Somerset Railway, 90 miles long, running from Oakland to Moosehead Lake, was acquired in March by purchase of $650,000 of its $736,649 capital stock. The road has not been merged with the Maine Central but is separately operated for the benefit of its owners. Since assuming its control active measures have been taken to properly complete and equip the property, and it is believed that in the not distant future its passenger and freight traffic will so develop that it will not only be self-supporting, but increasingly valuable as a feeder to the Maine Central.

There have also been acquired the Portland & Rumford Falls properties, consisting of the Portland & Rumford Falls and the Rumford Falls & Rangeley Lakes railroads. These roads run from Rumford Junction, near Auburn, Me., to Rumford Falls and Livermore, where there are already large manufacturing industries, and also from Rumford Falls to the Rangeley Lake region. They have been leased for 999 years at an annual rental of $328,000. The lease is given in full in the report. By it the company comes in possession of the franchises of the Indian River Railway, a company organized to build from the Maine-Quebec line to Megantic, Que., on the Quebec Central and the Canadian Pacific. This, with an extension of the Rumford Falls & Rangeley Lakes from Oquossoc north to the boundary, would give the Maine Central a short connection between Portland and these two Canadian roads. Such a line would considerably shorten the rail distance between Quebec and Portland. The Maine Central also comes in possession of valuable terminal property and privileges at and near Portland by this lease. The new acquisitions are already more than self-supporting and are likely to increase in value with the development of water powers and industries along the Androscoggin river.

The last year was a prosperous one for the Maine Central. Gross earnings were $8,400,000 against $7,800,000 in 1906, an increase of $500,000. Of this $178,000 came through the passenger department. Operating expenses, however, increased sharply. The pay rolls for the year amounted to $3,280,000, or 39 per cent. of gross earnings, against 36 per cent. in 1906. This was an increase of $511,000, or nearly 20 per cent. over the pay roll expense of the previous year. Net earnings were $3,200,000 against $2,600,000 in 1906, an increase of 23 per cent. Net income increased even faster, by 42 per cent. Both of these increases, however, are a good deal due to the fact that, following the Interstate Commerce Commission ruling, in 1907 all additions and betterments, amounting in that year to $721,000, were separately reported and deducted from surplus after dividends instead of being included in operating expenses as in 1906. As no figures for 1906 corrected to show comparisons with the new methods are given, it is not possible to tell how much of the increases in net earnings and income are due to this cause. The principal item under additions and betterments is $369,000 for new equipment.

The Maine Central shows an even greater increase in cost per locomotive mile than the Boston & Maine, from 27 cents in 1906 to 30 cents last year. This was due particularly to increase in cost of fuel and wages. The maintenance of way expenditure was $1,274 per mile against $1,940, a very large decrease, due partly to the change in accounting method. Even the present figure seems reasonably liberal in view of the fact that a good many of the lines run through sparsely settled regions and have thin traffic. The heavy winters, however, require many expenditures on the line which roads in more southern regions do not have. It is evident that the Maine Central has in the past been building itself up out of earnings.

Coal, grain, lumber, paper, potatoes, wood and wood pulp, besides merchandise and miscellaneous, furnish the principal articles of tonnage. The largest item of traffic is lumber; the next, wood. Lumber, wood and wood pulp together make up 1,788,000 tons out of a total tonnage of 5,537,000 tons. The average trainload was 280 tons.

The principal results of operation were as follows:

	1907.	1906.
Mileage worked	931	816
Passenger earnings	$2,708,004	$2,572,796
Freight earnings	5,024,116	4,657,389
Gross earnings	8,348,139	7,794,745
Maint. way and structures	1,076,193	1,483,408
Maint. of equipment	2,223,441	1,872,039
Conducting transportation	1,563,129	1,483,980
Operating expenses	5,149,529	5,265,059
Net earnings	3,198,610	2,589,686
Net income	1,748,412	1,232,614
Betterments and new equipment	1,238,949	$28,027
Year's surplus	161,094	56,218

Illinois Central.

A spirited contest is under way for control of proxies at the annual meeting of the Illinois Central next Wednesday. This contest is between E. H. Harriman through J. T. Harahan, the present President of the company, and Stuyvesant Fish, who until last November had for 20 years been President. Four new directors are to be elected. Of the directors whose term expires, Mr. Harriman is one and Mr. Fish another. The contest will center about the re-election of these two men. Mr. Fish appeals to the stockholders for proxies largely on the ground that complete domination of the Illinois Central by the Union Pacific and the Southern Pacific is threatened, which as the Illinois Central is a north and south line originating more business than it receives, would be to the disadvantage of the Illinois Central shareholders. It is not necessary to go into the other charges which he brings against the present management of the road, as it is not possible from the facts which have been made public to form a fair judgment as to their truth or importance.

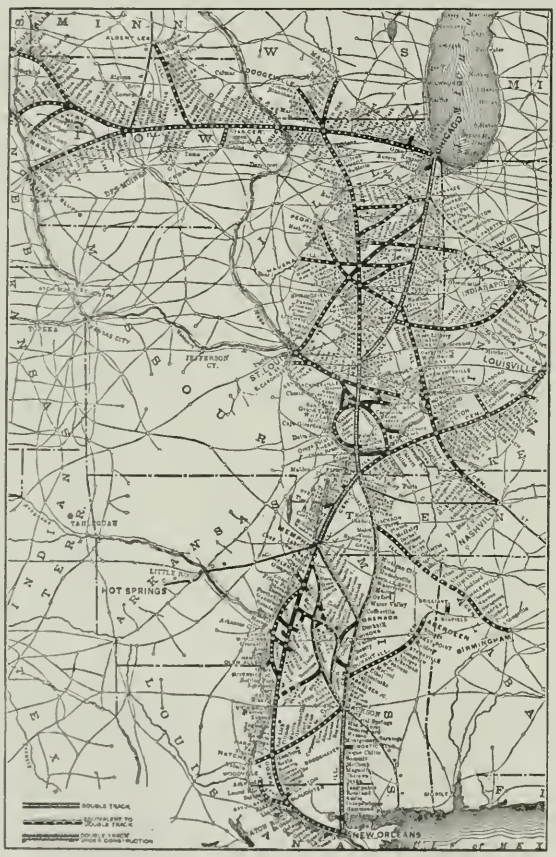
The southwestern railroads are the ones which are showing by far the largest increases in gross and net earnings for the past year. While the Illinois Central is not exactly a southwestern road, nevertheless, its position as the premier through line to the Gulf should give it a large share in the great prosperity of that region. It owns considerable mileage north of St. Louis, earnings on which would not be directly affected by the southwestern prosperity, but most of the mileage south of St. Louis should feel the result of this unusual growth. For this reason the increase of 10 per cent. in gross earnings seems smaller than might have been expected. Gross earnings of Illinois and Iowa railroads in general increased as much as that during the last year, while the increases on the southwestern mileage might reasonably have been considerably larger. Even on the Yazoo & Mississippi Valley, which operates the bulk

of the southern lines, the increase in gross earnings was only 10 per cent.

Nevertheless, the year's results were satisfactory, for in spite of an increase of 10 per cent. in operating expenses, net earnings were 8 per cent. larger than in the 1906 twelvemonth; gross earnings per mile of road increased 11 per cent., and net earnings per mile of road increased 10 per cent.

Operating expenses as a whole were larger by $3,500,000 than in 1906, of which increase $1,900,000, or 25 per cent., was in maintenance of equipment and $1,600,000 or 9 per cent. in conducting transportation. Maintenance of way decreased slightly in the total; per mile operated it was $1,568 against $1,550 in 1906; repairs and renewals cost $2,122 per locomotive against $1,944 in 1906; $775 per passenger car against $819 in 1906 and $92 per freight car against $67 in 1906—this last a large increase.

No specially noticeable gains were made in economy of operation. The revenue train load increased only 3 per cent., from 353 to 364 tons; car loading increased by less than 1 per cent., and net earnings per revenue train mile increased only 4 per cent.



Illinois Central System.

against the increase of 10 per cent. in net earnings per mile of road. With an increase of 6 per cent. in revenue ton miles there was an increase of 3 per cent. in the freight train mileage. Eleven per cent. more passenger miles were handled with an increase of only 5 per cent. in passenger train mileage. Freight earnings per train mile increased 7 per cent. and passenger earnings 3 per cent.

The balance sheet shows that the company needs to borrow money soon, for there was on June 30, 1907, $10,300,000 in bills payable at future dates outstanding, against $1,400,000 a year earlier. This increase represents money borrowed for construction expenditures on the Indianapolis Southern, Yazoo & Mississippi Valley, and the Nashville and the Birmingham extensions and terminals. Against a total of $11,860,000 payable at future dates, the company holds some $29,000,000 par value of bonds free in its treasury. The current assets exceed the strictly current liabilities by $3,200,000, although there was on June 30 only $1,000,000 cash on hand. Both in order to provide more working capital and to finance the large construction expenditures, the Illinois Central will evidently be one of the first railroads to come in the market for new funds as soon as there is an improvement in the demand for railroad securities.

The line to Indianapolis was put in operation last December. It was described in the *Railroad Gazette* of March 15, 1907. The line to Birmingham, Ala., is to be ready for operation by the first of November. Other new construction is a double-track branch from Kensington, Ill., to Hammond, Ind., seven miles, one of whose tracks will be used jointly with the Chicago, Cincinnati & Louisville, giving that road its permanent Chicago entrance, and the other as an electric line by the Chicago, Lake Shore & South Bend, which in return is to give to the Illinois Central trackage rights from Hammond to the United States Steel Corporation's new plant now building at Gary, Ind. A double-track freight line, 16 miles long, is being built around the city of Memphis, Tenn. The Illinois Central has also advanced $120,000 to a company through which the 10 railroads entering Memphis are together building a union station.

The Yazoo & Mississippi Valley, which operates a network of lines in the Mississippi delta as well as the western of the two through lines from Memphis to New Orleans, in all 1,239 miles of line, had gross earnings of $9,500,000, an increase of 10 per cent.; operating expenses of $7,800,000, an increase of 10 per cent., and net earnings of $1,800,000, a gain of 8 per cent. Revenue train load increased from 282 tons to 318 tons or 3 per cent.; while there was a decrease of 9 per cent. in the ton-mile rate and of 2 per cent. in the net earnings per revenue train mile. Maintenance of way cost $1,793 per mile, against $1,810 in 1906 and $1,354 in 1905. There was an increase of 30 per cent. in maintenance of equipment cost.

The following table sums up the operation of the Illinois Central, not including the Yazoo & Mississippi Valley, for the last two years:

	1907.	1906.
Mileage worked	4,371	4,424
Passenger earnings	$11,187,533	$10,004,041
Freight earnings	38,033,271	34,637,124
Gross earnings	56,610,633	51,636,405
Maintenance of way and structures	6,851,450	6,855,173
Maintenance of equipment	9,596,007	7,705,028
Conducting transportation	20,213,508	18,568,355
Operating expenses	37,847,707	34,302,477
Net earnings	18,762,926	17,333,928
Net income	11,687,091	10,862,339
Betterments	3,987,934	4,164,739

Brooklyn Rapid Transit.

The Brooklyn Rapid Transit Company did not make quite as favorable a showing for the year ended June 30, 1907, as in the three years previous. It is not yet in a position to pay dividends on its $45,000,000 stock and probably will not be for some years to come, but meanwhile it is accumulating a large surplus and spending money freely for permanent improvements.

There was a decrease of $116,068 in net earnings and the surplus after all charges was $1,658,444. Last year only $1,090,840 was carried over to surplus, $500,000 having been deducted for contingent reserve fund, a deduction which was not made this year. Gross earnings were $19,381,587, an increase of $908,259, or 5 per cent. In 1906 the increase in gross was 13 per cent., in 1906 11.1 per cent., in 1905, in 1904 and in 1903, 6 per cent. The sudden falling off in growth of gross receipts is due in part to further extensions of the transfer privilege during the year. Of the 511,839,437 passengers carried, 26 per cent. rode on transfers, as against 21 per cent. in 1906. Unfavorable weather, which affected the heavy travel to seashore resorts, also tended to keep down earnings. The surface lines were most affected by both these causes and the result was a decrease of $208,011 or 2 per cent. in gross earnings from these lines. On the other hand, the elevated roads show an increase of $1,065,302 or 18 per cent., as against an increase last year of 14 per cent.

Much of the improvement work carried out during the last three years has been designed to relieve the surface lines in the congested districts by transferring through passengers to and from the elevated roads at outlying junctions. In spite of this the congestion of the surface lines on the Brooklyn Bridge and on Fulton street is now so great that little further increase in traffic can be expected until measures are taken to relieve it. The widening of Livingston street, so long delayed, will do much to help the situation between City Hall and Flatbush avenue, but there is no immediate remedy for the conditions existing at both ends of the Brooklyn Bridge. The opening of the Battery tunnel and the completion of the New York terminal of the Williamsburg Bridge are still some time away, and the complete reconstruction of the Brooklyn Bridge terminals, which has just been begun, is even farther off. It is expected, however, that temporary arrangements will soon be made to run through elevated trains over the bridge during the rush hours, and thus add materially to the carrying capacity of the terminal tracks.

Operating expenses rose from $10,441,377 to $11,465,705, an increase of 10 per cent., although the total car mileage rose only 7 per cent. The principal items which show a large increase in cost are operation of cars, 11.1 per cent.; maintenance of equipment, 9 per cent., and damages, 16 per cent. Notwithstanding unfavorable

weather and the increase in car mileage, cost of operation of power plants increased only 3 per cent., which is a gratifying showing in favor of the new and modern equipment which has been installed during the last three years. The big increase in the item of damages and legal expenses was due largely to the fact that during the year the settlement of pending actions was greatly expedited by the election of a number of additional judges, which increased the capacity of the trial courts about 40 per cent. President Winter has been markedly successful in reducing the number and amount of judgments for personal damages secured against the company during the last five years, and while the actual amounts paid last year increased 16 per cent. the number of cases settled increased 36 per cent.

The total track mileage operated increased from 557 miles in 1906 to 579 miles in 1907. Most of the additional track consists of new sidings and turnouts. The reconstruction of the Brighton Beach line into a four-track road is nearing completion and two tracks are now in use on the permanent location. The entire improvement is to be finished by January 1, 1908. This is the only important construction work being carried on at present, although contracts have been let for the elevated structure to connect the Broadway line with the Williamsburg Bridge elevated tracks. The construction account against which the 4 per cent. refunding bonds of the Brooklyn Rapid Transit Company are issued was much smaller than in 1906. There was $5,703,186 spent, as against $8,414,136 in 1906, a decrease of 32 per cent. Only $762,787 was spent for new cars and electrical equipment, as against $3,460,834 in 1906.

At the beginning of the year there were in the treasury $943,000 refunding 4 per cent. bonds and there were issued by the trustee on account of construction expenditures during the year and for the purchase or exchange of securities, $6,867,000 in bonds, a total of $7,810,000. Of these there were sold only $3,186,000 owing to the poor market, leaving on hand $4,624,000. There was $4,844,934 more expended to June 30, 1907, for which bonds may be issued. The bonds sold during the year brought an average price of only $8.35; the discount, amounting to $371,825, was deducted from the surplus.

The following is a summary of operations for 1906 and 1907:

	1907.	1906.
Miles operated	579	557
Gross earnings	$19,381,587	$18,473,328
Operating expenses	$11,465,705	$10,441,377
Net earnings	$7,915,882	$8,031,951
Passengers carried	511,839,437	452,604,203
Car mileage	68,273,184	63,657,323

NEW PUBLICATIONS.

The Art of Railroading, or the Technique of Modern Transportation. Calvin F. Swingle, Editor-in-Chief. Chicago, Ill.: Railway Publications Society. 7 Vols., 3,230 pages; profusely illustrated. Half leather. $30.00.

Two volumes of the seven are devoted to locomotive engineering; the third is on air-brake practice; the fourth on mechanical examinations; the fifth on locomotive breakdowns; the sixth on machine shop practice, and the seventh on station and train service. When the great mass of technical literature bearing upon these subjects is considered it is of course apparent that it has not all been so condensed as to have been brought within the limits of the work under consideration. Still, the series contains much that will be of value to the man who has not had the advantages of a school training and who has nevertheless an ambition to succeed. He will be taught a great number of facts and a few principles, and it is in the paucity of these matters that the books, like most of their class, are weak. Two examples of work well done and skimmed over follow one another in the first chapter on the duties of the fireman. Where sensible and latent heat are defined the work is so well done and so clearly explained that anyone who can read should be able to understand. But there is nothing to show why a sight feed lubricator delivers oil to the cylinder, and the explanation of the "principle" of the action of the pop valve is confined to a statement of what it does, though the reason can be dug out of the text in another place. So throughout the whole there is plenty of information regarding facts, and plenty of instruction as to what should be done when something definite occurs. In the locomotive section there are full descriptions of the mechanisms of the valves and other working parts, especial attention being paid to the Walschaerts gear, with details of the various extras, as they are called, that enter into the construction of the modern locomotive. By these are meant such parts as gages, safety valves, whistles and the like.

In the volume of mechanical examinations there is a set of tables on the link motion that can be made of great value to anyone who will study them carefully. There are comparatively few who realize the great delicacy of adjustment required in order to secure a proper action of the Stephenson link motion and of the effects of apparently slight changes in the dimensions and location of the parts. These tables show the "effects produced in the distribution of the steam with different laps, leads, travel of valves and points of suspension or locating the stud on the saddle." These are the main points in the variations that are rung in with the link motion but are by no means all. The volume also contains chapters on fuel oil, fuel combustion and modern air brake practice.

In locomotive breakdowns there is sometimes something more than breakdown information proper. The volume is in the form of a catechism and most of the questions and answers have a practical value while others have the appearance of padding. For example, the reply to a question asking how a heavy main rod is to be handled when disconnected is to the effect that someone should be asked to lend a hand. Most of the questions, however, appear to be those that have been genuinely asked and credit for them and for their answers is given to the Brotherhood of Locomotive Firemen's Magazine.

In machine shop practice there is a collection of miscellaneous information starting in at the simple definitions of a primary arithmetic and leading up to logarithms, in a few pages, it passes through "practical geometry" to mensuration, and on to applied mechanics, and then with a brief sketch of the indicator and the methods of calculating horse-power we come to the general description of hand and machine tools with illustrations reproduced from catalogues of manufacturers, and conclude with a chapter on shop kinks. There is very little of this that is original though all of it may be of some value for reference, though of little to show the machinist how work should be done other than that conveyed in the general description of the machines.

The last volume on station and train work is a compilation of a number of papers and addresses that have been delivered by different persons upon the general subject of train handling and which are authoritative in that they emanate from men in positions of responsibility in train work. These are followed by the standard code of train rules, the rules for car loading, with instruction for general station work, concluding with a treatise on telegraphy.

As a whole the work is valuable as setting forth in a general way the salient features connected with certain branches of railroad work, notably that of the locomotive, and without going into these matters with a thoroughness that would make for a perfect understanding of the subject. Cars are not considered at all. The value of such text books is that they may serve as a guide to more extended study and they also serve conveniently for reference for those who wish some specific piece of information and do not care for an extended treatise. The use of the series for such references will be comparatively easy; for, while it is not cross-indexed, it is so arranged that it will be possible to find what is wanted with comparatively little trouble, provided it is there at all.

CONTRIBUTIONS

Parcel Rooms.

New York, Oct. 3, 1907.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Increasing conveniences in railroad service and travel are recognized means of decreasing public hostility. If a standard could be established by the leading lines in the petty matter of collection of fees for holding parcels in the station parcel rooms something would be gained. The lack of uniformity is particularly annoying in New England. It is preferable to collect when a parcel is left as one is not apt to be in a rush.

Again, all newsstands and news companies should be compelled to keep postal cards and possibly stamps, plain paper and envelopes. How often we start on journey, forget a word home or to the office, try to get a postal at the first important stop and receive that chilly response, "We don't keep 'em." GEO. B. LEIGHTON.

Steam and Electric Locomotives.

At the September meeting of the New York Railroad Club a paper was presented on steam vs. electric locomotives that dealt, for the most part, with possible improvements in the steam locomotive, with especial reference to the introduction of the superheater. In discussing the paper C. A. Seley, M.E., of the Chicago, Rock Island & Pacific, said:

All the steam railroads are not to be electrified, at least in our day and generation; neither will a tithe of the magnificent sum of $188,000,000 be spent for superheaters, etc., for the improvement of the 47,000 locomotives now so industriously burning up the company's money. We are altogether too far up in the air in this talk of millions and billions, and the assumptions in this paper are based on united and concerted action and practice which can never obtain until the millennium.

No railroad man believes that blessed epoch to be at hand, although if the views of some of our electrical friends can be believed it is already here. The fact of the two magnificent experiments being made by the railroads in this vicinity in electrification on diverse, and in some ways directly opposed theories and methods, proves my case. It is altogether possible that both are right in their theories and methods, based on their conditions.

The lay mind knows or appreciates nothing of this; hence the

popular cry for electrification, the dear public apparently believing that with the elimination of the smokestack and the other unpleasant concomitants of the steam locomotive and the substitution therefor of the man with the controller handle, all travel and transportation will be made sane and safe, clean, swift, cheap, and in every possible and in some impossible ways, an improvement on present steam railway methods.

The honorable Mayor of my home city came here to New York to investigate steam railroad electrification in order to obtain information that would lead to an amelioration of the horrible conditions brought about by presence within the city limits of Chicago of soft coal-burning locomotives, and there is already a hysterical feeling, bred largely by uninformed newspaper opinion and influence, that Chicago railroads must follow the example of those of New York and electrify.

Does the honorable Mayor, aforesaid, know that the authors of the electrical paper referred to, after closely analyzing and showing by comparison the savings possible by electric operation, go on to state that "the immediate and general adoption of the new motive power by our railroad companies is neither possible nor desirable," explaining that the very magnitude of such operations, coupled with the fact of the youthfulness of the art and the necessity for careful and close analysis of the conditions surrounding each railroad property requires conservative and carefully considered action?

When the chaos now existing north of the Grand Central Station shall have been cleared away, the structures and track equipment are completed, trains running normally, and under electrical power only, and when all the bills are paid, then and then only will we be able to profit by the experience gained in these two applications, so varied, so interesting and productive of discussion and opinion. The New York work of railroad electrification was of necessity, as was also that in Baltimore, and largely on account of tunnels and the traversing of long distances of densely populated sections as well as the movement of a multitude of trains in that territory.

No doubt the evolution of the transportation problem in this city would, sooner or later, without legislative action require the increased movement possibly by the more frequent detached or multiple unit trains, displacing the older transportation methods, and for such movements through tunnels, the comfort of passengers aside from any other consideration is enhanced by electric power. Just how we will take up this matter on the railroads in Chicago remains to be seen, but as yet there is little direct and conclusive information to be gained from New York electrification.

By this time I have probably established myself in your minds as opposed to progress and improvement in transportation methods, but I desire to state that this is not the case. On the contrary I am a firm believer in electric traction wherever there is density of population from which induced travel can be built up by increased transportation facilities. When there is a continued density of population across considerable territory, then electrification is possible and advisable as a railroad main line proposition, otherwise the steam locomotive in the present state of the art.

I will also admit the desirability, although not always conceding the necessity, for electrification of railroads in large cities, particularly those which are terminals and which deal in suburban transportation. I am also a believer in the possibilities in improvement of the steam locomotive and to a certain extent on the lines indicated under discussion.

The performance of superheater engines on the C. P. R., on which the regular coal records and not special test reports shows definite and conclusive savings under weather conditions much worse than we have in the states, should be proof of the value of superheating of locomotives. We are progressing slowly on the Rock Island in superheating. Most of our difficulties have been with details and not with the general principle, and I have no fear but that we and others now taking up superheating will be enabled to improve engine performance.

Modern simple locomotives are, as a rule, carrying too high steam pressure, brought about to some extent by the use of such pressures on compound engines, and we have to realize that a mistake was made for which we are paying dearly in boiler maintenance with no compensating gain in economy.

Dr. W. F. M. Goss contributed a paper last year to the Western Railway Club, based on data, showing conclusively that "the evaporative efficiency of a locomotive boiler is but slightly affected by changes in pressure between the limits of 120 and 240 lbs.," and with an allowable increase of weight for a given boiler better results can be obtained by increasing its capacity than by increasing its strength for carrying higher pressure. With the use of pressures beyond 160 lbs. the difficulty in maintaining boilers, particularly in a bad water district, increases in a startling ratio.

If, then, we take advantage of this, designing boilers for pressures that will contribute to economical maintenance, utilizing also admitted benefit of superheating in further improving the quality of the steam; also eliminating the breakages ensuing on carrying water over into the cylinders, such engines will no doubt give records most favorable as to fuel economy and maintenance.

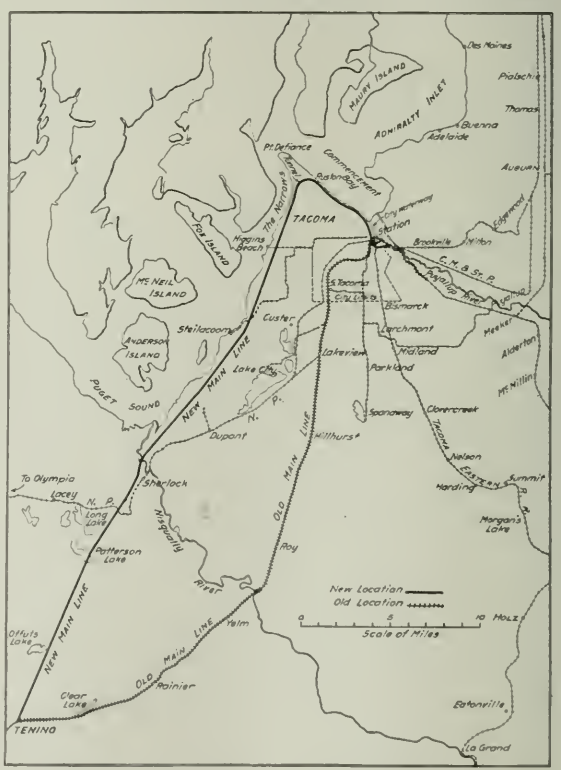
Feed water heating can be perfectly accomplished in stationary practice, but no successful heater has been developed for a locomotive. There may be one produced, but the chances are not in favor of it, as the water should come to a state of rest for precipitation, and this is not possible on a moving locomotive. Prevention is always better than cure, and the best place for feed water impurities is in the outlet of a water purification plant, and it will be found cheaper to take them out there than from the boiler. I have no doubt of getting larger economies in water treating than in heating for purification.

So far, I believe, there is no generally approved smoke consumer for locomotives except a good fireman. The stoker question is just now in a state of development, which is promising, but not yet conclusive. A pneumatic door-opener will decrease the labor of firemen very much and is worthy of attention until a successful stoker is adopted. I do not know if I have saved as many millions of dollars by my recommendations as has the distinguished writer of this paper (referring to Mr. Toltz's paper, not reprinted), but I do agree in the main with him and beg to congratulate him on his defense of the steam locomotive.

The New Tacoma-Tenino Line of the Northern Pacific.

BY H. COLE ESTEP.

At the time the Northern Pacific Railway was built there was nothing in the North Coast region to justify anything but the cheapest possible construction consistent with reasonable safety and economy of operation. But since that time conditions have changed mightily. The territory through which this and other northwestern



Part of Pierce County, Wash.; Showing New Tacoma-Tenino Line.

railroads pass has become comparatively thickly settled and traffic has increased enormously. To meet this demand the roads have been practically rebuilt. The Northern Pacific has been engaged in rebuilding work for 12 years and nearly every mile of track has been changed. There are still, however, a few weak spots in the system, probably the most notorious of which is the Tacoma terminal and the main line from Tacoma to Tenino, 39 miles south. The company has been working on this problem for a number of years, but has just recently begun active operations on a radical relocation of this section of the line.

The problem of getting into Tacoma from the east is easy of solution, the Puyallup river valley forming a natural gateway and a water grade to Commencement bay. But the problem of getting out of Tacoma to the south is very difficult. The bluff rises either vertically or on a 1½ to 1 slope directly from the shore of the bay

to an elevation of about 100 ft. and then shades off gradually, reaching a level plateau at an elevation of 250 ft., five miles back from the shore. Leading down from this plateau are several steep, narrow ravines. These form the only direct approach to the city from the south.

Sixteen miles south of Tacoma the Nisqually river, a stream of considerable size, flows into Puget Sound from the southeast. Access to the plateau back of the city, and the territory south of it, can be gained fairly easily by using this valley. The natural and only logical route for a railroad from Tacoma to Portland is

New Line West of Tacoma Passenger Station.
These tracks are now used for freight transfer.

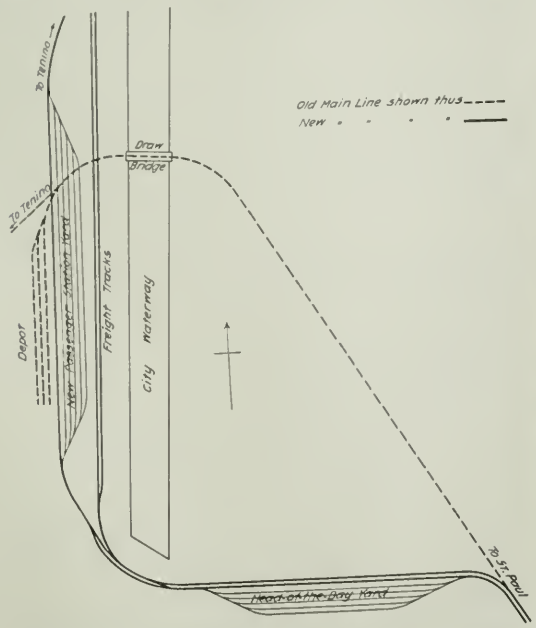
the one which follows the bay shore to the mouth of the Nisqually and then reaches the highland to the south through this gateway. But the construction of a line over this route encounters physical and financial difficulties which the original builders of the Northern Pacific preferred to avoid. They therefore accepted the only alternative and built the main line up the most favorable of the gulches noted above, and thus gained access to the prairie south of the city. This results in a tortuous 2.2 per cent. grade for four miles from Tacoma to South Tacoma, and in what is undoubtedly the most awkward and dangerous terminal arrangement on the coast. Likewise, the present location through the city of Tacoma includes many objectionable features.

The passenger station is approached from the east over a drawbridge which crosses a busy waterway and is open often, causing vexatious delays. Through trains, when ready to proceed, must back out onto the drawbridge and go up the heavy grade to South Tacoma. Trains approaching from the south must come down the same 2.2 per cent. grade, cross at grade the busiest streets of Tacoma and enter the drawbridge which is just at the foot of the hill. Stopping on the bridge, the train is backed up the hill into the station. A more clumsy, dangerous arrangement could hardly be imagined.

Temporary Track Through Tacoma Mill Co.'s Property.

The new location will do away with all of this. Commencing at a point just east of the city the new line, called for the first five miles the Point Defiance line, leaves the main line and turns to the left, passing through the Head-of-the-Bay yards. The tracks then swing around the end of the waterway now crossed by the drawbridge, eliminating this objectionable feature, and proceed due west to Point Defiance. The new passenger station will be located on the site of the present one, but the tracks will be 15 ft. lower. The station will be double-ended and through trains will proceed without switching. Freight traffic will be diverted around the passenger station, using the two freight tracks already built along the bay shore.

The new line, on which construction work is now commencing,



Rearrangement of Tacoma Terminals; Northern Pacific.

Tacoma-Tenino Line near Coal Bunkers.
This illustration shows present temporary tracks.

is 40 miles long from Tacoma to Tenino. The general route is along the shore of Commencement bay for five miles to Point Defiance, thence southward along the east shore of Puget Sound to the mouth of the Nisqually river, thence up the Nisqually valley to Sherlock, crossing the Olympia branch at this point, thence southerly, skirting Patterson lake and Offut's lake, to Tenino, where it joins the present main line.

Aside from the rearrangement of the passenger station and the elimination of the drawbridge, already noted, the new work contains several points of engineering interest, including the line under the bluff near Sperry Mills, the Point Defiance tunnel, and the big fill and bridge crossing the Nisqually valley and river.

From the passenger station to the smelter, four miles west, the line is practically complete. This portion will be double-tracked. Two miles west of the station, near Sperry Mills, the line is flanked by the bay on one side and by a high bluff on the other. For a distance of 500 ft. back of the mill the bluff is practically vertical, and in order to keep it from sliding onto the track a concrete retaining wall, 300 ft. long by 30 ft. high, is being built. Passing through the plant of the Tacoma Mill Company, part of which will be removed to make way for the new line, the track skirts the bay to a point just east of the Tacoma smelter. Here, turning to the south on a 3-deg. curve, the line enters a 4,000-ft. tunnel under Point Defiance. The tunnel is driven through a sandstone formation and the west portal brings the line out to the east shore of The Narrows.

The next point of interest is the crossing of the Nisqually valley. The problem of locating a successful crossing at this point, which baffled the engineers of 30 years ago in laying out the original line, has been boldly solved by two tremendous fills. The river is approached from the north on a long fill varying from 20 to 40 ft. in height. The river itself, which is narrow, is crossed by the customary steel span, and on the south side occurs a duplication of the long, heavy fill forming the north approach. Over 1,000,000 yds. of earth and broken stone will go into these fills. The rest of the line to Tenino, which cuts off one end of Patterson lake, presents no unusual problems and is nothing more than a first-class road through a broken country.

The new line will cost, all told, $5,000,000. It will have 0.3 per cent. maximum grades and 3-deg. maximum curves, whereas the present main line has 2.2 per cent. grades and 8-deg. curves. The location is one of the best pieces of work in the West and was done under the engineering supervision of A. R. Cook, Division Engineer of the Northern Pacific.

Equipment Depreciation and Renewal.

BY WILLIAM MAHL,

Comptroller of the Union Pacific System and the Southern Pacific Company.

The provision in the Interstate Commerce Commission accounting rules effective July 1, 1907, in respect to the charges to be made thereafter to operating expenses under "renewals" and under "depreciation" of the several classes of equipment, has opened a wide field of inquiry and speculation as to the measure of this depreciation. The lack of information on this subject is the cause of considerable perplexity to the railroads; for this reason, percentages for depreciation were adopted and charges growing out of the misunderstanding of the intent of the provision in respect of "renewals" were made, which increased considerably the operating expenses of the railroads for the month of July. The hope is expressed that during the year ending June 30, 1908, sufficient facts on this subject will have been collected to enable the Commission to decide on the percentage of depreciation to be observed by the railroads for the next year for each class of equipment.

In the hope of giving some aid to all concerned in this inquiry, several statements accompany this article bearing on equipment renewals and replacements. These are compiled from data published in the annual reports of the Southern Pacific Company but summarized so as to present the facts in a concrete form. These statements also illustrate a simple method by which the Commission, the investing public, and others interested in the matter may form an accurate estimate of the extent to which the railroads have taken up annually in their operating expenses the cost of equipment worn out, condemned, sold or otherwise disposed of. Any further charge is not within the facts at depreciation applies to the operation of railroads, and it is doubtful if any liabilities thus created would stand in law or would be considered as such in a sale in which the seller contracts to turn over the property free of all debts except outstanding stock and the mortgage debt, or would be recognized as such by the courts in the event of a receivership.

The annual reports of the Union Pacific and of the Southern Pacific state fully the equipment destroyed, condemned or sold and the equipment added during the year, and also the amounts charged respectively to operating expenses, to replacement funds, or to capital accounts. In this illustration of equipment depreciation and renewals, the Southern Pacific has been selected because the even tenor of its operations was not interrupted by a receivership, into which so many railroads were forced during the business depression which followed the panic of 1893, and the accountability for its equipment has not been changed from the policy originally adopted. The value of the statements submitted rest on this policy for, by it, the depreciation was made good in the fullest sense of the term. At some time the precise amount of depreciation must be accurately ascertained, if the data in respect thereof is to be of any value or guide.

In the operation of a railroad, the depreciation is equivalent to the replacement of that which has been worn out, or which was condemned or sold because its further use was unprofitable. The constituent companies of the Southern Pacific Company dealt with their equipment as they did with any other renewals and replacements, that is, they charged to the operating expenses the current cost of a new locomotive or a new car purchased to replace one destroyed, condemned or sold. Nearly all the railroads of the constituent companies had been in operation for a number of years before the Southern Pacific Company was organized. It is safe, therefore, to assume that a considerable depreciation in equipment had already taken place by 1885 and that the time was near at hand when the annual renewals would not be far from the average annual depreciation. The data for the five years from March, 1885, to December 31, 1889, is lacking, but, in the year 1890, Mr. Collis P. Huntington was elected President of the Southern Pacific Company and a definite policy was thereafter observed in respect to equipment renewals. In the closing section of his report for that year the following reference is made to the equipment:

> "There have been destroyed since the year 1885, when this Company commenced to operate these properties, a considerable number of cars belonging to the various companies, the greater part of which were then quite old and of light capacity. Of this number only a part has been replaced, but arrangements will be made to replace the remainder, about 1,150 cars, during the year 1891. Their cost, estimated to be $569,926.65, and representing cars of standard capacity, has been charged up, and this sum is included in the 'Renewal Fund,' shown under the Company's liabilities."

Beginning with 1890 the companies charged to operating expenses the cost of new locomotives and passenger train cars, less salvage, if such cost did not exceed by any considerable sum the cost of the equipment replaced. When the standard capacity of freight cars was 25 tons, and, later on, when this was increased to 30 tons, the companies charged to operating expenses the cost of a new 25-ton or a 30-ton capacity car, less salvage for the old car, for every freight car destroyed, condemned or otherwise disposed of. Exceptions were made in one or two instances in which a large number of old 10, 12 and 15-ton cars of the Oregon & California and of the Central Pacific were condemned; in these instances new cars were added equaling in the aggregate the tonnage capacity of the cars vacated. The companies continued in this course until 1898, when cars of 40 and 50-ton capacity came into use and the price of cars advanced. Prior to 1898 the companies paid $425 to $435 for a standard 30-ton capacity box car complete (the railroads furnishing the air-brake and fixtures), and it was believed to be to the best interest of the companies to make replacement along these lines rather than to take advantage of any technicalities in accounting and to charge a part of such cost to betterments. The use of freight cars of 40 and 50-ton capacity and the much greater cost of steel framing and bodies, the use of passenger train equipment of more costly design, and of locomotives of much greater capacity, made it necessary to modify the former practice in regard to these charges. Since 1898 the increase in wages and in material had also added largely to the former cost of equipment of the same design. The companies, however, have continued to make renewals of equipment along the same lines on which they made all other renewals, that is, at the current cost and have charged to their operating expenses the current cost of replacing the particular type of locomotive or design and character of car destroyed, condemned, sold or otherwise disposed of, less the cash received for it if destroyed on foreign lines or sold, or the value of the old material if destroyed on the home line or dismantled.

The amounts which were thus charged to operating expenses, together with the cash received from sales of, or value of, the old material, were credited to a "replacement fund," which was used to pay for new equipment of the capacity and design then best adapted to the traffic of the railroads. *By these methods two important conditions in railroad management were faithfully observed; first, the integrity of the capital account was maintained, and, secondly, the actual depreciation (i.e. the current cost of the equipment worn out, condemned, sold or otherwise disposed of), was taken up in the operating expenses and made good from the year's income.*

Considerable data relating to equipment matters prior to 1902 was destroyed in the warehouse burned on Pier No. 34, North river, in May, 1907. The data for the six years now submitted, however, will be of greater value in this inquiry than that of the preceding years, because the subject is dealt with during years of great prosperity when the companies condemned and sold equipment liberally, and also because the charge to operating expenses is for equipment at the present high cost and not at the lower cost prior to 1898. In the following tables the cost per annum is based on the average

number of locomotives and cars in service computed monthly. In "repairs" are included the expenditures for repairs and renewals other than replacement for equipment vacated. In "vacated" is included the cost of the equipment destroyed, condemned and dismantled, sold or changed to another class.

No. 1.—Locomotives; Southern Pacific Company.

Year	Average serviceable	Expenditures and charges for		Per locomotive per annum	
	No.	Repairs.	Vacated.	Repairs.	Vacated.
1907	1,691	$5,717,697	$271,820	$3,381.23	$160.74
1906	1,655	5,042,907	767,107	3,047.11	463.60
1905	1,637	5,179,486	142,257	3,164.01	87.59
1904	1,516	5,217,649	70,814	3,442.65	46.49
1903	1,419	4,412,410	197,382	3,109.52	139.10
1902	1,323	3,528,190	247,818	2,666.82	179.78
Average for 6 years	1,540	$4,875,240	$281,862	$3,165.39	$182.70

The large charge for locomotives vacated in 1906 resulted from the fact that a considerable number of locomotives in good condition, but too light for profitable service, were withdrawn. A number of them were sold to saw mills, and to logging and other railroads.

No. 2.—Passenger Train Cars; Southern Pacific Company.

Year	Average serviceable	Expenditures and charges for		Per car per annum.	
	No.	Repairs.	Vacated.	Repairs.	Vacated.
1907	1,700	$1,361,829	$120,889	$801.08	$71.11
1906	1,624	1,191,668	146,950	795.63	90.48
1905	1,566	1,221,568	102,301	780.05	65.53
1904	1,483	1,094,159	128,248	738.00	86.48
1903	1,349	1,013,262	315,930	751.12	234.19
1902	1,300	963,747	124,680	741.34	95.90
Average for 6 years	1,504	$1,141,589	$156,500	$759.20	$104.08

The large charge for cars vacated in 1903 resulted from a charge of $225,000 for cars destroyed by fire on the Alameda Mole.

No. 3.—Freight Train Cars; Southern Pacific Company.

Year.	Average serviceable	Expenditures and charges for		Per car per annum.	
	No.	Repairs.	Vacated.	Repairs.	Vacated.
1907	45,662	$3,875,956	$1,058,274	$88.77	$24.24
1906	44,172	3,173,773	1,289,492	71.85	28.74
1905	44,887	2,889,135	562,053	64.45	12.52
1904	44,571	3,031,840	524,882	68.02	11.78
1903	41,982	2,779,309	512,697	66.20	12.21
1902	38,625	2,380,410	465,372	61.63	12.04
Average for 6 years	42,983	$3,022,404	$732,128	$70.31	$17.03

The large charge for cars vacated in 1906 resulted from the withdrawal of 3,389 cars which, although in good condition, were too light for profitable service. In repairs, are included payments for foreign cars wrecked and the cost of repairing foreign cars while on the company's lines. From records kept for 12 years, the repairs of such cars averaged 7.58 per cent. of the combined repairs of owned and foreign cars.

The per cent. of freight-train cars vacated to the total number of freight-train cars in service at the beginning of each year for the past 17 years was as follows:

Year.	Per cent.	Year.	Per cent.	Year	Per cent	Year	Per cent.
1891	3.44	1896	2.87	1901	3.13	1906	6.83
1892	3.75	1897	2.28	1902	3.53	1907	4.39
1893	3.00	1898	3.54	1903	3.15		
1894	2.57	1899	4.41	1904	3.01		
1895	3.41	1900	3.02	1905	3.48		

Including the large number of cars vacated in the year 1906, the average for the 17 years is 3.63 per cent.

It should be borne in mind that this average of 3.63 per cent. is for cars of wooden construction, of which the cost of a box car probably did not exceed $450, excluding air-brakes. These wooden cars are now replaced by cars largely of metal construction, on which the depreciation will be slight, as, with the exception of cars destroyed or sold because they become unprofitable to use, the damaged or worn-out parts are constantly renewed and the depreciation thus made good. The position of these steel cars is similar to that of locomotives, which are vacated principally because of obsolescence and not of depreciation.

The following statement shows the number of locomotives and cars vacated in each of the six years, the amount credited to the replacement fund, the amount charged to operating expenses, and the amount of salvage:

Year	Locomotives.	Cars: Passenger train.	Cars: Freight train.	Cars: Road service.
1907	34	63	2,949	148
1906	127	47	3,389	103
1905	29	28	1,556	78
1904	17	32	1,367	56
1903	34	78	1,270	33
1902	53	51	1,266	50
Total number vacated	294	299	11,797	468
Total amount credited to replacement fund	$2,733,680	$1,264,139	$6,518,467	$265,504
Total amount charged to operating expenses	1,688,174	938,998	4,392,771	177,717
Scrap value or price realized for equipment sold	1,045,506	325,141	2,125,696	87,787
Av. price per locomotive or per car:				
Credited to replacement fund	9,298	4,228	533	567
Charged to operating expenses	5,742	3,140	372	380
Av. proceeds from sale or salvage	3,556	1,087	180	188

Total credited to replacement fund	$10,781,790
Total charged to operating expenses	7,197,659
Total scrap value or salvage	3,584,131

The sale to saw mills, to logging and other railroads of a considerable number of the locomotives vacated in 1906, added considerably to the salvage value.

Making allowance for the exceptions in the years 1903 and 1906, it will be observed that there has been a fairly approximate average annual charge for equipment vacated per locomotive or per car in service. This charge fixes a unit by which an estimate may be formed by all interested in this question of the extent to which a railroad company is making good the depreciation of its equipment.

There will be as much difference among the railroads in this charge for depreciation as there is now in the average cost per annum for maintenance of way and structures per mile of road, or for the average cost of repairs per locomotive or per car per annum; in fact, in any cost of operation, and rightly so, because the conditions are not alike on any two properties.

The lines of the Southern Pacific Company traverse such an extended area that its equipment is subjected to every climatic condition which affects its service or its life. Therefore, the results here submitted represent about an average of all conditions under which equipment is used or maintained.

From its organization the Southern Pacific Company purchased all equipment for the constituent companies. It did this because it could obtain it on more favorable terms and because a better observance of the adopted standards was secured thereby than if each company dealt separately for itself. The accountability for the equipment vacated, the allotment to the replacement fund or capital account of the respective companies, and the lease, sale or other disposition of equipment owned or purchased was entrusted by Mr. Collis P. Huntington to the writer. In 1886 Mr. Huntington also delegated to him the authority to approve all common standards for equipment for the lines controlled by him east of the Mississippi river, and, in 1894, for the lines of the Southern Pacific Company. In the lines east of the Mississippi river were six constituent companies, each operated by its own officers; the lines west of the Mississippi river comprised originally 26 distinct companies, thus making a total of 32 companies for which all transactions in respect to equipment came under the supervision of the writer up to the time of Mr. Huntington's death in August, 1900. The administration of this trust brought with it a great deal of personal work, and an experience with difficulties and complications which were not apparent until they were met. Much time and labor are required to secure accuracy in accounting for equipment even in so simple a form as that in which the results are reported under the heading of "Equipment" in the annual reports of the Union Pacific Railroad and of the Southern Pacific Company.

Appreciating, therefore, all the difficulties and cost which the keeping of the equipment accounts as contemplated by the Commission will impose upon the railroads without any practical compensation therefor, the writer expresses the hope that the Commission will amend its rules by omitting altogether the provision for "depreciation," and amend the provisions for "renewal" to represent the current cost of replacing all equipment vacated. This change will furnish the Commission with reliable data about the depreciation which has been carried into the operating expenses of the railroads and enable it to order adjustments suitable to each case if any such should be necessary.

Economy Test of 7,500-K.W. Westinghouse Parsons Steam Turbine

On September 1, 1907, an eight-hour economy test was made on turbine No. 253, installed earlier in the year, at Waterside station No. 2, of the New York Edison Co. The test was conducted by the New York Edison Company, under the direction of J. P. Sparrow, Chief Engineer, and the arrangements were carried out in accordance with a mutual agreement between builder and operator, entered into previous to the test. The results, as here given, were obtained by independent computation.

The turbine unit tested is of standard Westinghouse construction throughout. It has a maximum rated capacity of 11,250 kw., and was built to operate on 175 lbs. steam pressure, 28 in. vacuum and 100 deg. superheat. Under these conditions, the turbine unit was guaranteed to have a minimum steam consumption of 15.9 lbs. per kw. hr. at the generator terminals with a normal speed of 750 r.p.m. The electrical efficiency of the generator was guaranteed to be 97.8 per cent., exclusive of friction and windage, at a load corresponding to that sustained during the test. The results of the test detailed below show an economy about 7.5 per cent. better than the guarantee.

During the test period, No. 2 Waterside station sustained practically all of the 25-cycle load on the system, of which the unit under test carried practically 70 per cent., the remainder being carried by the other turbine units in the station. This load was maintained as constant as possible by remote control of the turbine governor by the switchboard operator. Between the first and the last hours of the test, the maximum variation in load was held within 4 per cent. above and below mean. During the last hour, however, the load decreased somewhat. Previous to the test, this

turbine unit had been running on a load of 7,000 kw., which was increased to its test load 10 minutes before the start.

Three-phase electrical load was measured by the two-wattmeter method, using two Weston indicating wattmeters of the standard laboratory type. These instruments were calibrated at the New York Electrical Testing Laboratories immediately before and after the test. Power factor was maintained substantially at unity, and all electrical readings were taken at one-minute intervals.

As a surface condenser was used in connection with this turbine unit, the water rate was determined by weighing the condensed steam delivered from the condenser hot well. This condensation was weighed in a tank mounted on platform scales, with a reservoir above large enough to hold the condensation accumulating between each weighing. These weighings of 12,000 to 13,000 lbs. each were made at intervals of five minutes. By the loop method of connecting the gland water supply the necessity for correcting condensation by an amount equivalent to the weight of the gland water used was avoided. A continuous gland water circuit was used entirely outside of the weighing apparatus, and all overflow from the standpipe was returned to the hot well delivery.

As the circulating water was quite salt, any condenser leakage could immediately be detected by the saliuity of the condensed steam which should be pure distilled water. On this account, condenser leakage was determined entirely by chemical analysis, employing the silver-nitrate test with a suitable color indicator. This method proved extremely sensitive and possessed a decided advantage over the ordinary method of weighing the leakage accumulating during a definite period when the condenser is idle and under full vacuum. As samples of circulating water and condensed steam could be taken at the same time, this method made it possible to discover any change in the rate of condenser leakage taking place during the test, while the method of weighing above described provides only an average result during the period.

In this condensing plant the delivery of the hot well pump is automatically controlled by a float valve in the interior of the hot well. This maintains the water level therein at a practically conatant point, and hence no correction had to be made for difference in level of water in the hot well before and after the test.

Steam pressures and temperatures were determined close to the turbine throttle. As usual, the degree of superheat was obtained by subtracting from the actual steam temperature the temperature of saturated steam at the corresponding pressure carried at the time. All gages and thermometers were calibrated previous to the test at the United States Testing Bureau. Both pressure and superheat were somewhat below the guarantee basis.

Vacuum was measured directly at the turbine exhaust by means of a mercury column with a barometer alongside for reducing to standard barometer—30 in. This also obviated the necessity for temperature correction between the two mercury columns. During the test the vacuum was not maintained quite up to normal.

The following data represents the results of the tests, calculated for the conditions as actually run; i.e., for instrumental errors only:

Duration of test	9:30 a. m. to 5:30 p. m.
Average steam pressure at throttle, lbs. per sq. in. gage	177.5
" superheat at throttle, degs. F.	95.74
" vacuum (referred to 30" Barom.) in Hg.	27.31
" load on generator, kilowatts	9,850.48
" steam consumption, as tested, lbs. per kw. hr.	15.15

Owing to the departure, during the test, from specific operating conditions on which guarantees were based, it was necessary to correct the observed results by the following amounts: Pressure (2.5 lbs. high) correction, 0.25; vacuum (0.69 in. low) correction, 1.84 per cent., superheat (4.26 deg. low) correction, .29 per cent. These corrections were mutually agreed upon previous to the test as representative of this type of turbine. When applied to the observed steam consumption given above, the following results, representing contract conditions, are obtained:

Average corrected water rate during 8-hr. test	14.85 lbs. per kw.-hr.
Guaranteed water rate	15.9 lbs. per kw.-hr.

The load was considerably lower during the first and last hour than during the main part of the test. Neglecting, therefore, these two hours and considering only the six hours period from 10.30 a.m. to 4.30 p.m., the results are as follows:

Average corrected water rate	14.8 lbs. per kw.-hr.
Equivalent water rate	10.65 lbs. b. h.-p.-hr.
Equivalent water rate	9.8 lbs. i. h.-p.-hr.

The two latter quantities are determined by applying conversion factors for generator efficiency and for internal losses.

In connection with these tests, a noteworthy agreement exists between the results noted and those previously obtained from tests of machines of similar design installed in the Manhattan station of the Interborough Rapid Transit Co., New York, and the Long Island City station of the Pennsylvania Railroad, at the same loads and with equivalent operating conditions, the performance of the machines is almost identical. These economic results, while not exceeding in actual steam consumption, the best records of European practice, are extremely good in view of the moderate operating conditions under which the test was conducted.

Progress on the Detroit River Tunnel.

The first section of the twin tubes and caisson of the Detroit river tunnel was successfully sunk in place on October 1, and the work of placing concrete by tremie in deep water is being carried on without difficulty. The accompanying illustration shows the first section, 260 ft. long, being towed down the river from the yard at St. Clair, Mich., where it was built and launched. There will be 10 sections like this, each 260 ft. long, and containing two tubes 23 ft. 4 in. in diameter. The tubes supported in the timber caissons will be sunk in a trench dredged in the bottom of the river and the caissons filled with concrete, completely surrounding the tubes.

Floating the First Section of the Detroit River Tunnel Tubes Into Place.

After concreting of a section has been completed the water will be pumped out of the tubes, a moderate air pressure put on and the work of putting in a reinforced concrete lining 20 in. thick begun from the inside. The tubes are built of boiler plate strongly braced and have a temporary bulkhead on each end which will be removed when the work of lining is begun. For a full description of the Detroit river tunnel work the reader is referred to the *Railroad Gazette*, February 16 and 23, 1906. The tunnel will cost about $10,000,000 and is expected to be completed by June, 1909.

Foreign Railroad Notes.

Express freight trains from Siberia to St. Petersburg and Baltic ports are to run the coming winter for carrying tea, fruit (?), eggs, fish, poultry, game and butter. The time from the River Obi to St. Petersburg will be 254 hours by way of Moscow and 224 hours by the route which passes north of Moscow.

The contract for the construction of a line from the Mer de Glace to the summit of the Jungfrau has been approved. This extension of the present line involves the excavation of a tunnel 2½ miles long under the Friar and the construction of about a mile and a half in the open with an elevator at the end rising to the center of the mountain. In spite of the apparent difficulties of the work, the engineers think that it can be finished in four years and a half of constant work. The capital required for this extension of the line will be $700,000.—*Le Journal des Transports.*

In South Africa railroad cars are used as movable missionary stations. Along the northern extension of the Cape Government Railways, clergymen of the Church of England for the past three years or more have been going up and down the line on locomotives and freight trains acting as missionary pioneers. The Cape government has now given to one of them a railroad car for missionary uses. There is also a similar car in use in the Transvaal and a third in Rhodesia. These cars are fitted up with a sitting room, kitchen and bedroom. They carry illustrated magazines, weekly papers and other literature which is welcomed in regions where good reading is scarce. They are parsonages or rectories on wheels.

Samuel Sloan.

Samuel Sloan, who died on September 25, was nearly 80 years old. He had been in bad health for about a year, although he presided as Chairman of the Board at the meeting of the directors of the Delaware, Lackawanna & Hudson last June. Mr. Sloan was born in Lisburn, Ireland, in 1817, his parents came to this country two years later. He was educated in New York and when he was 15 years old began work in an importing house. He became a partner in this firm, McBride & Co., in 1845, and was its head when he left it 10 years later. He became interested in New York city politics in 1852, and in 1857 was elected to the New York Senate. Two years before he was made a Director of the New York Central & Hudson River, and soon after was elected President of that company. He resigned in 1861 when Commodore Vanderbilt got control. He was then offered the presidency of the New York & Harlem, but declined. He was Arbitrator and Commissioner of Trunk Lines for two years and was then elected President of the Delaware, Lackawanna & Western. This road was then only a short line, getting a little way into the Pennsylvania coal fields. He resigned as President in 1899, being succeeded by W. H. Truesdale, and since that time acted as Chairman of the Board. He had been at various times president of many other roads, including the Michigan Central, the Rome, Watertown & Ogdensburg, and the International & Great Northern. At the time of his death he was a director or officer of 33 companies. He was married in 1843 and his wife and six children survive him.

Samuel Sloan.

A Modern Method of Locomotive Boiler Washing.

At a recent meeting of the Iowa Railway Club E. J. Harris presented a paper descriptive of the equipment used for washing out boilers in use at Valley Junction on the Chicago, Rock Island & Pacific. It is known as the Miller system for washing, changing water in and refilling locomotive boilers. This is comprised of two boilers or heaters, one 5 ft. in diameter and one 6 ft. 8 in. in diameter, both 16 ft. 6 in. long between flue sheets, the smaller placed over the larger and occupying one stall in the roundhouse. Each boiler is filled with flues and has a chamber at each end 2 ft. long, making them 20 ft. 6 in. long at joint of heads. Cold water under pressure from the boiler washing pump is admitted at the bottom of the larger heater, forced through from one heater to the other outside the flues and connection to the roundhouse boiler washing pipes made at top of the top heater. The exhaust steam of the stationary plant and waste water and steam from locomotives in need of boiler washing is used by means of suitable piping connected to the chambers at the ends of the heaters, to heat the cold water, with the result that there is always an abundance of hot water for boiler washing.

When the plant was first installed the steam pipe was connected to the heaters with a Y at one end between the heaters, the idea being that when blowing off the steam would rise to the top heater and hot water fall into the bottom one.

This did fairly good service, but we found when washing two boilers and filling two at the same time it was necessary to cut in a live steam pipe to the heaters to keep the water warm. This was too much of a drain on the stationary boilers, so a plan was developed to admit both steam and hot water to the lower heater. This made a marked improvement, which was still further bettered by the utilization of the waste steam and water of the roundhouse to heat all of the water. To do this partitions were inserted making three sections of the lower heater and two of the top. Waste steam and water was admitted to the central section of the lower heater, the waste steam flowing back through the upper section of flues in middle chamber, forward again through the top section of flues, up through the connecting pipe into lower section of upper heater, back through these flues and forward again in upper section of flues to the escape pipe to roof.

The hot water was made to flow back through the lower section of the flues in the middle chamber of the lower heater and forward again through the flues in the lower chamber to the overflow, thereby getting a perfect circulation through all of the flues of all of the heat obtainable. The results were very satisfactory. A Fahrenheit thermometer placed on the top boiler never registers less than 200 deg. while the usual registration runs from 208 to 212 deg. In fact, it is now necessary to blow off the locomotives into the heater in order to keep the roundhouse free from steam as the escape from the stationary boilers is sufficient to heat the water as evidenced by the continual escape of steam from the overflow pipe at the top of the heater.

With this arrangement the boilers are never allowed to cool except for boiler work, and there have been no cracked sheets since the system has been put into use. This, however, is perhaps one of the least of the benefits derived. The old method of preparing boilers for washing with the heavy power was as follows. Steam was blown off and sufficient cold water admitted to boiler through injector and check to fill boiler. The belly plug was then pulled and sufficient cold water allowed to flow into boiler to maintain a water level in the glass. This was kept up from an hour to one and one-half hours, by which time the boiler would be sufficiently cool to allow its being emptied of water, plugs pulled and washing started. A clear loss of from one to one and one-half hours, as by the new method the blow-off cock is connected to the heater and all of the steam and water blown off in the same time that was formerly used in blowing off the steam alone. The plugs are then pulled and it is found that all of the mud and slush being still hot is very easily washed out, particularly as we are using hot water to wash. Boiler is washed in two-thirds of the time, is washed more thoroughly, plugged and filled with hot water, and if engine is needed the caller is sent after the crew when the fire builder starts his fire in engine. Water being near 212 deg., or boiling point, the engine makes steam rapidly.

One of the heavy engines has been on the turntable under its own steam 25 minutes after the fire was started and where, under the old method, it averaged nine hours after an engine arrived at the cinker pit, to wash the boiler and get it outside ready for its train, the same work is now done in five hours, and with less injury to the boiler, as it never gets cold.

The time saved in doing the work is not the only economical factor. It has been found that under the old method it took about 7,000 gals. of water to cool the boiler, and this at 6 cents per 1,000 gals. cost 42 cents, which is now saved.

Tests were made to determine the saving of coal effected with the results as follows: Engine 1,642 with 3-in. cold water level in glass, water at a temperature of 42 deg. was fired up with 10 sticks of wood (cord), and in 1 hr. 50 min. the gage registered 50 lbs. steam, using 1,368 lbs. of coal.

Same engine with 3-in. hot water level in glass, water at a temperature of 170 deg., was fired up with 10 sticks of cord wood and in 55 minutes gage registered 50 lbs. steam, using 1,020 lbs. coal. Coal in both cases weighed and same man used in building fires.

About 1,600 engines are handled every month at this point, and it was found that the saving in fuel and water during the first 12 months nearly covered the cost of installation. It is also found that the saving in fuel and water amounts to 64 cents per engine as compared with the use of cold water, and that the average saving in these items since the plant was installed has amounted to $515.85 per month.

The new Executive Council of the Italian State Railroads, recently appointed, includes three engineers and two lawyers who belong to the government service, and two engineers and a great landed proprietor outside of the service.

Electrification of the Rochester Division of the Erie Railroad.

BY W. N. SMITH,
Electric Traction Engineer, Westinghouse, Church, Kerr & Co.

The change from steam to electric motive power on a portion of the Rochester division of the Erie Railroad, which took place on the 18th of June, 1907, is the first installation of a single-phase alternating system of electrical motive power on a steam railroad to go into commercial operation. This electrification can justly claim the priority of application of several important features, which are of interest in connection with the discussion on systems best suited for steam railroad electrification. This line was the first to operate electric cars on the single-phase system over the tracks of an operating steam railroad; the first in this country to use 11,000 volts working pressure commercially on a trolley, and the first instance of a heavy electric traction system receiving power from the 60,000-volt transmission line.

All of the construction described below, except that of the 60,000-volt power transmission line and the car bodies and trucks, was designed, executed and placed in operative condition by Westinghouse, Church, Kerr & Co., Engineers, through whose courtesy the drawings and photographs which illustrate this article were furnished.

The section of track equipped is 34 miles long, extending from Rochester over the main line of the Rochester division to Avon, about 19 miles, thence 15 miles over the Mt. Morris branch. The railroad is single track, with sidings at way stations, averaging three to four miles apart. The grades are light, and the curvature for the most part easy, the line being relatively quite straight.

The line was originally laid with 68-lb. rails, but was relaid with 80-lb. rail, taken from another division just prior to the electrification. The roadbed is ballasted with gravel, and the joints are of the Weber type. A single No. 2/0 protected rail bond is applied to each rail joint under the plate, one of the advantages of the high tension single-phase system being that the relatively small current combined with the high impedance of the main circuit renders it unnecessary to resort to heavy bonding. The line crosses a number of bridges, the longest one, that over the Genesee river, about a mile and a half south of Rochester, being 780 ft. long, comprising seven spans. There are also through truss bridges at Rush, and at Caneserauga creek, near Mt. Morris, and a stone arch bridge over Conesus creek, a short distance south of Avon.

The electric service is devoted solely to passenger traffic, which is of the local interurban type. The freight service is handled exclusively by steam as heretofore, as are also the through trains operating between Rochester and Corning over the main line of the Rochester division, a distance of about 94 miles. The steam service between Rochester and Mt. Morris originally consisted of three trains each way daily. The principal villages served are Avon, Genesee and Mt. Morris, the other regular way stations being little more than cross road stops. The population is entirely agricultural, and the Genesee valley traversed by this line is probably one of the most beautiful and prosperous farming regions of New York state. Instead of three round trips per day, the electric service has introduced six complete round trips between Rochester and Avon, and nine between Avon and Mt. Morris.

Rochester Terminal Yard, Four Tracks Electrified, Showing Overhead Span Construction.

POWER SUPPLY.

The power is generated at Niagara Falls, at the plant of the Ontario Power Company, and is transmitted at 60,000 volts, three-phase, over the lines of the Niagara, Lockport & Ontario Power Co. The Iroquois Construction Company built a branch connecting line from Mortimer, about four miles south of Rochester, to Avon, locating it on the Erie right-of-way for nearly the whole distance. The pole construction used on this branch transmission line is of the A-frame type, using two 40-ft. cypress poles, set abreast of each other, and inclined so that their tops are framed together, the butts being joined by horizontal plank braces underground. The conductors are of No. 4, hard drawn, stranded copper cable. The standard length of span between poles is 220 ft., which is shortened at curves where necessary. When crossing over the tracks of the Erie, or other railroads, a special construction of No. 0 copper cables carried on steel towers is used, so reinforced by guys that it is impossible

for a failure of the line to result in dropping the conductors across railroad tracks.

SUBSTATION BUILDING.

The substation building is located in the Y formed by the railroad tracks at Avon, and together with the car shed, is adjacent to the roundhouse and division repair shop. The walls of the building are of brick, resting on solid concrete foundations, the roof and floors being of reinforced concrete. The building is absolutely fireproof. Its dimensions are 39 ft. 8 in. x 41 ft. on the outside and 29 ft. 10 in. high from the top of the foundation to the top of the parapet.

In the basement of the building are located one of the transformer oil tanks and the oil pump. The main floor is divided into three rooms, the main transformer room being 43 ft. x 17 ft. and extending the full height of the structure to allow room for the high tension bus bars, which are carried over the transformers. The remaining space on the main floor is divided into a high tension room 16 ft. 8 in. by 19 ft. 8 in., and the operating room, 19 ft. 8 in. by 24 ft., where is located all the 11,000-volt switching apparatus and the measuring instruments.

SUBSTATION EQUIPMENT.

The transmission line terminates at the lightning arrester yard in the rear of the substation. The three high tension conductors from the lightning arresters enter the substation through glass discs held in 36-in. tile, set in the upper portion of the rear wall of the substation. Within the substation, the wires first pass through three 60,000-volt stick type circuit breakers, mounted directly inside of the rear wall. Thence over bare copper conductors to the three oil insulated choke coils, situated on the mezzanine floor; thence to three oil insulated series transformers, also on the mezzanine floor, from which connections are taken to the power measuring instruments in the operating room. The main connections finally terminate upon a set of copper bus bars in the transformer room directly over the line of transformers.

The 60,000 three-phase current is rendered available for single-phase distribution by means of three transformers of the Westinghouse oil insulated water-cooled type, each of 750 k.w. capacity. For the present installation, two transformers only are used at one time, the third being a spare. The high tension connections are such that in case of one transformer failing while in service, its connections can quickly be taken off of the bus bars and put on the spare transformers. The transformer windings are fitted with taps enabling the three-phase to two-phase "Scott connection" to be used. The low-tension windings can be so connected that either 11,000 volts or 22,000 volts can be obtained, so that in case it should ever be desired to transmit railway current for an extension of 40 or 50 miles to another substation it could readily be done without adding transformers to this equipment. The low-tension windings also have six taps, enabling relatively small variations in the secondary voltage if the same should be necessary to suit operating conditions in the trolley line.

The transformer cases are made of boiler iron. Each rests on a square cast iron base, which is in turn mounted on three pairs of wheels running on an iron substructure in the concrete floor of the room. A track runs lengthwise of the room directly in front of the transformers, a transfer truck running on it, on the top of which there is another set of wheels or rollers, which line up with those on which the transformer cases are set. When it is desired to remove the windings from the transformer case it is only necessary to disconnect the electrical, water and oil connections, roll the transformer off its substructure and on to the truck, which is then pushed to the rear end of the transformer room, where it comes directly under a 10-ton hand hoist.

Two cylindrical iron oil tanks are provided, each of slightly greater capacity than a single transformer. One is located in the basement directly under the transformer room, so that the oil from any transformer can readily be drained into it. The other is suspended from the concrete roof beams at the top of the transformer room, close to the side wall of the building, this being intended to act as a reservoir for distributing oil back into the transformer. The oil is pumped from the lower to the upper tank by means of a steam pump supplied from the boiler room in the adjacent division roundhouse, where steam is always available. From the upper tank oil is fed by gravity into either transformer. It is thus a simple matter to draw the oil off from any transformer if its insulating qualities are found to have depreciated, and the dehydrating, filtering or purifying apparatus can readily be employed with the aid of the pump, and the supply returned again to storage. The oil piping is of iron throughout.

The water circulation is by gravity, the supply coming from the railroad company's water tank system at the adjacent roundhouse, being pumped originally from the Genesee river about a mile distant. An artesian well had been sunk on the premises, but the water was so strongly impregnated with sulphur and other impurities that it was thought best not to introduce it into the copper piping in the transformers, although the cost of such a supply would have been practically nothing.

There are three separate water cooled coils in each transformer case, each one controlled by its own valve, so that the amount of water may be controlled as found necessary under various conditions of load.

The necessary transformation from three-phase to two-phase fits

Overland Bracket Construction for Main Line and Siding at West Henrietta.

in very well with the natural sub-division of the electrified line into two sections, one of which is about 19 miles long, north of Avon, and the other about 15 miles long, to the south of Avon. The connections were therefore laid out to operate the sections upon separate phases of the two-phase secondary system. Either the T or V connection can be used, the latter method being employed at present. Each one of the active transformers therefore feeds a separate section.

The outgoing 11,000-volt feeders run up to the mezzanine floor directly over the operating room, where they emerge from the building through perforated glass disks set in 18-in. round tiles.

A set of call bells is provided so that when the automatic breakers open a bell is rung in the car inspection shed adjoining. Also, if the temperature of any transformer runs above normal, a bell circuit connected to a thermometer in the top of the transformer tank is similarly made to operate. The station itself does not require the continuous presence of an attendant, which is needed in the case of a rotary converter substation. The working force is so organized that the car repair men are always available for manipulating the substation circuit breakers, and the cost of attendance is thereby reduced to a minimum.

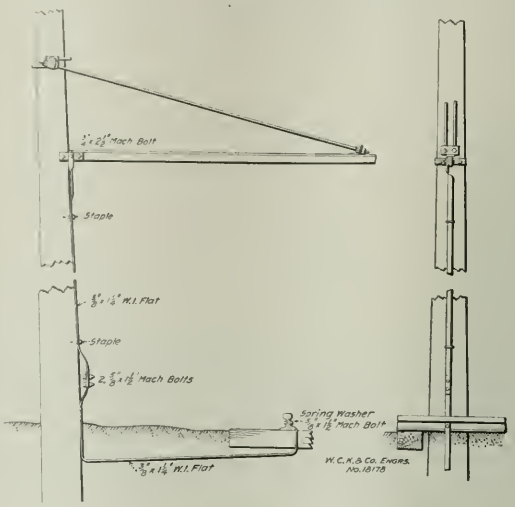
CATENARY TROLLEY CONSTRUCTION.

The overhead trolley construction is in many respects unique. It was the first catenary installation to operate regularly at 11,000 volts. There were few precedents to follow; many of the details of the overhead work are entirely original, and nearly all of them were specially designed for this installation by the engineers who executed the work.

The poles are of chestnut averaging 25 in. in circumference at the top, and about 42 in. at the butt. Most of them are about 35 ft. long, but 40-ft. poles were used where the embankments were narrow and steep, and in span construction. Nearly all the construction is of the bracket type, except at the railroad yards at Rochester, Avon and Mt. Morris, and for some distance at Mortimer, where there is a siding on each side of the main track, which prevented the use of bracket construction. The poles are given about 12 in. rake and are tamped with cobblestones, of which plenty were available from the coarse gravel with which the road is ballasted. Much water bearing gravel and quicksand was encountered in digging the holes and oil-barrels had to be resorted to in many instances to prevent caving in of the holes during pole setting.

The brackets are of an original design, each consisting of a 3½-in. x 2½-in. tee, 10 ft. long, the heel of which is fastened to the pole by a pair of bent straps, the outer end being supported from the pole top by two ⅝-in. steel truss rods, instead of the single rod commonly used for bracket work. The two rods are attached about 27 in. back from the outer end, and run one to each side of the pole, and are fastened there to a pole clamp devised for this work, which grips the top of the pole instead of requiring the bolt or truss rod to pass through it. In this way the timber of the pole is kept intact and does not have a hole bored through it which will admit moisture and induce rot. The two truss rods are threaded at both ends, and at the upper end each one passes through a small iron casting which is in turn carried on a bolt projecting out from the cast iron portion of the pole clamp like a trunnion. The whole construction is extremely rigid, and is stronger and more conducive to a long life for the pole than any bracket hitherto used. Where necessary, at switches, extra long brackets are employed, being lengthened by splicing and an extra truss rod being attached by means of a clamp to the outer end of such a bracket and run to the extreme top of the pole.

The insulator pins are of malleable iron, of a type specially devised for this work. The lower portion of the pin was divided and fitted closely over the flanges of the tee bracket, being provided with a single ⅝-in. bolt, by means of which the lower split portion of the pin is clamped securely against the bracket. The brackets and pins were furnished to the engineers' designs by the Electric Service Supplies Co.

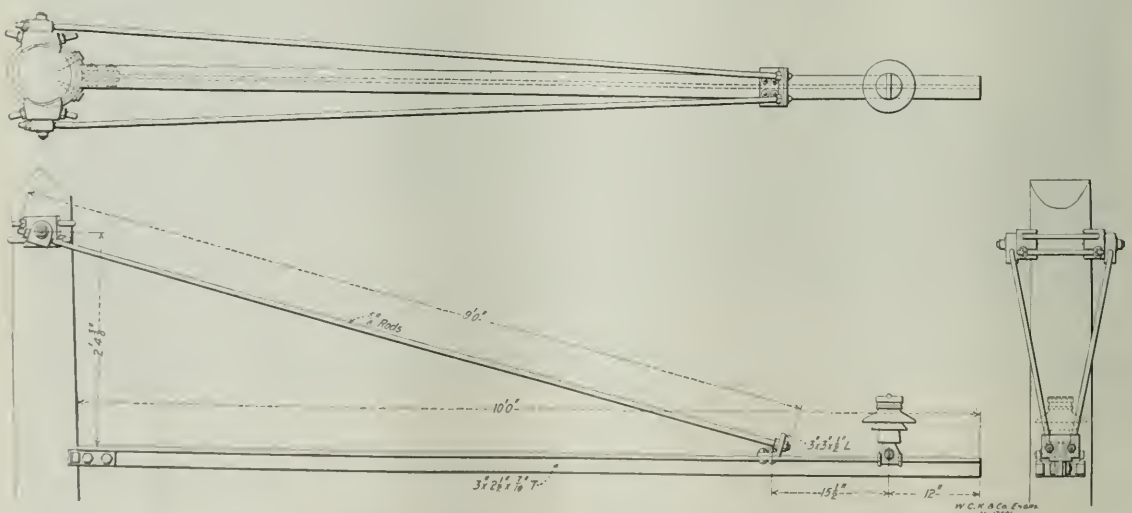


Method of Grounding Trolley Poles; Erie Railroad.

The insulator is of the R. Thomas & Sons manufacture, 6⅞ in. in diameter and 6 in. high, made in two parts, but of the three petticoat type, and known as the No. 3,029. It was designed by the engineers especially for this installation. As most of the overhead work was done during the winter months, and had to be rushed, a quick setting cement of litharge and glycerine was used in place of Portland cement, which not only enabled rapid work in construction, but obviated troubles due to the freezing of hydraulic cement while setting.

The insulator pins are ordinarily about 12 in. from the end of the bracket, but there is a space of 27½ in. between the end of the bracket and the point where the truss rods support it, which enables sufficient variation in location of insulator to meet most of the requirements in shifting the alinement of the trolley wire on curves.

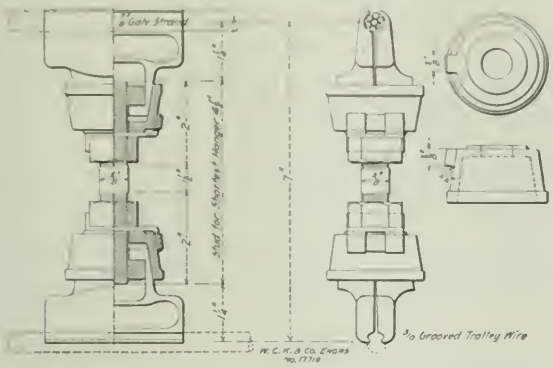
The messenger wire is of "extra high strength" steel, furnished



Standard Catenary Trolley Bracket; Erie Railroad.

by the American Steel & Wire Co. It is of seven strands, and is $^{7}/_{16}$ in. in diameter. Joints are made by using the so-called "open" and "closed" cable sockets, the sockets being sweated on to the abutting ends of the cables and joined by a pin connection through the eyes of the sockets. The trolley wire is No. 000 B. & S. grooved copper, the lengths being spliced with the usual type of soldered splicing sleeve.

The spans on the straight line track are 120 ft. long, and as much shorter than this on curves, as required by the radius of the curvature. The maximum deflection from the center line of the



Standard Catenary Trolley Hanger; Erie Railroad.

track, on curves, is 7 in. each way. The catenary hangers were of the Electric Railway Equipment Co.'s drop-forged type, being modified by the engineers to suit the requirements. The messenger clip and the trolley clip are of the same type but grooved differently to accommodate their respective wires. They are joined by a $^{5}/_{8}$-in. iron hanger-rod, with right-hand threads on each end, the longer rods being flattened in the middle to admit of bending them slightly so as to conform to the divergence of the messenger and trolley wire near the ends of the spans. Both trolley and messenger ears are secured in position by jam nuts. This type of suspension was developed especially for this installation, and is so constructed that there is no possibility of parts coming loose and falling apart on account of vibration. It is also very quickly and easily adjusted on the trolley wires. The hangers are spaced every 10 ft.

The steady strain rods are of treated wood of the Westinghouse Electric & Mfg. Co.'s make, and they are mounted at one side of the bracket instead of directly underneath, in order to give sufficient clearance for the pantagraph trolley on curves where the superelevation results in the tilting of the shoe from the horizontal. Each steady strain rod is hinged to a spool type Thomas porcelain strain insulator, which is clamped to one side of the bracket in such a manner that the hinged end of the rod is almost at the elevation of the top of the tee bracket. The method of attaching the steady strain insulators to the bracket is such that they can readily be shifted along the bracket to follow up any change in alinement of the trolley wire that may be required by curvature or for any other reason. The clamps holding the steady strain insulators are of 3-in. x $^{3}/_{8}$-in. bent iron. The spool type insulators are cemented on to pieces of $^{3}/_{4}$-in. pipe, through which passes the $^{5}/_{8}$-in. eye bolt by means of which they are attached to the bent irons. Steady strains are used only on curves and turnouts and were not found necessary on tangent track.

The tie wires are of No. 9 Extra BB galvanized telegraph wire, because it was thought best not to make too rigid an attachment between the messenger wire and the insulator; so that if a bracket became detached from the pole for any reason, its weight and the shock of detachment would tear the wire clear from the messenger and allow the bracket to fall entirely away from the wire and reduce the chance of steam railroad trains colliding with it. An accident to the electrical equipment of a railroad operating both steam and electric trains may shut down the electric service, but will not automatically place any check upon the steam service, so that accidents to steam trains must be guarded against, as a steam train might easily be wrecked by an obstruction which would automatically prevent power from being supplied to an electric train. This was one of the reasons for installing the system of "ground rods" from the brackets to the rails, which is carried out throughout the installation. Every bracket is grounded to the rail so that an insulator failure will instantly throw off the power, as it will cause a complete metallic short-circuit. There is thus no danger of setting the wooden poles on fire, which would be possible if this precaution were not taken. The burning of a wooden pole would not of itself necessarily cripple the electric service, but it would be quite likely to cause an obstruction dangerous to the passage of steam trains which are, of course, independent of any disturbances of the electric motive power system. Up to the present time, however, there have been no cases where the overhead construction has caused any obstruction to the passage of the steam traffic. The ground rods consist of $^{3}/_{8}$ in. x 1$^{1}/_{4}$ in. flat steel, their upper and lower ends being bolted to track rail and bracket respectively.

The span construction is as nearly as possible similar to the bracket construction, and uses the same type of pin and insulator. A piece of 3-in. x 2$^{1}/_{2}$-in. tee about 30 in. long is suspended from the span wire by hangers of galvanized strand cable, adjustable in length, and fastened to the span wire cable by specially designed clips, the construction forming a sort of stirrup upon which the pin and insulator are carried. The messenger wire rests upon the insulator just as in the case of regular bracket construction. This form is used, not only for spans where there is but one track, but also in the yards at Avon and Rochester, where three or four parallel tracks are electrified. Span construction, in general, was only used where conditions absolutely required it.

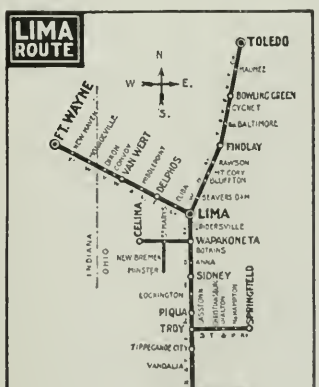
The Rochester yard was a difficult piece of construction on account of the distance between supports which reaches a maximum of 94 ft., where spanning seven tracks, four of which are electrified, and also on account of the uncertain nature of the soil which on the river bank is filled in with gravel and cinders. For these long spans, where it was impossible to use guys of the usual type (the river bank being on one side and the main highway, which gives teams access for loading and unloading of freight cars, on the other side), it became necessary to use self-supporting span construction, and this was done by using the "Tripartite" type of steel pole, set in concrete. This type of pole being constructed of re-rolled Bessemer steel rails is less subject to rust, and consequently more durable than any other available type of metal pole, and all of its surfaces are always open and easy of inspection. On account of the great tensile strength of the material, there is considerable saving in weight, and the fact that it was a standard product, enabled quicker delivery to be made than if special riveted poles of structural steel shapes had been designed for these locations. The span wires consist of the regular messenger cable fitted with cable sockets sweated on at each end, the same being fastened to turnbuckles and pole collars at the tops of the poles. There are two span cables at each pair of poles, the upper one being used to carry the weight, the lower one acting to steady the arrangement and also to act as a relay in case of an accident to the upper span. Similar construction was also used at Avon, where guying of side poles was not always possible.

(To be concluded.)

Electric Railway Competition.

BY RAY MORRIS,
Managing Editor, *Railroad Gazette*.

The *Railroad Gazette* has watched trolley competition closely ever since the inauguration of that competition about 1895, and has from time to time printed accounts of the existing situation in localities where the competition was most severe, and also of the general situation throughout the country. The last one of these general round-ups was printed May 12, 1905, and the method used in obtaining material for the present paper is the same that was used then; that is to say, a letter was written to every interurban line in the country with the request for specific information in regard to through runs, the time occupied in making these runs, the number of cars per day in each direction which made the through run named, steam competition, rates charged by the trolley company, and also by the steam company for its cheapest form of ticket between the points named, and we also inquired whether or not the steam railroad had reduced its fares since the onset of the trolley competition. The accompanying tables contain, in summarized form, the results of these inquiries. It will be seen that the first table includes all interurban runs of 10 miles or more concerning which replies were made to our inquiry. The total number of



Through Routes from Lima.
Toledo to Dayton, 160 miles.

such runs reported was 111, and the total mileage which they covered amounted to 3,361. The average speed of these cars was 19.9 miles an hour, and the average daily service consisted of a fraction under 19 cars in each direction. The average cheapest form of fare on the electric cars cost 1.47 cents per mile, while the average cheapest form of fare on competing steam lines cost 1.85 cents per mile.

TABLE OF INTERURBAN RUNS OF TEN MILES OR MORE.

Road.	Miles.	Speed, miles pr hour.	Cars.	Lowest rate, c. pr m.	Steam competitor.	Lowest rate c. pr m.
CALIFORNIA.						
Northern Electric Co	96.7	25.9	7	2.74	Southern Pac..	*1.05[1]
Petaluma & Santa Rosa	23.3	23	10	2.15	N. W. Pacific..	2.00[2]
COLORADO.						
Denver & Northw'n Ry.	10	20	15	1.50	Colo. & S.	2.00
CONNECTICUT.						
Farmington St. Ry.	14	15	24	1.43		
Groton & Stonington	19.7	14	33	1.56	N.Y.,N.H. & H.	2.00
Prov., R. I.-Danielson, Ct.	35	13	14	1.86	Non compet.	
DELAWARE.						
Cons. Rys., Lt. & P.	11.4	19.5	..	1.53		
GEORGIA.						
Augusta-Aiken Ry. & El.	23.5	15.7	30	1.07	Southern Ry.	2.13
INDIAN TERRITORY.						
Choctaw Ry. & Ltg	18	18	15	2.22	Rock Island	3.00
IOWA.						
Inter-Urban Ry.	36	22.7	11	1.50		[4]
ILLINOIS.						
Aurora, DeKalb & Rockford	30	20	4	2.00	Chic. & N. W.	2.00
Chicago & Joliet Elec.	30	20	30		Chic. & Alton.	2.00[5]
Illinois Valley Ry.	60	20	18	2.00	Rock Island	2.00[6]
Rock Island Southern	18	18	16	1.67	C., R. & Q.	1.80
Sterling, Dixon & E'n.	14.7	17.6	18	1.70	Chic. & N. W.	2.00
IDAHO-WASH.						
Spokane & Inland Empire.	30	43	14	1.84	Nor. Pac.	1.84[7]
INDIANA.						
Chic., So. Bend & Nor. Ind.	52	27.6	8	1.63	L. S. & M. S. & Lig. 4 (part)	1.90
Ft. Wayne & Springfield Tr.	21	16	20	1.90	Grd. Rap. & I.	2.20
Ft. Wayne & Wabash Val.	137	31.1	4	1.79	Lake E. & W.	1.79
Ft. Wayne & Wabash Val.	114	28.6	..	1.98	Wabash	1.98
Ind. Col. & Southern Tr.	42	26.5	2	1.55	Penn.	2.00[8]
Ind., Crawfdv. & Wn. Tr.	45	28.4	16	1.56	Big Four	1.56[9]
Indiana Union Traction.	72	30	..	1.32	Big Four	1.50
Kokomo, Marion & Wn.	30	26	10	1.50	T., St. L. & W.	2.16[9]
Louisville (Ky.) & Nthn.	18	23.6	1	0.74	L. & O. S. W.	2.11
KANSAS.						
Kansas City Wn.	30	20	18	1.25	Mo., Pac.; C., R. & Q.; C. G. W., etc.	1.70[10]
MAINE.						
Bangor Ry. & Elec.	26	18.4	2	1.92		
Bangor Ry. & Elec.	15	12	..	0.67	Me. Central	
Lewiston, Aug., & Wat'v.	29	14.5	28	0.86	Me. Central	1.20[11]
Somerset Traction	12.5	12.5	12	2.40		
MARYLAND.						
Hagerstown & Boonsboro.	13	13	8	2	No comp.	
MASSACHUSETTS.						
Berkshire St. Ry.	29	17.4	35	1.20	N.Y.,N.H. & H.	2.00
Berkshire St. Ry.	21	16.8	36	1.43	B. & A.	2.00
Berkshire St. Ry.	19	15.2	35	1.57	B. & M.	
Boston & Worcester	10.6	17.4	29	1.23	B. & A.	2.20
Boston & Worcester	20.1	16	36	1.12	B. & A.	2.20
Brockton & Plymouth	22.5	11.7	8	1.11	N.Y.,N.H. & H.	2.00
Citizens' Elec. (Newb'pt)	11	11	30	1.00	B. & M. (part)	[12]
Citizens' Elec. (Newb'pt)	15	15	..	1.34	No comp.	
Cone., Maynard & Hudson	15	15	60	1.33	B. & M.	1.66
Conn. Valley S. R.	23	15.4	16	1.01	B. & M.	1.30[13]
Holyoke St. Ry.	23	12.6	32	0.87	B. & M.	0.87[14]
Milford & Uxbridge St. Ry	21	14	20	1.19	B. & A. (part)	1.15
Newton St. Ry.	28	12.1	32	1.25	B. & M.	1.45
Norfolk & Bristol St. Ry.	14	12.5	31	1.43		
Prov. (R. I.) & Fall River	18	13.6	32	1.66	N.Y.,N.H. & H.	1.66
Springfield & Worcester.	60	17.1	14	1.33	B. & A.	1.83
Taunton & Pawtkt. (R. I.)	18	11	16	1.11	New Haven	2.00[15]
MICHIGAN.						
Ben. Har.-St. Joe R.& Lt.	13	13	16	2.31	Big Four	2.00
Detroit, Jackson & Chic.	76	27.6	3	1.32	Mich. Cent.	[16]
Det., Monroe & Toledo (O.)	57	28.5	22	1.32	Lk. Sh., Mich Cen., Pere M	1.32
Grand Rap., Hol & Chic	34	25.5	2	1.25	Pere M (part)	2.00
Houghton County S. R.	16.5	12	36	1.51	Copper Range Min. Range	2.15
Road.	Miles.	Speed, miles pr hour.	Cars.	Lowest rate, c. pr m.	Steam competitor.	Lowest rate c. pr m.
Mich. United Rys.	71	23.6	7	1.48	Mich. Cent.	1.90[18]
Mich. United Rys.	46	32.4	20	....	Mich. Cent.	[15]
Saginaw Val. Tr.	13.7	16.4	15	1.09	Pere Marq.. Gr. Trunk.. Mich. Cent..	1.82
MINNESOTA.						
Twin City Rap. Tr.	18	28.4	30	1	Minn. & St. L.	1.00
MISSISSIPPI.						
Gulfport & Miss. Coast Tr.	20	16	21	0.71	L. & N.	0.71
MISSOURI.						
Metrop. St. Ry. (Kas. City)	12	..	..	0.83	2 roads	1.00
NEW HAMPSHIRE.						
Manchester St. Ry.	18.2	19.9	30	1.37	B. & M.	*0.73
NEW JERSEY.						
Jersey Central Traction	18.9	12.6	..	..		
N. J. & Hud. R. Ry. & Fry.	14	14	41	..	Erie, part way	[20]
Public Service Corporation	28.8	..	..	..		
NEW YORK.						
Brooklyn Rapid Tr.	13.8	12.2	24	0.72		
Chautauqua Tr.	34	18.1	27	0.57	J. C. & L. E.	2.00[21]
Elmira Water, Lt. & R. R.	22.5	18.8	13	1.11	Nor. Cent.	2.00
Fonda, J. & Glov. R. R.	33	25.5	15	..	N. Y. Central	
International Ry.	37.5	26.7	8	0.39	N. Y. Central	[22]
International Ry.	25	25	1	0.58	N. Y. Cent.. Leh. Val.. Erie	0.58[23]
Rochester & Eu. Rapid.	44	27.7	3	1.42	N. Y. Central	2.00[24]
Rochester & Eu. Rapid.	28	26.6	..	1.34	N. Y. Central	2.00[25]
Schenectady Ry.	22.2	22.2	37	1	D. & H.	2.00
Syr., L. S. & Nor.	14	30	1	1.43	D., L. & W.	1.43
Utica & Mohawk Valley	38	†48	40	1.45	N. Y. Central	2.00
OHIO.						
Cincin. & Col. Tr.	53	26.5	10	1.90	B. & O. S. W.	1.90
Clev., Painesv. & Eu.	58.5	25.1	20	1.62	L. S. & M. S., N.Y.C. & St.L	1.88
Clev. S. W. & Col.	56	21.9	4	1.78	L. S. & M. S.	1.78
Mansfield R., L. & P.	12	16	1	2.08	B. & O.	2.00
Springfield & Xenia	20	21.8	19	2	Penn.	2.50
Toledo & Western	59	21.5	5	1.69	C., H. & D.	1.69
Toledo & Western	37	23.4	3	1.62	D., T. & I.. L. S. & M. S.. Wabash	1.62
Tol., Ft. Clint. & Lakeside.	55	28.7	..	0.91	L. S. & M. S., Lksde & Md.	1.59
Tol. Urban & Int.	160	27	8	1.69	T. & O. C.. C., H. & D.. L. E. & W.	1.69
OREGON-WASH.						
N. W. Gas & El. Co.	14	28	18	2.50	O. R. & N.	2.85[26]
Portland R., L. & P. Co.	37	19	8	1.15		
Portland R., L. & P. Co.	15	13	29	*1.33		
PENNSYLVANIA.						
Altoona & Log. Val. El.	15	15	30	1.67	Penn.	2.00
Chambersb. & Gettysb. El.	10	10	2	1.25		
Easton Transit Co.	11	15	32	1.36	C. R.R. of N.J.	2.00
Easton Transit Co.	11.8	16	19	1.27	Lehigh Val.	*0.82
Northern Cambria St. Ry.	10	15	3	2.40	Penn.	3.00
N. J. & Pa. Traction	17	20.4	18	1.76	Penn.	*1.06
Phila. & Easton	32	17.4	17	1.72	Non-compet.	
Valley Traction Co.	23	35	20	1.30	C. V., P. & R.	*0.7
Westchester St. Ry.	14	14	..	..	Penn.	
West Penn. Rys.	40	16	36	1.50	Penn.	2.5
York County Traction	13	15.4	15	1.50	Md. & Penn.	*1.00[27]
RHODE ISLAND.						
Mil'd, Attleboro & Woon'st	12.9	17.2	19	1.16	Non-compet.	
Mil'd, Attleboro & Woon'st.	12.5	12.5	19	1.20	Non-compet.	
Rhode Island Company	17.7	11.8	32	1.18	R. I. El. serv.	
Sea View Railroad	23	25.1	12	1.63	New Haven	2.00
SOUTH CAROLINA (see also Georgia).						
Anderson Traction Co.	10	20	23	2	Southern Ry.	3.1
WASHINGTON (see also Oregon).						
Everett Ry., Lt. & Water	10	20	9	2.50	Gt. Nor.	*1.5[28]
Puget Sound Electric	36.5	29	18	1.37	Nor. Pac.	3.42[29]
Seattle Electric Co.	36	28	14	1.67	Nor. Pac.	2.77
Seattle, Renton & Southern	12.5	15	17	0.80		
Spokane & Inland Empire.	76	25.3	6	2.40	Nor. Pac. and O. R.R. & N.	2.90
WEST VIRGINIA.						
Camd. Interst. (W.Va.&Ky.)	16	13	76	0.90	Ches. & Ohio.	2.25[30]
Fan Handle Traction	17	17	30	1.47	P.,C.,C. & St.L	2.06[31]
WISCONSIN						
Green Bay Traction Co.	24	25	15	1.63	3, part way	2.00
Winnebago Traction Co.	13	15.6	17	1.92	Chic. & N.W., and Wis. Cen.	2.00
Average or total	3,361	19.9	18.9	1.47		1.85

* Commutation rate.
† Maximum, not average; incorrectly reported.
[1] Trolley line newly opened for half the distance.
[2] Steam fares reduced from 5 cts. per mile to 2 cts. per mile by trolley competition. Steam has shortest through route and does three-fourths of the through business. Trolley gets nearly all short haul.
[3] Trolley gets most of the business on holidays; all of it, other days.
[4] Electric railway does 97 per cent. of the business.
[5] Steam road abandoned two local trains, result of electric competition.
[6] Trolley time and distance exclusive of 2½ miles in city streets.
[7] Trolley does 90 per cent. of the business.
[8] Steam fares reduced from 2.92 cts. per mile by trolley competition.
[9] Steam road reduced fare 10 cts., but did not thereby affect trolley fares.
[10] Electricity does 95 per cent. of business.
[11] Steam fare reduced by competition from $1.65 to 75 cents.
[12] 94 per cent of business done by electric road in competing territory.
[13] Steam fare reduced from 50 to 30 cents.
[14] Reduction by steam road of 10 cents.
[15] Competes with electrified branch of New Haven road.
[16] Steam does three-fourths rush hour commutation business, electricity does most at other hours.
[17] Steam min. tickets more restricted than electric.
[18] 16 miles of this is third rail.
[19] Third rail, included in above.
[20] Steam fare less in competing territory, but street railway has developed and holds most of business.
[21] Steam has discontinued all but one round trip daily; electric sells through tickets.
[22] Electric has two-thirds of business.
[23] Electric has most of the business.
[24] Electric does 90 per cent. of business.
[25] Electric does 99 per cent. of business.
[26] 500 electric tickets sold to one steam ticket.
[27] Trolley does all the business; steam commutation tickets restricted.
[28] Electric road does 95 per cent. of the business.
[29] Third rail and trolley; Northern Pacific cancelled all local trains between Tacoma & Seattle after electric began.
[30] Trolley does almost all the business.
[31] Steam rate reduced from 2.94 by trolley competition.

Certain general results are quite clearly shown by this compilation. It will be noted that in a number of states, especially in the eastern and central part of the country, the steam railroad fare has this year been reduced to 2 cents a mile by legislative action.

The effect which this will have on trolley competition is as yet problematical. Railroads in Ohio, Indiana and other highly competitive states have generally found it unprofitable to meet trolley competition with a direct cut in fares, but now that this cut has been forced upon them, it will remain to be seen whether or not

On the Road.

Lands the traveling man in heart of every business district with baggage; no cartage.

End of the Week.

A record-breaking trip because he traveled by the electric. Three days to one the old way.

the other advantages of the trolley car over the steam train; that is to say, the frequent service at easily remembered intervals, and the fact that cars run through city streets and past dwelling houses, shops and farms, will balance the newly reduced rate of fare on the steam railroads. It seems highly probable that the street and interurban railway companies will not at all feel the effect of the reduction in fares. Unfortunately, the answers received to the question relative to the existing state of competition between steam and electric roads were very meagre. The writer hoped to get a general statement from each company in regard to the respective amount of business which it was doing as compared with its steam competitor, but the replies received were so few in number that they do not permit of generalization. Some of the answers in specific instances are of great interest, however; thus, the Petaluma & Santa Rosa Company, in California, reports that its steam competitor reduced its fares from 5 cents a mile to 2 cents a mile after the trolley road commenced business, that the steam railroad has the shortest through route and does three-fourths of the through business, but that the trolley gets almost all the short-haul traffic. It is probable that this result is typical of the experience of a very large number of railroad managers; that is to say, where they have to face the competition of an interurban road 20 or 30 miles long, they can scarcely hope to get the short-haul traffic between these points, but are quite likely to get the through haul, especially in hours of maximum travel, if they run a good service at an attractive price. Another example of just this thing is found in the case of the Taunton & Pawtucket Street Railway, 18 miles long, which reports that its competitor, the New York, New Haven & Hartford, does three-fourths of the rush-hour commutation business, while the electric road does most of the business at other hours.

The figures shown in the table for the average cheapest form of fare on the electric cars, 1.47 cents, is a very interesting one.

The Old Way. Freight.

Shipper No. 1: "Great Scott! I ordered those goods 30 days ago by the steam line and not here yet."

The New.

Shipper No. 2: "Yes, I ordered my goods by telephone and here they are the same day. It used to take a week."

In a large number of cases this rate is below the ordinary round trip rate, but it is without a single exception less restricted than the low railroad commutation rates with which it has to compete. The minimum fares on the steam railroads are not infrequently obtainable through the use of monthly commutation tickets, an equivalent form for which on the trolley roads is a ticket entitling the passenger to the same number of rides, but without time limitation. Nothing was more striking in looking over the replies to inquiries than this fact, than that the steam railroads quite invariably found it advisable to restrict the use of their cheapest form of ticket, while the trolley roads with equal unanimity had devised a similar form, but were less anxious to impose restrictions with regard to the user, the time limit or the amount of baggage which might be carried.

The accompanying illustrations taken from an interurban railway circular show very well the controlling reasons which have contributed to the great success of interurban roads in short-haul territory, which can practically be summed up in the word convenience. It is not apparent that the steam railroads are ever going to be able to win back lost short haul business, and it is very doubtful if they want this business. It is far better that suburban and interurban territory should be built up as it is now being built up, so as to supply long-haul passenger traffic, and, above all, freight traffic to steam railroads. In this connection, the policy of the New York, New Haven & Hartford, in controlling substantially all the trolley roads in its territory to a total of over 1,500 miles of electric line, is extremely interesting, and it seems not unlikely that this policy might prove a wise one for imitation in many points of the country outside New England.

The great center of interurban development in this country is Indianapolis, where the steam railroads are much harassed by the competition of the long, fast interurban lines, as may be judged by a glance at a table showing two through lines over 100 miles

Morning.

Gets on the car at her door and lands in the shopping district with out change.

Evening.

No dirt, no smoke, no cinders. A successful day, and all because she goes "the electric way."

long, and six through lines over 40 miles long in the state. Next to Indianapolis probably comes Dayton, then Detroit, then Toledo, then Cleveland, Columbus, Boston and Cincinnati in the order named, and the steam railroads most interested in the suburban and interurban traffic in the vicinity of these cities have not in a single instance made any strong effort to get the trolley lines into their own hands. It seems almost inevitable that the tendency of development for the next 10 or 15 years will be for this form of combination between steam and street railways to take place, so long as the laws remain open and permit it. In England it is impossible for a steam railroad to own and operate a street railway, and it may be only a few years before similar restrictions are placed in this country. In the meantime there are undoubtedly a very large number of places in this country where it would be much to the ultimate profit of the steam railroads to control the electric lines.

As regards the general tendency of interurban development, it is noteworthy that all the important trolley groups of the present day lie between the Great Lakes and the Ohio river, and that they have all arisen as a result of the process of coupling up short local lines originally built in cities and towns and then gradually extended until their ends met. This characteristic is, of course, radically different from that which characterized the growth of the steam railroads in the country. The steam railroads were almost always pushed out to connect distant points, while the trolley lines, at least until very recently, always started as local enterprises and then outgrew their bounds and crowded one another.

Assuming, therefore, that this process of coupling up short lines is the chief characteristic of American interurban development, it is

noteworthy that the process is about completed in the state of Indiana. There are almost no isolated small lines left in the state, where there are some 41 operating street railway companies, all but three or four of which connect with each other. No such complete development has taken place in Illinois or even in Ohio as yet, although these two states perhaps come next to Indiana in interurban importance, and, after mentioning a fairly active state of interurban development in Michigan, and also in New York, Massachusetts, Pennsylvania, New Jersey and Connecticut, of the eastern states, and also in the more densely populated part of the state of Washington, the noteworthy fact is that the rest of the country has scarcely begun building interurban lines at all.

According to the estimate made by the *Street Railway Journal*, there were 63 companies in the year 1906 which earned $1,000,000 or more, as against 53 companies in 1905. There were 44 companies in 1906 which earned between $500,000 and $1,000,000, as against 30 companies in 1905. There were 184 companies in 1906 which earned between $100,000 and $500,000; 100 companies which earned between $50,000 and $100,000, and 90 companies which earned between $25,000 and $50,000, gross earnings in each case being the figure quoted. There were 15 companies which earned more than $5,000,000 each in 1906, as against 14 in 1905, and 20 companies which earned over $4,000,000 in 1906, as against 16 in 1905. The most interesting part of the figures presented was that decreases were practically non-existent, while each of the groups of roads, arranged according to earnings, showed a very substantial gain over 1905. Thus, as we pointed out in reviewing "American Street Railway Investments" last July, the gain of the companies in Group One, having gross receipts of over $1,000,000, was 16 per cent. in 1906 over 1905; the gain in Group Two, having gross receipts between $500,000 and $1,000,000, was 31 per cent.; that of the third group, having receipts between $100,000 and $500,000, was over 24 per cent., and the gain of the group having gross receipts between $50,000 and $100,000, was 29 per cent. When we reflect on these figures and then upon the vast areas in the South and West, where there is practically no street railway mileage, the chances for ultimate profitable development seem almost unlimited.

Table B is a selection from table A of interurban runs of 20 miles or more at an average speed of 20 miles per hour or faster, and is strictly comparable with the table which we prepared in 1905. At this time we obtained an average of 26 miles an hour as the speed of the fastest cars and an average minimum fare of 1.41 cents per mile for the through runs named. This year the average rate of speed is 25.9 miles an hour, practically the same as that of 1905, but the average rate of fare has been increased to 1.56 cents. A number of companies stated in 1905 that they thought fares were too low and there has been a concerted effort since then in several states, noteworthy in Ohio, to increase them.

TABLE OF INTERURBAN RUNS OF 20 MILES OR MORE, AT AN AVERAGE SPEED OF 20 MILES PER HOUR OR FASTER.

Road.	Miles.	Speed, miles pr hour.	Ro'nd trips.	Lowest rate, c. pr m.	Steam competitor.	Lowest rate c. pr m.
CALIFORNIA.						
Northern Elec. Co.	96.7	25.9	7	2.74	So. Pac.	*1.65[1]
Petaluma & San. Rosa.	23.3	23	10	2.15	N. W. Pac.	2.00[2]
IDAHO.						
Spokane & Inland Emp.	30	43	14	1.84	Nor. Pac.	1.84
ILLINOIS.						
Aurora, DeK. & Rockford.	30	20	4	2.00	C. & N. W.	2.00
Illinois Valley Ry.	60	20	18	2.00	Rock Island	2.00
Chicago & Joliet Elec.	30	20	30	..	Chic. & Alton.	2.00[3]
INDIANA.						
Chic., So. Bend & N. Ind.	52	27.6	8	1.63	L.S. & M.S. & Big 4 (part)	1.80
Indiana Union Tr.	137	31.1	1	1.79	L. E. & W.	1.79
Ft. Wyn. & Wab. Val. Tr.	114	28.6	..	1.98	Wabash	1.98
Indiana Union Traction.	72	30	..	1.32	Big Four	1.50
Indianap., Craw. & Wn.	45	28.1	16	1.56	Big Four	1.56
Indianap., Col. & So.	42	26.5	10	1.90	Penn.	2.00[4]
Kokomo, Mar. & Wn.	39	26	about 10	1.50	T., S. L. & W.	2.16[5]
IOWA.						
Inter-Urban Ry.	36	22.7	11	1.50	..	..
KANSAS.						
Kansas City Western	30	20	18	1.25	Mo. Pac. C., R. & Q. C. G. W., &c.	1.70

[1] Commutation rate.
[2] Maximum, not average; incorrectly reported.
[3] Trolley line newly opened for half the distance.
[4] Steam fares reduced from 5 cents per mile to 2 by trolley competition; steam has shortest through route and does three-quarters through business; trolley gets nearly all short haul.
[5] Running time excludes 2½ miles on slow schedule in city streets. Trains of 2 to 4 cars are run.
[6] Steam road has abandoned two local trains, result of competition.
[7] Trolley does 90 per cent. of business.
[8] 10 per cent. reduction in steam fare has not affected trolley business.
[9] Electric road has 97 per cent. of business.
[10] Since trolley began, steam fare reduced from $1.05 to 35 cents.
[11] Minimum time more restricted on steam than on trolley.
[12] Third rail for 46 miles.
[13] Third rail.
[14] Electric does 95 per cent. of business.

Road.	Miles.	Speed, miles pr hour.	Ro'nd trips.	Lowest rate, c. pr m.	Steam competitor.	Lowest rate c. pr m.
MAINE.						
Lewiston, Aug. & Waterville	29	14.5	28	0.86	Me. Central	1.23[1]
MICHIGAN.						
Detroit, Jackson & Chicago	76	27.6	3	1.32	Mich. Cent.	....
Detroit, Monroe & Toledo.	57	28.5	22	1.32	Lake Shore, Mich. Cent., Pere. Marq.	1.32[2]
Grand Rap., Holl. & Chic	34	25.5	2	1.25	P. M., part way	2.0
Michigan United Rys.	71	23.6	7	1.48	Mich. Cent.	1.9[10]
do. (part of above service)	46	32.4	20	..	Mich. Cent.	....[11]
NEW YORK.						
Fonda, Johnst. & Gloversv.	33	25.5	15	..	N. Y. Central.	....
Internat. Ry. Co.	37.5	26.7	8	*0.39	N. Y. Central.	*0.39[12]
do. (Buffalo-Niagara)	25	25	1	*0.58	N. Y. Cent., Lehigh Val., Erie	*0.58[13]
Roch. & E'n Rapid.	44	27.7	3	1.42	N. Y. Central.	2.00[14]
Roch. & E'n Rapid.	28	26.6	..	1.34	N. Y. Central.	2.00[15]
Schenectady Ry.	22.2	22.2	37	1.00	Del. & Hudson	2.00
Utica & Mohawk Val.	38	†38	40	1.45	N. Y. Central.	2.00[13]
OHIO.						
Cincinnati & Col. Tr. Co.	53	26.5	10	1.90	B. & O. S. W.	1.90
Cleveland, Painsv. & En.	58.5	25.1	20	1.62	L. S. & M. S., N.Y.C. & St.L	1.88
Cleveland, S. W. & Col.	56	24.9	4	1.78	L. S. & M. S.	1.78
Springfield & Xenia Ry.	20	21.8	19	2.00	Penn.	2.50
Tol., Pt. Clinton & Lakeside	55	28.7	..	0.91	L. S. & M. S., Lksde & Mrb	1.59
Toledo & Western.	59	21.5	5	1.69	C., H. & D.	1.69
do. (Tol. Adrian, Mich.)	37	23.4	3	1.62	D., T. & I., L. S. & M. S., Wabash	About 1.62
Toledo Urban & Inter.	160	27.0	8	1.69	T. & O. C., C., H. & D., L. E. & W.	*1.69
PENNSYLVANIA.						
Valley Traction Co.	23	†35.0	20	1.30	C. V., P. & R.	*0.7
RHODE ISLAND.						
Sea View R. R.	23	25.1	12	1.63	N.Y.,N.H. & H.	2.0
WASHINGTON.						
Puget Sound Elec.	36.5	29	18	1.37	Nor. Pac.	3.4[18]
Seattle Elec. Co.	36	28	14	1.67	Nor. Pac.	2.77
Spokane & Inland Empire.	76	25.3	6	2.40	N.P., O.R. & N	2.9[19]
WISCONSIN.						
Green Bay Traction.	23	25	about 15	1.63	Partial	2.0
Total or average	2,085	25.9	13	1.56		1.82

The "convenience" feature of trolley service, mentioned above, has always seemed to us to outweigh the specific feature of low fares, or at least of extremely low fares, as a stimulation of traffic, and it seems wholly probable that the extremely low fares quoted in some instances can be advanced somewhat without materially affecting business. For example, the International Railway Company, in competition with the New York Central, gives a minimum commutation fare of 0.39 cents per mile; the Toledo, Port Clinton & Lakeside, in Ohio, a minimum fare of 0.91 cents, and the Lewiston, Augusta & Waterville, in Maine, a minimum fare of 0.86 cents. We cannot see any reason why a trolley road or a steam road, either, should carry passengers at a figure below a cent a mile, except possibly in the case of regular daily commutation traffic, which needs special inducements to make it move long distances, but this is not the kind of work which a trolley line is best fitted to do.

Even a casual review of the facts and figures which have been stated in this paper must show that the interurban business in this country is one of very great promise which has as yet scarcely begun to be developed. The conclusion is irresistible—that the steam railroads most affected should work in line with this movement and not contrary to it, and make of the trolley lines useful friends instead of competitors.

A firm which furnished materials for the Prussian State Railroads made presents to clerks who had to do with ordering and accepting of the materials under the immediate direction of higher officials. These clerks regarded these presents as intended to influence their official acts in favor of this firm, and notified their superior officers. Suit was brought against the firm for slander, and it was found guilty. The court found that, whether accepted or not, the offering of such presents is an insult, as assuming the employees to be capable of a dishonorable act. The Railroad Minister has called attention of all employees to this decision and declared that severe measures will be taken against all who accept and all who offer gratuities of this kind; while those who offer them will be excluded from all business with the State Railroads thereafter.

[1] Electric does two-thirds of business; steam commutation more restricted than electric.
[2] Electric does most of the business; steam commutation more restricted.
[3] 90 per cent. of business done by electric.
[4] 99 per cent. of business done by electric.
[5] Steam road owns trolley road.
[6] Third rail and trolley; Northern Pacific cancelled all local trains between Tacoma and Seattle after electric began operation.
[7] For additional service, see under Idaho.

GENERAL NEWS SECTION

NOTES.

The city council of El Paso, Tex., has passed an ordinance prohibiting ticket brokers from doing business in that city.

Kansas and Michigan railroads are abolishing excursion rates with a view to making 2 cents a minimum as well as a maximum.

The New York Central will restore to its telegraphers and signal men the old rates of pay, which were reduced when the eight-hour law went into effect.

The Atchison, Topeka & Santa Fe has made an increase of two cents an hour in the pay of machinists and boilermakers and one and a half cents an hour in the pay of helpers in the shops.

Eleven residents of Hollis, L. I., have begun suits in the Supreme Court against the Long Island Railroad for injunctions to restrain it from the use of soft coal. Each of the plaintiffs demands money damages.

A suit in equity has been begun before the United States District Court at Atlanta, Ga., by the Central of Georgia, which alleges that the 2½-cent maximum passenger rate ordered by the state railroad commission is confiscatory.

It is stated that a contract has been entered into between the Erie and the Baldwin Locomotive Works whereby the latter is to repair one engine a day for the road. The work is to be done in the Eddystone shops near Philadelphia.

Trainmen and shopmen are striking on the United Railways (Havana, Cuba), and strike breakers have recently been brought in from the United States. There is no strike on the Van Horne system or the Cuba Eastern or the Cuban Central.

At the annual meeting of the Boston & Maine stockholders last Wednesday, less shares were voted than were needed for a quorum to elect Directors. This was because the 109,949 shares held by the New Haven, could not, under the act passed by the Massachusetts legislature last June, be voted.

The principal railroads of South Dakota have secured in the United States Court a temporary injunction against the enforcement of the reduction in passenger rates from 3 cents a mile to 2½ cents, which had been ordered by the State Railroad Commission to go into effect October 15.

M. V. Richards, head of the Land and Industrial Department of the Southern Railway, is now making a tour of the southern states with a company of 100 cotton spinners and manufacturers from Europe who desire to study the cotton industry of the south. The visitors come from England, Germany, Austria, France, Belgium, Italy and Portugal.

Mrs. Potter Palmer, who came over from Liverpool on the Cunard steamship "Lusitania," September 13, made the trip from Liverpool to Chicago in 6 days, 11 hours, 15 minutes, apparent time —or 6 days, 16 hours, 45 minutes, actual time. Mrs. Palmer left Liverpool September 7, 9.10 p.m.; arrived New York, September 13, at noon; left by the Pennsylvania special at 3.55 p.m.

At the annual meeting of the Canadian Pacific it was announced that additional steamships will be built or acquired either for the Pacific or Atlantic service and two for the lake service. If it is found impossible to acquire two larger and faster boats for the Atlantic service, they will be built, and the "Empress of Britain" and "Empress of Ireland" will be transferred to the Pacific service.

The Pennsylvania Lines West of Pittsburgh have renewed their contract with the Western Union Telegraph Company and the agreement has been extended to cover the Grand Rapids & Indiana and the Columbus & Sandusky. The agreement is taken to mean that the differences between the Pennsylvania Railroad and the Western Union, which led to the termination a few years ago of the contract with the W. U. on the lines east of Pittsburgh, has been settled.

Through the arrest of Joseph Williamson Oct. 7, the New Haven road believes that it has exposed a system of robbery which has cost the railroad $100,000 a year. For several months the railroad has been much annoyed by the disappearance of large quantities of goods in transit, especially in the neighborhood of this city. The transfer barges were watched recently, and it is said that 20 others, including several tugboat captains, have been engaged in looting cars on the barges.

Western roads have decided that on and after Nov. 1 next tickets sold at second class party fares will not be good in parlor cars or standard or tourist sleepers. They have further decided to cease the practice of transferring baggage free between stations, when the owners of such baggage have not through tickets. Kansas roads have decided that local excess baggage in that state shall hereafter be charged 1⅛ per cent of the 2-cent passenger rate, and that home-seekers' excursion rates shall not apply locally in Kansas, nor shall such rates be made from points in the eastern part of the state to points in the western part.

After Jan. 1 clergymen who have been traveling on half rates on all western railroads will be compelled to pay full fare. The Transcontinental Passenger Association will continue to issue half-fare permits to clergymen so long as the rates are not reduced in Colorado, Montana, Arizona and states west of there to the Pacific coast. The permits may also be continued in Louisiana and Texas, where their withdrawal depends upon the state commissions of those states. The action of the railroads is in line with the announced policy of withdrawing all reduced rate privileges in states where the 2-cent laws are passed.

Vice-President W. C. Brown, of the New York Central, at an address at a luncheon given by business men in Boston last week, announced that beginning October 27 through passenger trains would be run between Boston and Buffalo well-equipped for the best service, meaning, presumably, with a full equipment of dining cars. This change probably means the separation of eastbound Boston cars from the New York cars at Buffalo instead of Albany. Mr. Brown said that $1,275,000 was to be spent for additional main tracks on the Boston & Albany, $1,389,600 for locomotives and $364,000 for passenger cars; most of this within the present year. He predicted that the export freight traffic from the West through the Atlantic ports, including Boston, would continue to increase.

Announcement is made of the following men chosen to constitute a special joint committee to represent western and southern lines in an effort to draft a uniform classification: Southern: W. R. Powe, Chairman; D. M. Goodwyn, General Freight Agent, Louisville & Nashville; D. W. Longstreet, General Freight Agent of the Illinois Central at Memphis; G. R. Browder, Assistant Freight Traffic Manager of the Southern at Atlanta; A. S. Dodge, formerly Vice-President of the Frisco. Western: W. B. Hamblin, General Freight Agent of the Burlington, Chicago; E. H. Wood, General Freight Agent of the Union Pacific, Omaha; R. C. Fyfe, Assistant General Freight Agent of the Cotton Belt; W. M. Hopkins, formerly General Freight Agent of the Minneapolis & St. Louis; R. H. Countiss, agent Transcontinental Freight Bureau.

National Association of Railway Commissioners.

Co-operation between the Interstate Commerce Commission and the state railroad commissions was the dominant note in speech and action of the first day's session of the National Association of Railway Commissioners, holding its 19th annual session in the hearing room of the Interstate Commerce Commission at Washington. Chairman Knapp, of the Interstate Commerce Commission, made co-operation between state and nation the theme of his address opening the convention. The sentiment received hearty endorsement, and the convention lost no time in carrying out the idea by adopting, after liberal discussion, the report of the committee on grade crossings, accompanied by a resolution that a model bill be drafted by committee to present to state legislatures looking to the abolition of grade crossings. The report was presented by Commissioner A. T. Siler, of Kentucky, and its discussion brought out statistics revealing tremendous loss of life at grade crossings throughout the country.

The convention next voted for a uniform system of accounting to be required of both steam and electric lines. The discussion of this report, presented by O. W. Seymour, of Connecticut, and heartily endorsed by Commissioner Decker, of New York, also revealed the desire of the commissioners to make uniformity in state legislation most emphatic.

Florida East Coast Extension.

In denying the rumors that work on the Florida East Coast Railway's extension from Homestead, Fla., southwest along the Florida keys to Key West, about 125 miles, is to be stopped or curtailed, J. R. Parrott, Vice-President and General Manager of the road, who is in charge of the extension, said, in part:

"There is not the slightest intention of abandoning the work of building the Key West extension. We expect to have the road

built to Knight's Key, 66 miles from Homestead, and boats running from that point to Cuba by January 15 ,1908. Since the beginning of the work, construction has been under way on the entire line between Homestead and Key West, forces being at work at both ends and in the middle. In August nearly all the machinery and forces available were transferred to the section north of Knight's Key so as to get that part in operation and have it earning something. In thus concentrating our work we were able to lay off a great many steamboats and launches. This saving was also helped by getting rails laid on 57 miles of line south of Homestead. Before the rails were down boats were used entirely for moving men, material and supplies. On the southern end of the line, Key West north to Bahia Honda, 47 miles, 80 per cent. of the work is about finished. Between Knight's Key and Bahia Honda, 12 miles, are the three viaducts. So far these three openings offer no problems that have not already been overcome in the Long Key opening, which is about finished and which is longer than any of the others. There are 2,500 men employed at present, as against about 1,600 at the same date last year."

American Street & Interurban Railway Association.

The program of entertainment for delegates and guests to the American Street & Interurban Railway Association, and Accountants', Engineering and Claim Agents' Associations at Atlantic City during the week beginning October 14, is an attractive one. On Monday evening Miss Kitty Cheatham will entertain for an hour in the solarium of the Marlborough-Blenheim hotel. On Wednesday afternoon the ladies of the convention will be entertained at the Country Club at Atlantic City, and on the evening of the same day a theatre party will be given. The Supplymen's third annual amateur theatrical performance will be given at Young's Pier Theatre Thursday evening following a trolley trip in the afternoon for the ladies of the convention. On Friday afternoon the men will be given an opportunity to take part in a golf tournament at the Country Club. On Friday evening there will be an entertainment at the solarium of the Marlborough-Blenheim. Delegates and guests will be entitled to use roller chairs, and the Delaware & Atlantic Telephone Co., the Bell Telephone Co., Philadelphia, Pa., and the American Telephone & Telegraph Co. will provide local service day and night and long distance service before 9 a.m. and after 6 p.m. without charge. A. L. Whipple, of the Curtain Supply Co., is Chairman of the Entertainment Committee.

TRADE CATALOGUES.

Concrete Piles.—The Simplex Concrete Piling Company, Tacony, Philadelphia, Pa., has issued an interesting pamphlet describing simplex concrete piles. It is illustrated with unusually good reproductions of photographs showing the piles while being driven; also single piles and groups of piles partially or entirely excavated after being driven. Other photographs show the piles being tested. In one case a single pile was loaded with 50 tons without settlement and with 70 tons with a settlement of ½ in. Other interesting views show piles being driven under difficult conditions, such as close to old walls and inside of buildings where very short piles have to be used. Line drawings show the two types of driving forms used; one has a cast-iron point which is left in the ground and the other an alligator point, which consists of jaws that open so as to be withdrawn with the rest of the form. Other line drawings show different types of foundations, and comparisons of the number, time needed for driving and efficiency of concrete piles and wooden piles. A striking photograph shows a number of wooden piles which failed completely after being driven. Many examples of concrete pile foundations are shown, using the shell, molded, jointed and composite types of Simplex piles.

Turbine Pumps.—The Watson-Stillman Company, New York, is distributing sectional catalogue No. 72 describing Twinvolute turbine pumps; these are made single stage for low heads and two stage for higher duty. The construction and operation of the pumps are described, being illustrated with line drawings and half-tones. The two types are also shown as driven by alternating-current or direct-current motors. Tables give the capacities in gallons per minute at different velocities, the friction head in pipe, the head in feet with equivalent in pounds pressure, theoretical horse-power required to raise water to different heights nad similar information on hydraulics. The catalogue includes a list of other catalogues of hydraulic machines made by the company.

Portable Machine Tools.—A particularly attractive catalogue issued by H. B. Underwood & Co., Philadelphia, Pa., is devoted to portable tools for railroad repair shops. Each tool is clearly illustrated by half-tones and is given a short description. A large variety of tools is shown, including different kinds of portable bars for boring cylinders, valve seats and engine guides. These are shown both in operation and in detail showing parts and attachments, including different cutterheads, etc. Other tools are: Circular planer tools for driving boxes and valve seats, cylinder dome facing machine, portable milling machine, crank pin turning machine, and other apparatus.

Chain Belt.—General catalogue No. 35 of the Chain Belt Company, Milwaukee, Wis., has 287 pages and is attractively bound in cloth. It is exceedingly full and profusely illustrated with half-tones showing many styles of chain belt conveyors in operation. It gives the approximate horse-power of different kinds of chain belts, specific gravities and weights of various substances handled by conveyors and other information of interest. Each kind of chain is illustrated, and full price lists, capacities, weights, etc., given. The catalogue also covers auxiliary parts of conveying systems, including buckets, elevator boots, clutches, gears and other products of the company.

Draft Gear.—A folder published by the Waugh Draft Gear Co., Chicago, consists of a brief statement of the advantages of this draft gear and a number of half-tone illustrations showing relative positions of the parts under different stages of tension and compression; also the manner of applying it to wooden and steel sills. The gear consists of transverse spring plates in groups of eight or more, separated by concave and convex castings, alternating. It is claimed that tests show from 200,000 to 600,000 lbs. spring cushion capacity in 2-in. to 3-in. drawbar travel, with no recoil.

Steam Turbines.—The General Electric Company, Schenectady, N. Y., has issued pamphlet No. 4,531 describing the Curtis steam turbine generator. The line and half-tone illustrations show the complete machine and details of the buckets and other parts. Reports of tests of different sizes of Curtis turbines showing vacuum, superheat, pressure, etc., under different loads are included. One test shows the comparative efficiency of a turbine and a reciprocating engine of equal rating, operating under the same conditions.

Municipal Filtration.—The Pittsburgh Filter Manufacturing Co., Pittsburgh, Pa., has published an illustrated pamphlet describing installations made by the company of municipal filtration plants in a number of cities. The pamphlet includes reports of the operation of certain plants, in which daily comparisons show the color, odor, amount of alkali, incrustants, bacteria, etc., of the filtered and unfiltered water. The pamphlet also illustrates and describes the different filters and auxiliary apparatus the company installs.

Wattmeters.—Bulletin No. 4,527 of the General Electric Company, Schenectady, N. Y., describes the Thomson polyphase induction wattmeters. These can be used for one, two or three-phase circuits. They are made in three types: one for house service, with a metal cover, and two for switchboards, one kind having a metal cover and the other a glass cover. The bulletin gives the capacities, etc., of the different sizes and a number of connection diagrams showing the method of installation on different circuits.

Electrolysis.—The H. W. Johns-Manville Co., New York, has published a small circular on the company's Electroless pipe covering. It speaks of the well-known effect of stray currents on pipe and is illustrated with photographs showing sections of pipe so affected. Electroless pipe covering is made of asbestos paper, impregnated and coated with a waterproof insulating compound.

Snow Plows.—A small pamphlet issued by the Wilder Snow Plow & Manufacturing Co., Worcester, Mass., illustrates and describes the Wilder radial snow plow. It is claimed that this plow is particularly successful on sudden changes of grade and on curves as sharp as 45 ft. radius. It is made for electric railways in two sizes, weighing respectively 38,000 lbs. and 42,000 lbs.

Derails.—The Hayes Track Appliance Co., Geneva, N. Y., has sent out circulars Nos. 47 and 48, consisting of reproductions of photographs showing different models of Hayes derails as applied to different sizes of rails. Other illustrations show installations of these derails at interlocking stations on several roads.

Rock Island Employees' Magazine.—The October number has some good short articles. They include "Staff Meetings an Aid to Team Work"; "Brevity in Telegrams," and "Pointers on Handling Freight." Other matters of special interest to the employees of the system make up the balance of the magazine.

Concrete Construction.—Bulletin No. 16 of the Association of American Portland Cement Manufacturers, Philadelphia, Pa., is entitled "Regulation and Control of Concrete Construction," by E. S. Larned.

MANUFACTURING AND BUSINESS.

The Samson Cordage Works, Boston, Mass., is putting on the market a signal cord with a galvanized steel wire metal center.

W. P. Cosper, Chicago, has resigned as General Sales Agent of the Garton-Daniels department of the Electric Service Supplies Co., to engage in the manufacture of hot water heaters for steam and electric railroad cars.

The Barker Mail Crane Co., Clinton, Ohio, has contracts with the Harriman Lines for the use of the company's all-iron mail crane. The crane is now standard on the Northern Pacific, Chicago, Milwaukee & St. Paul, and the New York, Ontario & Western. They have been installed on 30 railroads.

The increase in capital stock of the Westinghouse Air-Brake Co., Pittsburgh, Pa., from $3,000,000 to $14,000,000, and the distribution of a 25 per cent. stock dividend were considered at the annual meeting of the stockholders last week, but it was decided to act finally at a special meeting called for December 3.

The Washburn Steel Castings Coupler Co., Minneapolis, Minn., will exhibit at the American Street & Interurban Railway Association's convention at Atlantic City a number of types of traction couplers. Only a few of these have heretofore been offered for sale, but the company is now ready to put them on the market in large amounts

The Goldschmidt Thermit Co., New York, will have an exhibit in the music hall on the steel pier at the Atlantic City convention of the American Street & Interurban Railway Association and also a demonstration booth just outside of the pier for showing the welding of street car rails, motor cases, truck frames, etc. The company's new system of using yellow wax as a matrix for the mold is used in repairing motor cases.

John MacD. Greene, Drexel Building, Philadelphia, Pa., has established a brokerage business for the handling of released machinery in connection with the engineering work of the Greene Engineering Co., of which he is President. The Greene Engineering Co. is a specialist in plant modernization and in designing and supervising the construction of elevating and conveying plants of all kinds. Bulletins of released machinery on hand are issued monthly.

Walter B Snow, for some years in charge of the Publicity Department of the B. F. Sturtevant Co., has opened an office at 170 Summer street, Boston, Mass., as a publicity engineer. He is prepared to conduct the publicity departments of a limited number of non-competitive clients and to render special service to others in the form of general advertising, catalogue making, technical writing and investigation. There is room in the fields covered by trade and technical papers for the kind of work Mr. Snow proposes to do, and he is especially fitted to succeed. He has had practical experience in the machine shop and as a shop foreman, and was for some time chief draftsman, and later mechanical engineer, for the B. F. Sturtevant Co., Hyde Park, Mass. He had charge of designing and erecting the new plant of the company at Hyde Park. During his more than 20 years connection with the B. F. Sturtevant Co. he had charge of all the publicity work, including not only trade paper advertising and catalogue making, but preparing special treatises, delivering lectures at technical schools and before engineering societies and writing special articles for the technical press. He had charge of the photographic retouching and printing departments and compiled special mailing lists for circularizing and systematic following. Part of his time was devoted to doing similar work for a large machine tool company and for a maker of steam pumping and condensing machinery. Mr. Snow is a graduate of the Massachusetts Institute of Technology, and is a member of the Society of Mechanical Engineers, and has served as a member of the Publication Committee of that society.

Iron and Steel.

The Maryland Steel Company is reported as having an additional order for 5,000 tons of rails for the Panama Canal; delivery to be made in 75 days.

Official announcement is made by the Bethlehem Steel Corporation that 15,000 tons of high grade open hearth rails have been sold to the Lehigh Valley. The price, it is said, is in excess of $28 a ton.

The Jones & Laughlin Steel Co., Pittsburgh, Pa., is to build one of the largest rail mills in the world at its new plant at Aliquippa, Pa. Work on the new mill will not begin until after the new blast furnaces are blown in. It is said that the company has been guaranteed orders for 1,000,000 tons of rails when the mill is in operation.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad conventions and engineering societies, etc., see advertising page 24.)

Franklin Institute.

At the section meeting held October 10, a paper on the Thermo-Electric Production of Iron and Steel, by Dr. Joseph W. Richards, of Lehigh University, was presented.

Western Railway Club.

The October meeting will be held at the Auditorium Hotel, Chicago, on Tuesday, the 15th inst., at 8 o'clock p.m. A paper on "Steel Tires; Causes of Imperfections and Defects," will be read by George L. Norris, Engineer of Tests, Standard Steel Works, Burnham, Pa.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Apalachicola Northern.—W. C. Myers has been appointed Auditor, with office at Apalachicola, Fla., succeeding A. H. Guest, resigned.

Chicago & Alton.—The following new Directors have been elected: T. H. Hubbard, T. P. Shonts, G. H. Ross, Joy Morton, F. H. Davis, W. G. Beale and H. E. Huntington. The following members of the old Board remain Directors: Edwin Hawley, N. B. Ream, Samuel Felton and J. J. Mitchell.

Chicago, Rock Island & Pacific.—L. K. Luff, Assistant Auditor of Freight Traffic, has been appointed Auditor of Disbursements, succeeding C. F. Balch.

Delaware & Hudson.—W. D. Schofield has been appointed Assistant to the President, with office at New York, succeeding W. H. Williams, elected Third Vice-President in charge of the treasury and accounting departments.

Detroit & Mackinac.—See Erie & Michigan Railway & Navigation.

Erie & Michigan Railway & Navigation.—T. G. Winnett, General Passenger Agent of the Detroit & Mackinac, has been elected also President of the Erie & Michigan Railway & Navigation, with office at Bay City, Mich. S. S. Jenkins has been appointed Treasurer, with office at Chicago. C. W. Luce, General Superintendent of the Detroit & Mackinac, has been appointed also General Superintendent of the Erie & Michigan Railway & Navigation, with office at East Tawas, Mich.

Illinois Valley Belt.—E. B. Ashcraft, Vice-President, has been elected President. A. E. George, Secretary and Treasurer, has been elected Vice-President and General Manager. J. R. Hawkins succeeds Mr. George. The offices of all are at Chicago.

Missouri Southern.—See this company under Purchasing Officers.

New York, New Haven & Hartford.—O. M. Shepard, formerly General Superintendent, has been appointed Assistant to Vice-President John F. Stevens.

Northern Pacific.—A. C. James has been elected a Director, succeeding D. W. James, deceased.

Oklahoma Central.—T. C. Woods has been elected Secretary, with office at Purcell, Ind. T., succeeding W. G. Walling.

St. Joseph Valley.—The officers of this road, which has just been opened from Angola, Ind., to La Grange, 26 miles, are as follows: President, H. E. Buckley; Vice-President, John Fieldhouse; Treasurer, C. H. Winchester; Secretary and Auditor, Strafford Maxon; Superintendent, M. L. Swinehart, and Traffic Manager, G. T. Moore. The general offices are at La Grange, Ind.

St. Louis Southwestern of Texas.—R. C. Fyfe, Assistant General Freight Agent, has resigned to become a member of a special committee of the Universal Classification Committee.

Sonora Railway.—The office of W. G. Sherlock, Assistant Auditor, has been moved from Guaymas, Mex., to Tucson, Ariz.

Tremont & Gulf.—The general offices have been moved from Tremont, La., to Winnfield, La.

Wisconsin Central.—G. W. Webster, Secretary, and S. G. Courten have been elected Directors, succeeding W. F. Vilas and G. M. Cummings, resigned.

Operating Officers.

Arizona & Colorado.—J. W. Williams has been appointed Superintendent, with office at Naco, Ariz.

Chicago, Burlington & Quincy.—J. M. Gruber, General Manager of the Lines East of the Missouri River, has resigned to go to the Great Northern.

Chicago, Rock Island & Pacific.—T. H. Beacom, Superintendent of the Oklahoma division, has been appointed Superintendent of the Missouri division, with office at Trenton, Mo., succeeding W. H. Whitenton, transferred. H. M. Hallock, General Superintendent of the Choctaw division, succeeds Mr. Beacom, with office at El Reno, Okla. T.

F. O. Whiteman has been appointed Trainmaster at El Dorado, Ark., succeeding J. H. Lynch, assigned to other duties.

El Paso & Southwestern.—W. G. Roe, Trainmaster at Carrizozo, N. Mex., has been appointed Assistant Superintendent at Alamogordo, N. Mex. R. C. TenEyck succeeds Mr. Roe.

Florida East Coast.—O. M. Carter has not been appointed Consulting Engineer as stated in this column last week.

Great Northern.—See Chicago, Burlington & Quincy.

Grand Trunk.—J. C. Crombie has been appointed Master of Transportation at London, Ont., succeeding D. Crombie, promoted.

Keweenaw Central.—The office of J. C. Shields, General Superintendent, has been moved from Hancock, Mich., to Phoenix, Mich.

Lehigh Valley.—J. F. Maguire, Assistant Superintendent of Transportation, has been appointed Superintendent of Transportation, with office at South Bethlehem, Pa., succeeding T. H. Pindell, assigned to other duties.

Michigan Central.—J. H. Snyder, Assistant General Superintendent, has been appointed Superintendent at Chicago, succeeding M. B. Snow, who takes Mr. Snyder's place at Detroit, Mich.

Missouri Pacific.—C. H. Bevington, Superintendent of the Omaha division, has been appointed Superintendent of the Valley division, with office at Monroe, La., succeeding J. G. Lorton, resigned to go to the St. Louis & San Francisco. W. E. Brooks, Superintendent of the Northern Kansas division, succeeds Mr. Bevington, with office at Omaha, Neb. W. E. Merrifield, Trainmaster at Sedalia, Mo., succeeds Mr. Brooks, with office at Atchison, Kan.

Oklahoma Central.—W. S. Wells is Trainmaster, with office at Purcell, Ind. T.

Oregon Short Line.—A. D. Stevenson, Superintendent of the Montana division, has been appointed Superintendent of the Utah division of this road and of the Union Pacific lines west of Green river, with office at Salt Lake City, Utah, succeeding W. E. Costello, resigned. W. H. Jones, Assistant Superintendent at Pocatello, Idaho, succeeds Mr. Stevenson, with office at Pocatello.

Pacific & Idaho Northern.—A. L. Wiley has been appointed Superintendent, with office at Weiser, Idaho, succeeding C. M. Hunt, resigned to go to the Oregon Short Line.

Rio Grande Western.—O. J. Ogg has been appointed Assistant Superintendent of the Rio Grande Western at Helper, Utah, succeeding R. R. Sutherland, resigned.

St. Louis, Iron Mountain & Southern.—T. B. Nash, chief despatcher of the Memphis division, has been appointed Trainmaster at Wynne, Ark.

Somerset Railway.—G. H. Foster, Assistant Superintendent, has been appointed Superintendent, with office at Oakland, Me., succeeding W. M. Ayer, resigned, and his former office has been abolished.

Southern.—H. E. Hutchens, General Superintendent at Charlotte, N. C., has been appointed General Superintendent at Birmingham, Ala., succeeding W. N. Foreacre, who takes Mr. Hutchens' place at Charlotte.

Southern Pacific.—Thomas Ahern, Assistant Division Superintendent at Dunsmuir, Cal., has been appointed Superintendent, with office at Dunsmuir, of the new Shasta division, consisting of the lines from Red Bluff to Ashland. D. Burkhalter, Acting Superintendent of the Sacramento division, has been appointed Superintendent of that division. F. M. Worthington, Assistant Superintendent at Tucson, Ariz., has been appointed Superintendent of the San Joaquin division, with office at Bakersfield, Cal., succeeding Mr. Burkhalter, who held that position before being appointed Acting Superintendent of the Sacramento division. A. F. Bowles succeeds Mr Worthington.

Union Pacific.—See Oregon Short Line.

Wrightsville & Tennille.—See this company under Purchasing Officers.

Traffic Officers.

Canadian Pacific.—J. S. Carter, city passenger agent at Nelson, B. C., has been appointed General Agent, passenger department, at Spokane, Wash.

Colorado Midland.—M. R. Sutton has been appointed General Agent at Kansas City, Mo., succeeding Morell Law, resigned to go to another company.

Georgia Coast & Piedmont.—W. R. Bassett, Auditor, has been appointed also General Passenger Agent.

Georgia, Florida & Alabama.—B. C. Prince, Acting Traffic Manager, has been appointed Traffic Manager, with office at Bainbridge, Ga.

Jamestown, Chautauqua & Lake Erie.—J. A. Barry, local manager, has been appointed Acting General Freight and Passenger Agent, with office at Jamestown, N. Y., succeeding to the duties of H. T. Mentzer.

Missouri Southern.—T. J. Dreessen has been appointed General Traffic Manager and Freight Claim Agent, with office at Leeper, Mo.

Prescott & Northwestern.—O. H. Helbig, General Freight and Passenger Agent, has been appointed to the new office of Traffic Manager, and his former office has been abolished. He remains also Secretary and Treasurer.

St. Louis, Brownsville & Mexico.—William Doherty, General Passenger Agent, has been appointed Traffic Manager in charge of both freight and passenger traffic, H. W. Adams, Freight Traffic Manager, having resigned.

Texas & Pacific.—R. T. G. Matthews has been appointed General Agent, passenger department, at Cincinnati, Ohio.

Timpson & Northwestern.—C. W. Gray, rate clerk in the general freight office of the Galveston, Harrisburg & San Antonio, has been appointed Traffic Manager of the Timpson & Northwestern.

Engineering and Rolling Stock Officers.

Alabama Great Southern.—See Cincinnati, New Orleans & Texas Pacific.

Atlantic, Quebec & Western.—W. L. Browne has been appointed Acting Resident Engineer of this road and also Acting Chief Engineer of the New Canadian Company, succeeding J. V. Nimms, resigned. The road is about to be opened for traffic from New Carlisle, Que., to Port Daniel, and work is under way from Port Daniel north.

Bessemer & Lake Erie.—F. W. Dickerson, general foreman, car department, at Greenville, Pa., has been appointed Master Car Builder, with office at Greenville, succeeding W. J. Buchanan, resigned.

Chicago Junction.—J. B. Cox, Chief Engineer, has resigned.

Cincinnati, New Orleans & Texas Pacific.—E. C. Tomlinson, Superintendent of Transportation of this road and of the Alabama Great Southern, has been appointed to the new office of Car Accountant of both roads and his former position has been abolished.

Erie.—T. Rumney, Mechanical Superintendent, has been appointed General Mechanical Superintendent, with office at New York, succeeding E. A. Williams, who resigned last spring. William Schlafge, Assistant Mechanical Superintendent, has been appointed to the new office of Mechanical Superintendent of the Erie grand division and of the New York, Susquehanna & Western, with office at Jersey City, N. J. A. G. Trumbull, Assistant Mechanical Superintendent, has been appointed to the new office of Mechanical Superintendent of the Ohio division and the Chicago & Erie, with office at Cleveland, Ohio.

Lehigh & New England.—W. J. Young, Chief Engineer, has resigned to go to the Alpha Portland Cement Co., Martin's Creek, Pa.

Peoria Railway Terminal.—G. P. Paradis is Engineer of Maintenance of Way.

St. Louis, Watkins & Gulf.—S. H. Spangler has been appointed Master Mechanic, with office at Lake Charles, La., succeeding J. C. Ramsey.

Santa Fe Central.—E. M. Peden is Superintendent of Motive Power and Rolling Stock, with office at Estancia, N. Mex.

Seaboard Air Line.—A. J. Poole, Master Mechanic at Atlanta, Ga., has been appointed to the new office of General Master Mechanic, with office at Portsmouth, Va.

Purchasing Agents.

Missouri Southern.—E. J. Grimes, Auditor, has been appointed Purchasing Agent, with office at Leeper, Mo.

Wrightsville & Tennille.—Hereafter the purchasing department will be in charge of D. R. Thomas, Superintendent, Tennille, Ga.

LOCOMOTIVE BUILDING.

The Wisconsin Central has ordered three locomotives from the American Locomotive Co.

Procter & Gamble, Cincinnati, Ohio, have ordered one locomotive from the Baldwin Locomotive Works.

The St. Louis, Brownsville & Mexico has ordered five locomotives from the Baldwin Locomotive Works.

The Virginia Air Line, Charlottesville, Va., under construction, is in the market for locomotives. See Railroad Construction column.

The New York Central Lines have reserved space with the American Locomotive Company for 148 locomotives. The types will consist of Pacific, similar to those delivered to the Lake Shore last spring, New York Central Lines standard consolidation, 10-wheelers and switch engines.

The Lake Shore & Michigan Southern has ordered nine simple six-wheel switching (0-6-0) locomotives from the American Locomotive Co. The specifications are as follows:

General Dimensions.

Type of locomotive	Switching
Weight, total	154,000 lbs.
Diameter of drivers	57 in.
Cylinders	21 in. x 28 in.
Boiler, type	Straight back
" working steam pressure	180 lbs.
" number of tubes	308
" material of tubes	Charcoal iron
" diameter of tubes	2 in.
" length of tubes	16 ft.
Firebox, length	72 in.
" width	65¼ in.
" material	Steel
" grate area	32.7 sq. ft.
Heating surface, total	2,716 "
Tank capacity	5,100 gals.
Coal capacity	7½ tons

Special Equipment.

Air brakes	Westinghouse
Bell ringer	Sampson
Brake-beams	Buffalo
Couplers	Climax
Headlight	Dressel
Injector	Nathan
Journal bearings	Magnus
Piston rod packings	United States
Valve rod packings	United States
Safety valve	Amerlean
Sanding devices	Leach
Slight-feed lubricators	Nathan bull's-eye
Springs	Railway Steel-Spring Co.
Steam gages	Crosby Thermo
Tires—Driving wheel	Latrobe

The Harriman Lines, as reported in the *Railroad Gazette* of October 4, have ordered 43 consolidation locomotives, 10 Atlantic locomotives, 30 mogul locomotives, 24 ten-wheel locomotives and 18 switch locomotives. Of these engines, 55 are to be oil burning.

General Dimensions.

	Hy. Consol.	Atlantic.	Mogul.	10 wheel.	Switch.
Weight, total	208,000 lbs.	196,000 lbs.	162,000 lbs.	198,000 lbs.	140,000 lbs.
On drivers	187,000 lbs.	105,000 lbs.	140,000 lbs.	150,000 lbs.	140,000 lbs.
Cylinders	22 x 30 in.	20 x 28 in.	20 x 28 in.	22 x 28 in.	19 x 26 in.
Diam. drvrs.	57 in.	81 in.	63 in.	63 in.	51 in.
Boiler, type	Straight top.	Straight top.	Straight top.	Straight top.	Straight top.
Stm press	200 lbs.	200 lbs.	200 lbs.	190 lbs.	175 lbs.
Tubes, No.	413	297	297	355	237
Material	Seamless steel and charcoal iron.				
Diameter	2 in.	2 in.	2 in.	2 in.	2 in.
Length	15 ft.	16 ft.	12 ft. 8 in.	15 ft.	11 ft. 6 in
Firebox, lgth.	108 in.	108 in.	108 in.	121 in.	108 in.
Width	66 in.	66 in.	66 in.	37¼ in.	40¼ in.
Material	Otls steel.	Otls steel.	Otls steel.	Otls steel.	Otls steel.
Grate area	49.5 sq. ft.	49.5 sq. ft.	49.5 sq. ft.	32.1 sq. ft.	30.2 sq. ft.
Htg. surf.	3,403 sq. ft.	2,649 sq. ft.	2,102 sq. ft.	2,094 sq. ft.	1,557 sq. ft.
Water capac.	7,000 & 9,000	7,000 gals.	7,000 gals.	7,000 & 9,000	4,000 gals.
Coal capac.	14 & 10 tons.	14 tons.	11 tons.	14 & 10 tons.	6 tons.
Oil capacity	2,940 & 2,487	2,940 gals.	2,940 gals.	2,940 & 2,487	1,020 gals.

Special Equipment.

Acetylene gas generator	Elliott
Bell ringer	Gollmar
Brake adjuster equipment, freight	Acme
Brake adjuster equipment, passenger	American
Boiler lagging	Magnesia
Brake-beams	Damascus
Brake-shoes	American Brake-Shoe & Foundry Co.
Couplers	Climax steel
Draft rigging	Miner
Feed pipe strainer	Burnham, Williams & Co.
Headlights	Handlan Buck
Headlights, electric	Pyle National
Hose tank	Anaconda
Injector	Nathan
Journal bearings	Hewitt
Journal boxes	National Mal. Casting Co.
Piston rod packings	Paxton-Mitchell Co.
Valve rod packings	Paxton-Mitchell Co.
Safety valve	Crosby
Sanding devices	Leach
Side bearings	Miner
Sight feed lubricator	Nathan
Springs	Railway Steel-Spring Co.
Steam gages	Asheroft
Steam and oil conduits	Franklin Railway Supply Co.
Steam heating equipment	Consolidated
Steam heat reducing valve	Leslie
Tires, driving wheel	Midvale
Tires, truck wheel	Midvale
Tires, tender wheel	Midvale
Truck bolsters	Simplex
Tender truck side frames	Andrews cast steel
Vestibule diaphragms	Acme
Water gages	Nathan
Whistles	Star Brass

CAR BUILDING.

Swift & Co. Chicago, are said to have ordered 100 cars.

The American Railways, Des Moines, Iowa, are figuring on some cars.

The New York, Ontario & Western is in the market for 10 day coaches.

The Columbia & Puget Sound is figuring on two or three new passenger coaches.

The Galveston, Harrisburg & San Antonio is in the market for 10 passenger coaches.

The Arkansas, Louisiana & Gulf has ordered one passenger coach from the Hicks Locomotive & Car Works.

The Virginia Air Line, Charlottesville, Va., under construction, is in the market for cars. See Railroad Construction Column.

The Canadian Pacific denies that it is figuring on building 2,000 additional box cars at its own shops, as reported in the *Railroad Gazette* of September 27.

The Duluth & Iron Range, as reported in the *Railroad Gazette* of July 26, is said to have ordered six passenger cars from the American Car & Foundry Co.

The Duluth, Missabe & Northern is figuring on four first class coaches, four second class coaches, two baggage and mail cars, two passenger and baggage cars and one baggage express car.

The New Orleans Great Northern, as reported in the *Railroad Gazette* of October 4, has ordered from the Western Steel Car & Foundry Co. 65 all-wood stock cars of 60,000 lbs. capacity, 300 all-wood box cars of 60,000 lbs. capacity, 200 steel flat cars of 80,000 lbs. capacity and 200 flat bottom gondola cars of 80,000 lbs. capacity. The stock cars will measure 36 ft. long, 8 ft. 6 in. wide and 9 ft. 6¼ in. high, inside measurements, and 36 ft. 9⅛ in. long, 9 ft. 1¾ in. wide and 13 ft. ¼ in. high, over all. The box cars will measure 36 ft. long, 8 ft. 6 in. wide and 9 ft. 10 in. high, inside measurements, and 36 ft. 9⅝ in. long and 9 ft. ⅝ in. wide, over all. The flat cars will measure 41 ft. long, 9 ft. 6¾ in. wide and 3 ft. 10⅞ in. high, over all. They will have yellow pine flooring. The gondola cars will measure 41 ft. long, 8 ft. 10½ in. wide and 3 ft. 3¼ in. high, inside measurements, and 42 ft. 3⅞ in. long, 10 ft. wide and 7 ft. 3¼ in. high, over all. Bodies will be of wood and underframes of steel. The special equipment for all cars includes:

Bolsters	Pressed steel for all except gondolas
Brake-beams	Pressed steel
Brakes	Westinghouse
Couplers	Climax, steel shank
Draft rigging	Miner
Dust guards	Gould for stock and box cars; Symington for flat and gondola cars
Journal boxes	Gould for stock and box cars Symington for flat and gondola cars
Trucks	Arch bar

RAILROAD STRUCTURES.

Albuquerque, N. Mex.—Work has begun on the new Atchison, Topeka & Santa Fe storehouse, and additions to the local machine shops. (April 5, p. 498.)

Alva, Okla.—The improvements to be made by the Atchison, Topeka & Santa Fe establishing the new grade and straightening the Panhandle branch through western Oklahoma include a large bridge over the Salt Fork.

Fernandina, Fla.—The Seaboard Air Line is planning to rebuild its phosphate elevator recently destroyed by fire at a loss of $150,000.

Fort Smith, Ark.—The St. Louis & San Francisco, and the St. Louis, Iron Mountain & Southern, it is said, will put up large roundhouses and shops at this place.

Fort Worth, Tex.—The Missouri, Kansas & Texas, it is said, has given a contract for putting up a brick freight house 45 ft. x 300 ft., two stories high.

Frederick Junction, Md.—The Baltimore & Ohio has given contracts for building a new bridge over the Monocacy river on the old main line at this place, to the Drake & Stratton Co., of Philadelphia, for the substructure work, and to the McClintic-Marshall Co., of Pittsburgh, for the superstructure. The bridge is to consist of four spans, each about 85 ft. long, with deck plate girders, and will carry two tracks. The work will be pushed to completion as early as possible.

Grand Forks, B. C.—The Canadian Pacific, it is said, will start work next year on roundhouses, repair shops and yards at this place. The cost of these improvements will be about $100,000.

Meridian, Miss.—Engineers are locating the site of a bridge to be built over the railroad tracks.

New York, N. Y.—Contract has been let to J. C. Rodgers for the new bridge over the Harlem river at Madison avenue and 138th street at $1,155,987; the next lowest bid was that of the Phoenix Construction Company, $1,189,626. Other bids were: Williams Engineering Company, $1,197,000; Maryland Steel Company, $1,324,567, and Bernard Rolf, $1,333,333. The work includes building a steel draw span, two approach spans, fender piers, three masonry river piers, masonry approaches, grading, paving and furnishing electric equipment for operating the draw and lighting the structure. The work will require about 2,000 tons of structural steel, and it is thought that the contract for this steel will be given to the American Bridge Company.

The Board of Estimate and Apportionment at a recent meeting authorized an issue of $10,000,000 of stock to pay for buying and improving the property along the South Brooklyn water front from 28th to 36th streets and from 58th to 61st streets. About $6,000,000 of this will be spent for the land and the rest is to be used for putting up docks.

San Angelo, Tex.—The Kansas City, Mexico & Orient, it is said, will soon start work on a combined freight and passenger station here.

Toledo, Ohio.—Announcement is made that the Lake Shore & Michigan Southern will put up a bridge this fall over the mouth of Swan creek, at the foot of Munroe street.

Wilkesbarre, Pa.—An agreement, it is said, has been made between the city and the Lehigh Valley, the Jersey Central, the Delaware & Hudson and the Pennsylvania to eliminate the grade crossings on these roads from South Wilkesbarre to Market street.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

Alabama Roads (Electric).—A company is being formed by Richard Tillis, of Montgomery, to build an electric line from Geneva, Ala., on the Louisville & Nashville northeast via Hartford and Slocomb to Dothan, on the Atlantic Coast Line and the Central of Georgia, 40 miles. It is proposed eventually to extend the line from Dothan north.

Alva & Southern.—Incorporated in Oklahoma, with $5,000,000 capital and offices at Alva and at St. Louis, Mo. The company proposes to build about 250 miles of railroad from Kiowa, Kan., south through Oklahoma to the Red river, 250 miles. L. T. McKnight, President and General Manager; J. B. Cheadle, Vice-President, and W. Habiland, Assistant Secretary, all of Alva, and G. E. Autrey, Treasurer, of Granton, Ohio.

Arizona & California.—See Atchison, Topeka & Santa Fe.

Arkansas Valley.—See Atchison, Topeka & Santa Fe.

Atchison, Topeka & Santa Fe.—The report of this company for the year ended June 30, 1907, gives a total of 9,350.28 miles for all the lines included in this system, as compared with 9,189.43 miles in 1906, an increase of 160.85 miles. The 1906 figures have been revised since the last annual report to include additional lines now in the system. The average mileage operated during the year ended June 30, 1907, was 9,273.15 miles, an increase of 120.35 miles, as compared with the preceding year. In addition the company has under construction 488.43 miles, which is almost finished. The Arizona & California has been extended to Parker, Ariz., 106.84 miles from Wickenburg. The Barnwell & Searchlight, from Barnwell, Cal., to Searchlight, Nev., 23 miles, has been finished and was opened for traffic in April. The Denver, Kansas & Gulf, from Kiowa, Kan., via Medicine Lodge to Belvidere, 49.41 miles, has been finished. The Sulphur branch from Davis, Ind. T., to Sulphur, 9.28 miles, was opened for traffic in August, 1906. The Jasper & Eastern has been opened for traffic from Kirbyville, Tex., to Cravens, La., about 57 miles. Grading is finished to Oakdale, La., and track laying is now in progress; of this 5.35 miles were added last year. The Holly & Swink Railway and the Arkansas Valley Railroad, which were bought by this company during the year, are being extended through the beet sugar district of Arkansas valley, Colorado. The new mileage added during the year on these lines aggregates about 68.07 miles. On the Pecos & Northern Texas, the Canyon City (Tex.) Plainview branch, 57.30 miles, was finished and the line opened for traffic in February. On the Eastern Railway Company of New Mexico, extending from Texico, N. Mex., west to Belen, 250 miles are finished, and work is under way on a cut-off from Belen to Rio Puerco, N. Mex., 19 miles, which is nearing completion. Work is in progress to reduce heavy grades and curvature on the line between Texico, N. Mex., and Wellington, Kan.; these improvements are being made to obtain a new low grade line, which it is expected will be ready for operation by June, 1908, for transcontinental freight via Wellington, Texico, Belen and Rio Puerco. This company and the Southern Pacific each has a half ownership in the Northwestern Pacific, which is building a line to connect the California & Northwestern, of the Southern Pacific, at Willits, Cal., with the San Francisco & Northwestern, owned by the Santa Fe, to complete a through line from Eureka, Cal., south via Willets to San Francisco, about 290 miles. The report states that owing to existing conditions, the directors have decided to suspend various extension projects, which were under consideration, and to only finish improvements already under way.

Barnwell & Searchlight.—See Atchison, Topeka & Santa Fe.

Cairo & Tennessee River.—General Manager E. C. Weston is quoted as saying that work will be started shortly on a section of this proposed line from Wickliffe, Ky., east to Hopkinsville, about 108 miles. The Atlantic & Cairo Construction Company has the contract for the work. The line is projected east to Newcomb, Tenn., about 425 miles. (June 14, p. 878.)

Charlotte Harbor & Northern.—An officer writes that this line, which is known as the Boca Grande Route, has finished its line from Boca Grande, Fla., north to Arcadia, 53 miles, and is now in operation. At Boca Grande there is a deep-water harbor at the south end of Gasparilla Island, and extensive dock improvements are now under way. Allen Fouts, Second Vice-President and General Manager, Jacksonville, Fla. (July 26, p. 110.)

Chesapeake & Ohio.—The report of this company for the year ended June 30, 1907, shows that the 19 miles of second main track, mentioned in the last report as being built, has been finished, with the exception of 6.4 miles from Norgeva to Diascund. Contracts have been let for 91.8 miles additional second track, referred to in the same report, except for the section between Concord, Ky., and Crooked Creek, on the Cincinnati division, 10.3 miles. The 6.3 miles between Morrison, Va., and Oriana, on the Richmond division, is in operation, and work on the section between Hawk's Nest, W. Va., and Cotton Hill, two miles, and between Maysville, Ky., and Lawrence Creek, 5.4 miles is almost finished. Work on the remaining 67.8 miles, also on the 6.4 miles between Norge and Diascund has been suspended. A bridge has been built over New river, one mile west of Sewell, W. Va., the second main track being continued to that point and connection made with the Southside branch, paralleling the main line to Hawk's Nest, 11 miles, which has been rebuilt. On the Potts Creek branch, building a 20-mile line from Covington, Va., south to Potts Creek, 18 miles of track has been laid and placed in operation. On the Coal River Railway, in West Virginia, 22.9 miles has been built and placed in operation, and 16.2 miles are under construction.

Chicago & Alton.—See Warrensburg & Clinton.

Chicago, Burlington & Quincy.—This company, it is said, is making surveys for an extension of the line from Herrin, Ill., west to the Ohio river, about 30 miles.

Chicago, Indianapolis & Louisville.—The Indianapolis & Louisville, recently finished from Victoria, Ind., on the Illinois Central, northeast to Wallace Junction, on the main line of the Chicago, Indianapolis & Louisville, one mile north of Quincy, about 47 miles, is reported opened for freight traffic. At Victoria connection is to be made with the eight-mile line already built to the Little Giant and Shirley Hill coal mines. (March 15, p. 381.)

Cincinnati, Hamilton & Dayton.—New yards are reported being laid out north of Hamilton, Ohio, by this company to have four miles of track.

Coal River.—See Chesapeake & Ohio.

Colorado Roads (Electric).—A company, it is said, is being formed in which H. C. Chapman, of New York, is interested, to build an electric line from a point on the Denver & Rio Grande either at Rifle, Colo., or Newcastle, north via Meeker to Craig, 75 miles.

Continental Tunnel Company.—This is the name of the company which proposes to build a line (including a tunnel about five miles long) from Tolland, Colo., on the Denver, Northwestern & Pacific, west to Vasquez, on the same road. It will shorten the D., N. W. & P. about 23 miles and lessen the grade, which on the existing line is 4 per cent. (See Colorado Roads, October 4, p. 403.)

Denver, Kansas & Gulf.—See Atchison, Topeka & Santa Fe.

Denver, North-Western & Pacific.—See Continental Tunnel Company.

Evansville & Terre Haute.—This company, it is said, has just finished a three-mile belt line to the new South Vincennes, Ind., factory district.

Grand Trunk Pacific.—An order, it is said, has been issued by H. A. K. Drury, Inspector for the Canadian Railway Commission at Winnipeg, authorizing this company to open for freight traffic 122 miles of its line from Portage la Prairie, Man., west.

Great Northern.—The Vancouver, Victoria & Eastern, it is

said, has been finished from Oroville, Wash., northwest to Keremeos, B. C., 38 miles, and this section is to be placed in operation at once. Work is under way on the next section from Keremeos northwest to Hedley, 40 miles. (Sept. 27, p. 371.)

On the Minot division the new line from Berthold, N. Dak., northwest has been opened for traffic to Crosby, 80 miles. (Sept. 17, p. 307.)

Granite City & East St. Louis Terminal Railway Company.—This company now operates a seven-mile single-track line for switching and other service, connecting the railroads at Granite City, Ill., with roads at East St. Louis. (March 15, p. 384.)

Holly & Swink.—See Atchison, Topeka & Santa Fe.

Illinois Central.—Work, it is said, is under way on the Yazoo & Mississippi Valley relaying the present track from Natchez, Miss., northeast to Harrison, 27.8 miles, with 75-lb. rail.

Indianapolis & Louisville.—See Chicago, Indianapolis & Louisville.

Iowa Roads (Electric).—Work, it is said, has been started on an electric line from Nauvoo, Ill., to Keokuk and Carthage, and north from Nauvoo to Fort Madison, a total of about 30 miles. The promoters, it is said, have bought the city street lines at Fort Madison and expect to have the entire line ready for operation next spring. The promoters are residents of Nauvoo.

Jasper & Eastern.—See Atchison, Topeka & Santa Fe.

Kansas City & Springfield Southern (Electric).—An officer writes that this company, which was organized some time ago, will build a line from Springfield, Mo., northwest 75 miles to Nevada, with a south branch to Carthage, 40 miles. W. B. Forsyth, President, Chicago, Ill. (March 15, p. 385.)

Lake Shore Electric.—This company, operating about 160 miles of electric lines in Ohio, has recently opened a new line from Sandusky west via Vickery to Fremont, 29 miles. Through trains are now operated between Cleveland and Toledo via Sandusky, Vickery and Fremont; also by the old route via Norwalk and Fremont.

Minco & Monongahela.—Incorporated in Pennsylvania with $120,000 capital to build a 12-mile line from a connection with the Wheeling, Pittsburg & Baltimore branch of the Baltimore & Ohio, about 700 ft. west of Thomas tunnel, to a connection with the Pittsburgh, Virginia & Charleston branch of the Pennsylvania, 1,000 ft. southeast of Mingo creek crossing. S. J. Jones, President; P. Moran, D. Thompson, R. H. Robinson, J. H. Gamble, and Wm. G. Parkinson are directors.

Minneapolis, St. Paul, Rochester & Dubuque (Electric).—Incorporated in Maine, with $25,000,000 capital, to build electric lines in Minnesota and Iowa. E. W. Freeman, President, Portland, Me., and M. H. Bonteil, Secretary, Minneapolis, Minn.

New York, New Haven & Hartford.—The report of this company for the year ended June 30, 1907, which is reviewed elsewhere in this issue, shows that the six-track construction of the Harlem River-New Rochelle branch is well under way; part is to be opened for service this year. The new four-track bridge over the Housatonic river at Naugatuck Junction has been put in service, completing the four-track system on the New York division. The second track from South Braintree, Mass., to Whitman, 10.6 miles, has been put in service; also the second track extension from Nantasket Junction to Cohasset. Satisfactory progress has been made on the second-track work between Seymour, Conn., and Waterbury, about four miles of which is finished from Pines Bridge north. The rest of the work is expected to be finished this year. All bridges over and under grade crossings in Waterbury, Conn., have been finished except the bridge over the freight yard approach. The new freight yard at Waterbury is about finished, and contracts have been let for a new passenger station, as well as an engine house and storage tracks. During the present year the second track on the Highland division, between Danbury, Conn., and Hawleyville, is expected to be placed in operation. On the same division between Waterbury, Conn., and Bristol, second-track work is under way; of this about nine miles from Waterbury to Terryville Summit, is expected to be put in operation early next year, and the rest to be finished before the close of that year. Improvements have been made in the yard and freight facilities at Hartford, Conn. The new double-track line from Needham, Mass., to West Roxbury, 4.5 miles, has been put in operation. Work is still under way on the New Haven cut. This great improvement is to be finished by next January. New shops have been built at Readville, Mass., and are now in operation. Work on the double-track connecting line from the main line station at Providence, R. I., under the river to East Providence, 2.70 miles, including a tunnel about two miles long, has been continued. The portals of both headings have advanced about 2,100 ft., leaving about 2,900 ft. between headings in the tunnel yet to be bored. At Attleboro 11 grade crossings were eliminated, four tracks have been put in, and a new passenger station is nearly finished. The new Scherzer double-track lift bridge over the Connecticut river at Lyme, Mass., is now in service. Considerable work has been done during the year renewing bridges to permit operation of heavier rolling stock, depressing tracks and raising overhead bridges. Twenty-two grade crossings have been eliminated in Connecticut, four in Massachusetts, and one in New York. Work has been begun in Boston eliminating the Dudley street grade crossings, and is nearing completion. The elimination of nine highway crossings at New Bedford, Mass., is expected to be finished in about a year. A new engine house and freight yard are to be built here. The grade crossing elimination work at Main street, East Hartford, is nearly finished.

Norfolk & Southern.—The Eastern district of the Raleigh division has been extended from Farmville, N. C., west to Wilson, 23 miles.

Northern Dakota.—Incorporated in North Dakota to build a line from Edinburg, N. Dak., on the Great Northern northeast to the works of the Pembina cement mines, about 21 miles. The office of the company is at Grand Forks. Thomas Campbell, President, E. Thorwaldson, Vice-President, and D. Bull, Secretary and Treasurer.

Northern Electric.—See Northern Electric of California.

Northern Electric of California.—This company has been incorporated in California, with $25,000,000 capital, to take over the property of the Northern Electric Company, operating an electric line from Chico, Cal., south via Oroville to Sacramento, 105 miles, and to buy the Shasta Southern, operating a line from Chico west to Hamilton City, in Glen county, 18 miles. It is the intention of the new owners to extend the line north from Chico via Red Bluff to Reading, 76 miles, and southeast from Sacramento to Folsom City, 26 miles; also from Sacramento via Woodland north to Hamilton, 108 miles, with a branch from Colusa east to Yuba City, 30 miles. R. Augustus Bray is President of the new company; W. Maginnis, Treasurer, and Curtis Hillyer, Francis C. Van Diense, Martin S. Washburn, Henry C. Mack and Charles Elsey, Directors.

Northwestern Pacific.—See Atchison, Topeka & Santa Fe.

Omaha & Nebraska Central (Electric).—This company, which was organized some time ago, will soon start work on its proposed line from Omaha, Neb., southwest to Hastings, 159 miles. (March 15, p. 389.)

Pecos & Northern Texas.—See Atchison, Topeka & Santa Fe.

Pennsylvania.—The Millsboro branch on the Monongahela division from West Brownsville Junction, Pa., southwest to Millsboro, 11.1 miles, was opened for passenger traffic September 2.

Plans, it is said, are being made by this company for improvements to its yards and tracks at Uniontown, Pa., to cost about $100,000.

Pennsylvania Roads.—It is reported in Pittsburgh that H. C. Frick and other local capitalists will build elevated, subway and surface lines to connect Pittsburgh with Wilkinsburg, East Pittsburgh, Braddock and McKeesport.

Potts Creek.—See Chesapeake & Ohio.

Quebec & Lake St. John.—D. B. Hanna, President of this company, is reported as saying that the branch from La Tuque Junction, Que., to La Tuque Falls, 40 miles, is almost finished, and as soon as the government inspection is made, the line is to be opened for traffic. (March 15, p. 396.)

Rogers Southwestern (Electric).—This company, which is building an electric line from Siloam Springs, Ark., northeast via Rogers to Eureka Springs, 50 miles, has the first 27 miles from Siloam Springs finished. Surveys are now being made on the northern end of the line. When this work is finished a line is to be built from a point seven miles southwest of Eureka Springs south to Huntsville, 22 miles. (March 15, p. 390.)

St. Joseph Valley.—An officer writes that this road has been opened for business from Angola, Ind., west via Crooked Lake, Lake Cage, Orland and Mongo to La Grange, 26 miles.

St. Louis & San Francisco.—Work is reported under way on the branch between Arcadia, Kan., and Cherryvale, changing the alinement and bridges, and putting in heavier rails. The company, it is said, has also made surveys for a cut-off from Minden, Mo., northeast 10 miles to Iantha, on which work is soon to be begun.

St. Louis, Bartlesville & Pacific.—This company, which was incorporated some time ago to build a line from Joplin, Mo., west to Pond Creek, Okla., about 240 miles, has been granted a bonus of $20,000 by residents of that place, and expects to begin grading work about the first of next month. (March 15, p. 391.)

Shasta Southern.—See Northern Electric of California.

Southern.—The Greenville, Elizabeth & Kergs Mill branch of this road has been extended from Wolfs Mill, Miss., 6.6 miles east to Kergs Mill.

Stephenville North & South Texas.—An officer writes that this company, which is building a line from Stephenville, Tex., south via Alexander and Carlton to Hamilton, 44 miles, is now in operation between Stephenville and Carlton, 24 miles, and has track laid on nine miles additional. The grading is being done by Read Bros. & Montgomery, of Stephenville, and the Wisconsin Bridge & Iron Company, of Milwaukee, is putting up two steel bridges; one 100-ft. long and the other 125 ft. The line will have maximum grades of 1 per cent. with maximum curvature of 4 deg. (Sept. 13, p. 308.)

Texas Roads (Electric).—Residents of Greenville, Tex., are organizing a company to build a line from that place via Wolfe City to Bonham, 50 miles.

Tremont & Gulf.—This company has extended its road from Dodson, La., south to Winnfield, about 10 miles.

Union Pacific.—This company, it is said, is planning to build a line from Wamsutter, Wyo., south to Craig, Colo., about 90 miles.

Vancouver, Victoria & Eastern.—See Great Northern.

Virginia Air Line.—An officer writes that contracts have been let to J. N. H. Hornell & Co. for building part of this proposed line from Lindsay, Va., on the main line of the Chesapeake & Ohio, south to Bremo, on the James River division of the same road. Additional contracts are to be let about the first of November. Maximum grades will be 1 per cent. and maximum curvature 6 deg. compensated. Contracts have been let for two steel bridges aggregating about 360 ft. T. O. Troy, President, and W. Washabaugh, Chief Engineer, Charlottesville, Va. (Sept. 27, p. 371.)

Warrensburg & Clinton.—Surveys are reported under way by this company for a line from Higginsville, Mo., on the Chicago & Alton and the Missouri Pacific, south via Warrensburg to Clinton, 50 miles. Captain M. L. Belt, Higginsville, is promoting the project. It is thought that when built the line will be turned over to the Chicago & Alton.

Yazoo & Mississippi Valley.—See Illinois Central.

RAILROAD CORPORATION NEWS.

Boston & New York Air Line.—See New York, New Haven & Hartford.

Brooklyn Rapid Transit.—Gross earnings for the year ended June 30, 1907, were $19,381,587, an increase of $908,259; net earnings, $7,915,882, a decrease of $116,068. Out of net income there was appropriated $442,063 for betterments and additions, a decrease of $138,279; the surplus for the year was $2,002,598, a decrease of $160,011.

Buffalo, Rochester & Pittsburgh.—C. C. Harrison, Jr., & Co., Philadelphia, are offering, at a price to net 5.35 per cent., part of an authorized issue of $3,000,000 4½ per cent. equipment trust bonds dated April 1, 1907. There is $2,100,000 of this issue outstanding.

Canadian Pacific.—At the annual meeting the stockholders adopted a resolution authorizing the lease of the St. Marys & Western Ontario, which is under construction from Embro, Ont., to Sarnia, via St. Marys.

Denver & Rio Grande.—The San Pete Valley, which runs from Nephi, Utah, to Morrison, 51 miles, has been sold to Gould interests and is now a part of the Denver & Rio Grande. The Sterling Coal & Coke Co. and the quarries at Mt. Nebo, to which a branch line runs, are included. The San Pete Valley has $510,000 stock and $815,000 bonds.

Erie.—The annual report shows that a contract has been made with the Hudson & Manhattan, giving the Erie trackage rights through the tunnels now being built and to be built under the Hudson river, as well as terminal facilities in New York. The contract is to become effective as soon as the tunnels are in operation. The Erie has extended for 16 years, from July 1, 1916, its contract with Wells, Fargo & Co. for handling express business on the road.

Great Northern.—An extra dividend of 1½ per cent. will be paid on November 1, at the same time that the regular quarterly dividend of 1¾ per cent. will be paid. The extra dividend is paid by the Lake Superior Co., which owns Great Northern properties other than steam railroads. The Lake Superior Co. formerly held the ore lands which were leased to the United States Steel Corporation and turned over to a board of trustees last fall. The present extra dividend is paid out of surplus derived from the earnings of other subsidiary companies or from the working of the ore lands previous to the above lease.

Gulf & Ship Island.—Gross earnings for the year ended June 30, 1907, were $2,485,949, an increase of $347,171; net earnings, $601,991, a decrease of $79,676; surplus, $317,472, a decrease of $83,803.

Hocking Valley.—The time for the deposit of the stock of the Hocking Valley and of the Kanawha & Michigan under the plan for the consolidation of the two companies has been extended to March 1, 1908. (May 24, page 728.)

Hudson & Manhattan.—See Erie.

Kanawha & Michigan.—See Hocking Valley.

New York, New Haven & Hartford.—The following table, taken from the annual report for the last fiscal year, shows the outstanding debentures of the company, including those of merged lines whose debentures have been assumed by the New Haven. Nearly all of the securities, excepting the convertible debentures and some of the debentures of subsidiary companies, have been issued within the last three years. The amounts outstanding are all in the hands of the public except for $1,766,000 Naugatuck Railroad debentures and $2,700 of the convertible debentures.

	Total Outstanding.	Date of Maturity.
Convertible 3½ per cent. debenture certificates	$11,578,900.00	Jan. 1, 1956
Convertible 4 per cent. debenture certificates	66,100.00	Apr. 1, 1908
Non-convertible 4 per cent. debentures	5,000,000.00	Feb. 1, 1914
Non-convertible 4 per cent. debentures	5,000,000.00	Mch. 1, 1947
Non-convertible 3½ per cent. debentures	5,000,000.00	Mch. 1, 1947
Non-convertible 3½ per cent. debentures	10,000,000.00	Apr. 1, 1954
Non-convertible 4 per cent. debentures	15,000,000.00	July 1, 1955
Non-convertible 4 per cent. debentures	15,000,000.00	May 1, 1956
Naugatuck R.R. 3½ per cent. debentures	2,000,000.00	Oct. 1, 1930
Par value of warrants for convertible 3½ per cent. debenture certificates	18,421,100.00	Jan. 1, 1956
Two-year 4½ per cent. debenture notes	600,000.00	Oct. 20, 1908
Two-year 5¼ per cent. debenture notes	1,250,000.00	Nov. 15, 1908
Two-year 5 per cent. debenture notes	500,000.00	Nov. 15, 1908
Two-year 5¼ per cent. debenture notes	100,000.00	Nov. 19, 1908
Two-year 5 per cent. debenture notes	2,000,000.00	Nov. 22, 1908
Two-year 5 per cent. debenture notes	500,000.00	Nov. 27, 1908
Two-year 5 per cent. debenture notes	370,000.00	Dec. 1, 1908
Two-year 5 per cent. debenture notes	300,000.00	Dec. 5, 1908
Two-year 5 per cent. debenture notes	200,000.00	Dec. 7, 1908
Two-year 5¼ per cent. debenture notes	50,000.00	Dec. 11, 1908
Two-year 5 per cent. debenture notes	400,000.00	Dec. 11, 1908
Two-year 5 per cent. debenture notes	400,000.00	Dec. 14, 1908
Two-year 5 per cent. debenture notes	250,000.00	Dec. 21, 1908
Two-year 5 per cent. debenture notes	200,000.00	Dec. 22, 1908
Two-year 5 per cent. debenture notes	250,000.00	Dec. 24, 1908
Two-year 5 per cent. debenture notes	450,000.00	Dec. 29, 1908
Two-year 5 per cent. debenture notes	500,000.00	Dec. 31, 1908
Two-year 5 per cent. debenture notes	1,500,000.00	Jan. 9, 1909
Three-year 5 per cent. debenture notes	3,500,000.00	Jan. 9, 1910
Three-year 5 per cent. debenture notes	50,000.00	Jan. 10, 1910
Four-year 5 per cent. debenture notes	2,150,000.00	Jan. 9, 1911
Five-year 5 per cent. debenture notes	300,000.00	Jan. 1, 1912
Five-year 5 per cent. debenture notes	6,400,000.00	Jan. 9, 1912
Hartford Street Railway Co.		
4½ per cent debentures, series N	145,000.00	Jan. 1, 1930
4 per cent. debentures, series M	165,000.00	Jan. 1, 1930
Consolidated Railway Co.		
4 per cent. 1954 debentures	4,354,000.00	July 1, 1954
4 per cent. 1955 debentures	2,350,000.00	Jan. 1, 1955
4 per cent. 1956 debentures	2,108,000.00	Jan. 1, 1956
4 per cent. 1955 debentures	1,341,000.00	Apr. 1, 1955
3 per cent., 3½ per cent. and 4 per cent. 1930 debentures	1,000,000.00	Feb. 1, 1930
European loan of 1907	27,985,000.00	Apr. 1, 1922
	$148,734,100.00	

Kidder, Peabody & Co., Boston, are offering at 97 and interest $1,000,000 4 per cent. bonds of 1955, being part of an authorized issue of $5,000,000, of the Boston & New York Air Line, guaranteed principal and interest by the New York, New Haven & Hartford. The New Haven bought the road, which runs from New Haven, Conn., to Willimantic, 52 miles, last year.

Norfolk & Southern.—A special meeting of the stockholders has been called for October 23, to create an issue of $25,000,000 5 per cent., first and refunding mortgage bonds and also some equipment trust notes. The stockholders will also act on a plan for the sale of additional common and preferred stock and of the new bonds and notes. It is said that arrangements for placing part of the new issues are being made with Edward Sweet & Co., as managers of a syndicate.

St. Marys & Western Ontario.—See Canadian Pacific.

San Pete Valley.—See Denver & Rio Grande.

Union Pacific.—The surplus after dividends on the preferred stock, for the year ended June 30, 1907, was $32,350,439, which is equal to 16.5 per cent. on the common stock. This figure does not include $2,015,962 due from the Atchison, Topeka & Santa Fe, the Baltimore & Ohio and the Illinois Central. Including this, the amount would equal 17.6 per cent. on the common stock.

Western Maryland.—This company has sold to John T. McGraw, Grafton, W. Va., its coal plant at Simpson, W. Va., and 3,000 acres of coal lands.

ANNUAL REPORTS.

NEW YORK, NEW HAVEN & HARTFORD RAILROAD COMPANY—THIRTY-SIXTH YEAR.

In accordance with the By Laws of the New York, New Haven & Hartford Railroad Company, the Board of Directors have caused to be prepared a general statement of its affairs for the year ending June 30, 1907, as follows:

For Twelve Months July 1, 1906, to June 30, 1907, Inclusive.

Earnings: From passenger department	$26,758,929.06	
From freight department	28,385,704.38	
From rents	402,398.26	
From telegraph receipts	53,904.62	
Total gross earnings from operation		$55,601,936.32
Less operating expenses (68.073 per cent.)		37,850,081.71
Net earnings, steam railroad		$17,751,854.61
Net earnings, street railways		3,615,809.69
Net earnings, steamship lines		635,127.22
Total net earnings		$22,002,881.52
Add income from other sources:		
Interest and dividends on investments	$1,925,287.58	
Miscellaneous income	152,586.78	
		$2,077,874.36
Total income		$24,080,755.88
Deductions from income:		
Taxes	$3,592,235.93	
Rental of leased lines (Exhibit L)	5,601,846.10	
Int. on bonds, debentures and other liabilities	5,732,742.61	
Miscellaneous charges	257,889.54	
Total deductions from income		$15,187,714.18
Net income		$8,893,041.70
Dividends:		
No. 108—2 per cent. on $83,537,100.00	$1,670,742.00	
No. 109—2 per cent. on 83,584,600.00	1,671,692.00	
No. 110—2 per cent. on 84,471,600.00	1,689,432.00	
No. 111—2 per cent. on 121,878,100.00	2,437,562.00	
	$7,469,428.00	
Less dividends on stock of subsidiary cos.	564,440.00	
		$6,904,988.00
Surplus net income of all lines for the year carried to profit and loss account		$1,988,053.70

While the gross earnings show an increase of about 5 per cent. over the previous year the operating expenses increased about 7 per cent., due to a large increase in wages and in the cost of nearly every class of material necessary in the operation of the property, and to an increase of 25 per cent. in the per diem rate for the use of freight cars.

The six-track construction of the Harlem River & Port Chester Railroad has been continued. A portion of the line will be ready for service during the present year.

The new four-track bridge over the Housatonic River at Naugatuck Junction with a four track Scherzer rolling lift draw, with new signal towers, etc., has been put in service during the year, thus completing the four tracks from South Mount Vernon to New Haven.

The extension of the second track from South Braintree to Whitman, Mass., a distance of 10.6 miles, has been completed and put into service.

The extension of the second track from Nantasket Junction to Cohasset has been completed and put in service.

The second track construction between Seymour and Waterbury has progressed satisfactorily, having been completed from Pines Bridge north, a distance of about four miles. The remainder of the work is estimated to be completed by the end of the present year.

All bridges for abolishing grade crossings in Waterbury have been completed except the new bridge for the freight yard approach. The old freight house has been removed and the business moved to the new. The new freight yard is practically completed. Contract has been awarded for the new passenger station. The whole work planned, including the new passenger station, engine house, and storage tracks, should be completed during the year 1908.

The construction of second track between Danbury and Hawleyville has progressed satisfactorily, and it is estimated the work will be completed during the present year.

The changes in yard and freight facilities at Hartford have progressed. The new double track abutments and bridge across State street and the Valley branch to replace single-track structure, have been completed. The new State street passenger station has been put in service and additions have been made to the Morgan Street freight yard. The completion of the whole work is delayed waiting the completion of other work being done by the Connecticut River Bridge and Highway district.

The second track construction on the Highland division between Waterbury and Bristol, has been prosecuted, but not very rapidly. The double track between Waterbury and Terryville Summit, nine miles, should be ready for service early in 1908. From Terryville Summit to Bristol, which includes the tunnel section, the work will probably not be completed before the close of the year 1908.

The new double-track line between Needham and West Roxbury, Mass., a distance of 4.5 miles, was completed and put into operation in November, 1906.

The work of providing additional tracks and widening the cut through the city of New Haven has been actively prosecuted, and will be practically completed and the new tracks in service by January, 1908.

The construction of the new locomotive repair shop at Readville has been completed. This work includes a new locomotive shop 150 ft. by 900 ft., complete with machinery and cranes, new blacksmith shop 80 ft. by 354 ft., complete with forges, machinery, etc., tire house, iron house, scrap bins, etc. The shops are now in operation.

The construction of the double track connecting line in Providence, including tunnel, has continued. Work was begun at the east end of the tunnel in April, 1906, and at the west end in July, 1906. Owing to adverse circumstances and difficult conditions encountered, and time consumed in installation of necessary plants, the work was not vigorously under way before the fall of 1906. Since that time the work has been prosecuted on both ends of the tunnel with double shifts, day and night. At the close of the fiscal year the advance of the portals of both headings was about 2,100 ft., leaving a distance of 2,800 ft. under the hill between headings. At the present rate of progress, it is estimated that the headings will meet in September, 1908, and the tunnel be completed two or three months later. It is expected the balance of the construction, including the drawbridge over the Seekonk river, will be ready for service by the time the tunnel is.

The elimination of grade crossings in Attleboro, Mass., closing 11 highway crossings at grade, and the construction of four tracks, has been completed, the number of crossings eliminated being included in those reported for the year ending June 30, 1906.

The new Scherzer double-track lift bridge over the Connecticut river at Lyme has been completed and is in service.

Extensive work has been done during the year in renewing bridges to permit operation of heavier locomotives and in depressing tracks and raising overhead bridges to give more clearance for the same, to enable increased train loads. The main lines between New York and Boston and between New Haven and Springfield will be ready for such service within the calendar year.

Grade crossings in the various states were eliminated as follows:

Connecticut	22
New York	1
Massachusetts	4

The electrification of the New York division between Woodlawn and Stamford has been practically completed, and electric service has been inaugurated for local trains between New York and New Rochelle, and New York and Port Chester. The complete change from steam to electric traction for all our passenger service on this section of our line should be made effective during the month of October, 1907.

New passenger stations or increased facilities have been provided during the year at Rockland, Westport, Stepney, Lyman Viaduct, Monument Beach, Lyme, Taunton, Stamford, Putnam, Ashcroft, Attleboro and at Columbus Avenue, Mt. Vernon.

Work is in progress and will be completed during the coming year on new passenger stations or increased facilities at Oakville, New Milford, East Taunton, Dudley street Boston, Bournetown and Pelham.

New freight houses or increased freight facilities have been provided during the year at Massachusetts avenue yard Boston, Danbury, Mystic, Centreville, Pomfret, Housatonic, Stamford, Brewster, East Walpole, Fargo street Boston, Lowell, and a 35 ton electric traveling crane has been installed in the freight yard at Boston.

Work is in progress and will be completed on new freight houses or increased freight facilities at Fairmount, East Bridgeport, Lee, New Milford, Greenwich, Bridgeport, Woonsocket, Bournetown and Centerdale.

A new coal discharging plant has been constructed at South Boston. This includes a wharf 40 ft. by 500 ft. and a new coaling plant with two hoisting towers having a capacity of 13,300 tons.

Additional coaling facilities have been provided at the Shop dock, New Haven.

The Dover Street coaling plant in South Boston was destroyed by fire, and the work of rebuilding same is in progress.

New 75 ft. turntables have been installed at New Haven and South Boston, and an 80-ft. turntable has been constructed at Providence.

A 60-cycle, 2,300 volt, A. C. lighting plant has been constructed at South Boston, and at Danbury an electric lighting plant is in progress of construction. At Berlin an increase in the capacity of the power station by 1,500 k.w. has been authorized.

At Housatonic an improvement in the alignment has been made and two grade crossings eliminated.

The elimination of the Dudley street grade crossing in the city of Boston, including four track masonry, has been commenced. The grade crossing has been discontinued and the work is nearing completion.

The elimination of grade crossings at New Bedford, including nine highway crossings, has been commenced during the year and will be completed about October, 1908. A new engine house and freight yard improvement at the same point is also under way.

Work was commenced in December on the elimination of grade crossings at Main street, East Hartford, and is nearing completion.

Improvements and additions to interlocking and signaling have been made at Marlboro Junction, Slades Ferry drawbridge, Fall River, Boston to Harrison Square, South Braintree, and between East Hartford and Vernon. Improvements are under way at Putnam and between Harrison Square and Mattapan.

Improvements and additions to water stations have been made at East Hartford, Stonington, Simsbury and Southington.

In addition to the work above mentioned, bridges have been strengthened

for heavier engines between Taunton and New Bedford, and such work is now in progress between Waterbury and Winsted, and between Concord Junction and Lowell.

A new double-track steel swing drawbridge on stone masonry piers is being constructed across the Taunton River at Somerset.

A new steel bridge has been constructed across the Housatonic river at Sandy Hook, on the Highland division.

A new double-track roller lift drawbridge is being constructed across the Niantic river at Niantic, and is about 50 per cent. completed.

The long trestle between Saybrook Point and Fenwick is being partially filled and a portion of the same rebuilt.

A new four-track steel bridge with rolling lift has been constructed over the Neponset river in Boston, Mass.

The line between Middletown and Meriden, and between Westfield, Conn., and Berlin, has been electrified, and electric passenger service has been substituted for passenger service by steam.

The Shore Line Division between Tufts and Central Village has been electrified, permitting continuous operation of electric cars between Worcester and New London.

The electrification of the line between East Hartford, Vernon and Melrose is nearing completion.

Contracts for the following new equipment have been made, deliveries under which are in progress:

122 locomotives	650 steel flat cars
35 electric locomotives	1 steel towing steamer
24 parlor cars	160 open electric cars
4 standing sleeping cars	202 closed electric cars
2 compartment sleeping cars	4 electric express cars
4 composite cars	28 electric snowplows and miscellaneous cars
4 dining cars	1 passenger steamer for Fall River Line
4 observation cars	3 steam lighters
500 passenger coaches	13 covered barges
500 refrigerator cars	5 open barges.
11,300 steel underframe box cars	
4,500 steel gondola cars	

Since the last annual meeting 85,120 additional shares of the capital stock of your company have been issued at $200 a share in exchange for 4 per cent. debentures of the Consolidated Railway Company at par. This retired $17,042,000 of indebtedness by the creation of additional capital stock of the par value of $8,521,000.

The merger of the New York, New Haven & Hartford Railroad Company with the Consolidated Railway Company on May 31, 1907, further added 300,000 shares of capital stock, making the total issued capital stock of your company on June 30, 1907, 1,218,781 shares, of which 247,977 shares are held in the treasury of subordinate companies whose capital stock is all owned by your company.

On account of improvements authorized and additional equipment contracted for, the company has issued and sold its debentures maturing in one, two, three, four and five years to the amount of $25,170,000, and has also negotiated through New York bankers a European loan to the amount of 145,000,000 French francs on debentures bearing 4 per cent. interest and maturing on April 1, 1922. To furnish the further funds needed to meet the payments maturing upon contracts for such necessary improvements and equipment required to efficiently handle the business now offering and to maintain a reasonable margin for future needs, the directors recommend that the stockholders of record December 2, 1907, be offered the right to subscribe at $125 a share to additional stock in the proportion of one share of new stock for each four shares of old, and that this right be extended to the holders of the company's convertible debenture certificates dated January 1, 1906, proportionate to their rights as future stockholders; payments to be required on such subscriptions at the rate of 25 per cent. on January 1, 1908; 25 per cent. on July 1, 1908; 25 per cent. on January 1, 1909, and 25 per cent. on July 1, 1909, with the option to the subscriber to pay in full on January 1, 1908, or on any other of the dates mentioned, any balance due. Interest to be allowed at the rate of 5 per cent. per annum on partial payments until stock is issued.

The properties of the Connecticut Railway & Lighting Company, consisting of 193.48 miles of urban and interurban electric lines operating in territory contiguous to your company's electric railways, and of numerous city gas and electric lighting plants, all located within the state of Connecticut, were acquired by lease for 999 years at a varying rental from August 1, 1906, to August 1, 1914, and at a fixed rental thereafter. At the same time, purchases were made of the stock of the Meriden, Southington & Compounce Tramway Company, of the New Milford Power Company, of the Housatonic Power Company and of the stock and securities of the Rhode Island Securities Company.

The Rhode Island Securities Company is the sole owner of the stock of the Rhode Island company, which controls through leases 295 miles of electric railways situated in the cities of Providence and Pawtucket and adjacent territory in the state of Rhode Island, which feed and supplement your lines in that vicinity.

The purchase of the stock of the Rhode Island Securities Company was made with an issue of 4 per cent. 50 year debentures dated May 1, 1907, to the amount of $19,911,000 of the Providence Securities Company (a company whose capital stock is owned wholly by your company), which, in consideration of such ownership, guaranteed said issue of debentures as to principal and interest.

It is believed these properties in themselves will eventually become a source of profit, though a deficit in the returns from their operation was estimated to result for a short term immediately following their acquisition. Their control was important to the protection and growth of other properties in which your company was largely interested, and the increased value of these properties should more than offset any direct loss occurring.

As indicated in the last general statement on November 1, 1906, a maximum passenger rate of two cents a mile figured in multiples of five, became effective on the entire road.

From July 1, 1907, the per diem rate for the use of freight cars was increased from 25 to 50 cents a car. This increase of 100 per cent following an increase of 25 per cent. effective only 12 months previously, meant so serious an additional charge upon our income, estimated at one million dollars per annum, and to territory where the law imposes such restrictions as render us powerless to adopt any measure of protection, impelled us to protest against so unreasonable a charge.

Failing in having this protest respected, or in securing any reasonable measure of relief, the necessary notice, effective October 1, 1907, has been given of our withdrawal from the agreement governing such interchange.

The following lines have been merged, effective upon the dates named, and their outstanding obligations have been assumed and are included in this year's balance sheet:

The Providence Terminal Company, Dec. 29, 1906.
Boston & New York Air Line R. R. Company, Jan. 30, 1907.
Manufacturers' Railroad Company, April 30, 1907.
The Torrington & Winchester Street Railway Company, June 28, 1907.
The Meriden, Southington & Compounce Tramway Company, June 28, 1907.
Pawtuxet Valley Railroad Company, April 16, 1907.
The Waterbury & Pomperaug Valley Railway Company, April 22, 1907.

The balance sheet presented with this report is one made up by a consolidation of the balance sheets of all the companies controlled in the interest of your company through the ownership of all or a majority of their capital stocks, excepting only the New York, Ontario & Western and the Central New England Railway Companies (no obligations having been assumed by your company in connection with those properties other than our investment in their securities), thereby presenting for your consideration a complete statement of all the assets and liabilities of your company, whether resulting directly or through the intermediary of other companies or individuals.

For simplification of operation and that the accounts of our operating results may be intelligibly compared with those of other companies not operating similar properties, the street railways, electric lighting, gas and water supply companies in Connecticut owned and controlled by your company, have been since June 1, 1907, operated under a contract by the Connecticut Company, all of whose capital stock is owned by your company, which provides for the payment monthly of all the net earnings, which results are shown in the Income Account and not included in either the gross earnings or operating expenses of the railroad company.

For similar reasons the steamship lines have been since June 1, 1907, operated under a contract with the New England Steamship Company, all of whose capital stock is owned by your company, and the results treated in like manner.

CENTRAL NEW ENGLAND RAILWAY COMPANY.
Income Account, Year Ending June 30, 1907.

Gross earnings from operation		$2,153,366.51
Operating expenses		2,584,413.46
Operating deficit		431,046.95
Deduct income from other sources		50,547.67
Balance deficit		$80,499.28
Taxes and fixed charges:		
Taxes	$56,879.67	
Rentals of leased lines	106,828.84	
Interest on bonds and other liabilities	103,360.96	
		$267,069.47
Net deficit for year		$347,568.72

The operating expenses include expenditures during the year for rebuilding and strengthening the Poughkeepsie bridge.

The Newburgh, Dutchess & Connecticut Railway Company, the Dutchess County Railroad Company, the Poughkeepsie Bridge Railroad Company, and the Poughkeepsie & Eastern Railway Company were merged with the Central New England Railway Company on June 25, 1907, and their outstanding obligations assumed. As a result of these mergers the capital stock of the Central New England Railway Company and the ownership thereof by the New York, New Haven & Hartford Railroad Company are summarized below:

	Total.	Owned by N. H. & H. R.R.	Owned by others.
Preferred stock	$3,750,000.00	$3,382,876.50	$367,123.50
Common stock	4,800,000.00	4,394,795.38	405,204.62
Total stock	$8,550,000.00	$7,777,671.88	$772,328.12
C. N. E. 1st mort. 5 per ct. bonds	$1,250,000.00	$190,000.00	$1,060,000.00
" gen. mort. income bonds	7,250,000.00	6,318,123.29	931,876.71
" notes	900,000.00	900,000.00	.....
P. & E. 1st mort. 5 per ct. bonds	500,000.00	500,000.00	.....
Dutchess Co. 1st mort. 4½ p.c.bnds	350,000.00	.....	350,000.00
N. D. & C. Col. Tr. 5 per ct. bonds	216,000.00	216,000.00	.....
Inc. income bonds	1,164,500.00	1,156,500.00	8,000.00
Total bonds	$11,630,500.00	$9,280,623.29	$2,349,876.71

The rehabilitation of this property is so far advanced it is believed practicable to commence the payment of a rate of interest, probably not exceeding 3 per cent., upon the general mortgage income bonds from the net earnings for the year ending June 30, 1908.

Early in 1907 the New England Navigation Company acquired by purchase the entire capital stock of the Boston & Philadelphia Steamship Company, running lines of steamers in connection with the rail lines of your company between Boston, Providence and Philadelphia, Pa.

Negotiations were almost immediately entered into with the Merchants & Miners' Transportation Company, reaching the principal ports south from Boston and Providence, resulting in the consolidation of the two companies upon terms which eventuated in the acquisition by your company of a half interest in the Merchants & Miners' Transportation Company and the entering into a close traffic relationship with the same, which it is believed will prove of importance to the protection of your property and the promotion of its revenue.

The operation of the consolidated company since our interest in the [illegible] acquired, indicates the investment will directly return to your company a profit in excess of the interest upon its cost, and the indirect advantages accruing through the influence it is possible to bring to bear upon the entire situation between New England points and the points south [illegible] the Merchants & Miners' and its connections are of even greater [illegible] to your company and the public served by it.

[illegible] high rate of interest prevailing during the past year has rendered [illegible] the sale of any large amount of the 4 per cent. preferred stock

of the New England Investment & Security Company, from which it was expected there would be realized sufficient income to enable it to discharge its indebtedness incurred through the sale to the Consolidated Railway Company of certain securities in electric lines in Massachusetts, referred to in the report for the year ending June 30, 1906, which [illegible] have become the property of your company.

Only about $4,000,000 par value of said stock has thus far been disposed of, and until financial conditions materially improve no further sales are possible except at prices inadvisable.

The interest due has been paid and the properties controlled by the New England Investment & Security Company [illegible] a development which should result within a reasonable time in the payment of the amount of indebtedness due, which payment will be materially hastened by improved financial conditions, rendering possible the sale of its preferred stock without too great a sacrifice.

In the meantime the indebtedness would seem to be adequately well secured.

On May 31, 1907, by authority of the stockholders and in accordance with an Act of the state of Connecticut authorizing the same, a merger was effected of the Consolidated Railway Company and the New York, New Haven & Hartford Railroad Company under the name of The New York, New Haven & Hartford Railroad Company.

The New York, New Haven & Hartford Railroad Company as to-day constituted is the owner directly of all the railroads, electric urban and interurban lines, lighting, gas and water supply companies formerly owned and operated under the separate companies known as the New York, New Haven & Hartford Railroad and the Consolidated Railway Companies.

It was brought to the attention of your Directors early in the present year that a large amount of the capital stock of the Boston & Maine Railroad was seeking a market, and if acquired by interests likely to become the purchasers, the result might be a serious menace to the independence and prosperity of your property. After a long negotiation it was deemed advisable that your company should make the purchase and agreements to that effect were entered into through which your company became indirectly the owner of the same. Such agreements contemplated giving all the stockholders of the Boston & Maine the same terms, but before they became effective legislation was enacted by the commonwealth of Massachusetts prohibiting any further acquisition of stock before July 1, 1908. Inasmuch as the terms agreed upon contemplated a loss of one dollar per annum per share upon all stock to be acquired, it has worked no hardship upon your company thus far, and as the balance of the Boston & Maine stock is widely scattered there is no longer danger of its control passing to interests inimical to those of your property.

The Boston & Maine Railroad is probably as little competitive and is more supplementary and complimentary to your system of roads than any other railroad property with which we are engaged in business, and the operation of the two properties in close harmony with the economies naturally resulting would, judging by experience everywhere upon the system of roads controlled by your company, render possible an improved service and reduced tariffs; and if the Boston & Maine Railroad can be acquired with the good will of the public it now serves it should prove a profitable business venture, but if there is to be only unfavorable criticism, misrepresentation and disparagement, it may be well to proceed no farther, but such investment as has already been made even in that event is justified in that it has removed what could only be regarded as a menace to your property in preventing the control passing in another direction.

New by-laws were adopted on May 31, 1907, increasing the number of Directors to twenty-five, and in accordance therewith the following were elected Directors:

Mr. Lewis Cass Ledyard, of New York.
Mr. Charles M. Pratt, of New York.
Mr. Richard Olney, of Boston.
Mr. A. Heaton Robertson, of New Haven, Conn.
Mr. Frederick F. Brewster, of New Haven, Conn.
Mr. Henry K. McHarg, of Stamford, Conn.

Mr. Alexander J. Cassatt died at his home in Philadelphia on December 28, 1906, and the following minute was recorded upon the records of the Board:

"Alexander J. Cassatt died in Philadelphia, Pa., Dec. 28, 1906. His associates desire to place on record their high appreciation of his services as a Director of this Company and express their sympathy and tender their condolences to his family on the great loss they have sustained.

"Therefore be it

"*Resolved*, That the Secretary be instructed to enter this minute upon the records of the Company and transmit an engrossed copy thereof to his family."

The vacancy was filled by the election of Mr. James McCrea of Philadelphia.

The faithful and efficient services of the officers and employees are hereby acknowledged.

By order of the Board of Directors,
CHARLES S. MELLEN,
President.

STATEMENT OF EARNINGS AND OPERATING EXPENSES OF THE STEAM RAILROAD IN DETAIL, FOR THE TWELVE MONTHS ENDING JUNE 30, 1907.

Earnings.

Passenger Department:		
Regular passengers	$21,075,723.34	
Commutation passengers	1,187,711.17	
Extra baggage	190,607.36	
Special trains, parlor and sleeping cars, etc.	1,378,921.77	
Mails	788,650.05	
Express	2,137,315.37	
		$26,758,929.06
Freight Department:		
Regular	$27,687,481.56	
Hoisting, switching, etc	699,219.82	
		$28,386,701.38
Rents		402,398.26
Telegraph receipts		53,904.62
Gross earnings from operation		$55,601,936.32

Operating Expenses.

Maintenance of Way and Structures:		
Repairs of roadway	$2,564,481.4[illegible]	
Renewals of rails	178,418.42	
Renewals of ties	[illegible]	
Repairs and renewals:		
Of bridges and culverts	[illegible]	
Fences, road crossings, signs & cattle guards	112,1[illegible]8.48	
Of buildings and fixtures	852,7[illegible]0.87	
Of docks and wharves	77,347.8[illegible]	
Of telegraph and telephone	[illegible]	
Stationery and printing	1,474.75	
Other expenses, maintenance of way and structures	20,0[illegible]8.8[illegible]	
Total		$5,479,08[illegible]
Maintenance of Equipment:		
Superintendence	$15[illegible],926.47	
Repairs and renewals of locomotives	2,264,180.76	
passenger cars	1,1[illegible]3,476.99	
freight cars	1,24[illegible],481.78	
work cars	34,231.37	
marine equipment	185,481.0[illegible]	
shop machy. & tools	18[illegible],960.26	
Stationery and printing	1,864.79	
Other maintenance of equipment expenses	130,200.97	
Total		$5,6[illegible]8,784.12
Conducting Transportation:		
Superintendence	$414,94[illegible].[illegible]6	
Engine and roundhouse men	3,209,225.24	
Fuel for locomotives	5,322,325.95	
Water supply for locomotives	316,512.91	
Oil, tallow and waste for locomotives	107,815.64	
Other supplies for locomotives	79,736.13	
Train service	2,841,818.05	
Train supplies and expenses	552,084.20	
Switchmen, flagmen and watchmen	2,299,078.72	
Telegraph and Telephone expenses	474,667.52	
Station service	5,613,968.02	
Station supplies	325,206.07	
Car service, balance	895,036.44	
Loss and damage	341,489.56	
Injuries to persons	521,469.83	
Clearing wrecks	59,533.25	
Operating marine equipment	743,226.52	
Advertising	99,109.21	
Outside agencies	29,643.90	
South Boston elevator	3,542.56	
Rents of tracks, yards and terminals	420,203.91	
Rents of buildings and other property	51,756.15	
Stationery and printing	263,139.99	
Other expenses, conducting transportation	200,773.12	
Total		$25,286,306.05
General Expenses:		
Salaries of general officers	$214,747.06	
Salaries of clerks and attendants	530,572.15	
General office expenses and supplies	48,625.93	
Insurance	208,650.23	
Law expenses	203,674.74	
Stationery and printing (general offices)	28,040.01	
Gratuities and pensions	56,888.97	
Other general expenses	154,703.00	
Total		$1,445,902.09
Total operating expenses		$37,850,081.71
Net earnings		$17,751,854.61

STATEMENT, EARNINGS AND OPERATING EXPENSES OF STREET RAILWAY LINES.

Earnings.

Passenger	$9,410,432.33	
Freight	130,581.29	
Mail	10,638.66	
Express	122,786.52	
Chartered cars	30,285.56	
Sale of power	86,744.72	
Park earnings	69,690.86	
Advertising	34,268.37	
Miscellaneous, incldg. gas, light, power and water	742,629.49	
Total earnings		$10,638,057.80

Operating Expenses.

Maintenance of way and structures	$1,143,967.52	
Maintenance of equipment	698,315.65	
Maintenance of power plants	75,415.13	
Operation of power plants	1,027,375.64	
Operation of cars	2,622,945.47	
General expenses	1,079,542.13	
Miscellaneous expenses	374,596.57	
Total operating expenses		$7,022,158.11
Net earnings		$3,615,899.69

STATEMENT OF EARNINGS AND OPERATING EXPENSES OF STEAMSHIP LINES.

Earnings.

Passenger	$1,589,712.07	
State rooms	511,074.35	
Meals	351,118.42	
Freight	2,959,749.38	
Mail	2,863.65	
Express	114,761.12	
Lighterage and towing	37,233.48	
Rents	40,782.58	
Miscellaneous	37,253.13	
Total earnings		$5,644,548.18

Operating Expenses.

Steamer repairs	$460,760.15	
Running expenses	4,291,081.85	
General expenses	257,578.96	
Total operating expenses		$5,009,420.96
Net earnings		$635,127.22

PROFIT AND LOSS ACCOUNT.

Credit.

Balance brought forward from June 30, 1906:		
N. Y., N. H. & H. R. R. Co.	$13,084,445.67	
Subsidiary companies	287,267.02	
		$13,371,712.69
Surplus income for year ending June 30, 1907		1,988,053.70
Premiums on issues of stock and bonds less discount and commission on debentures		4,777,366.03
Profit on sundry securities		66,653.21
Sundry adjustments relating to prior years		238,972.99
		$20,442,758.62

Debit.

Improvements and betterments	$3,000,000.00	
Loss on dismantled third-rail not replaced	40,720.07	
		3,040,720.07
Balance June 30, 1907, as per General Balance Sheet		$17,402,038.55

EXHIBIT A. *Investments in Stocks of Leased Railroad Companies not Controlled.*

	No. of shares.	Par value.	Book value.
Old Colony R. R. Co.	68,967	$6,896,700.00	$7,638,758.53
Boston & Providence R. R. Corporation	1,902	190,200.00	583,453.72
Providence & Worcester R. R. Co.	2,669	266,900.00	791,086.43
Norwich & Worcester R. R. Co.	550	55,000.00	127,488.79
West Shore Ry. Co.	875	21,875.00	31,574.72
Holyoke & Westfield R. R. Co.	200	20,000.00	20,000.00
		$7,450,675.00	$9,192,362.19

EXHIBIT B.—*Other Investments.*

	No. of shares.	Par value.	Book value.
Boston Terminal Company	2,000	$200,000.00	$200,000.00
N.Y., O. & W. R.R. stock, common	291,600	29,100,000.00	13,105,185.62
N.Y., O. & W. R.R. stock, preferred	22	2,200.00	3,212.00
Central New England Ry. Co.:			
Preferred stock and scrip	33,828.7650	3,382,876.50	$45,719.13
Common stock and scrip	43,947.9538	4,394,795.38	659,219.31
Gen'l income bonds and scrip		6,318,123.29	4,596,434.69
Income bonds		1,156,500.00	398,992.50
Wood River Branch R.R. stock	331	33,100.00	21,467.50
Hart. & Conn. Western R.R. stock	705	70,500.00	34,703.01
Merchants & Miners' Transportation Co. stock	25,000	2,500,000.00	2,500,000.00
Investments in and advances to N. Y. Connecting R.R. Co.			1,527,227.23
Bennington and North Adams St. Ry. Co. stock	6,434 [illegible]	643,466.67	560,033.10
Securities of and advances to Worcester and Webster and Webster and Dudley St. Ry. Companies			1,020,190.09
Boston & Maine R. R. stock	109,948	10,994,800.00	12,835,984.20
Miscellaneous investments			324,966.75
			$38,653,335.13

THE NEW YORK, NEW HAVEN & HARTFORD RAILROAD COMPANY AND COMPANIES CONTROLLED AND OPERATED.
GENERAL BALANCE SHEET, JUNE 30, 1907.

Assets.

Cost of properties		$191,870,988.09
Equipment:		
Steam railroads	$32,792,939.81	
Street railways	6,458,236.97	
Steamships	13,763,583.32	
		53,014,760.10
Investments in stocks of leased companies not controlled (Exhibit A)		9,192,362.19
Other investments (Exhibit B)		38,653,335.13
Real estate at Park Square, Boston, and South St., New York, held for sale		5,210,000.00
Expenditures for additions and betterments to properties leased		7,835,866.58
Materials, fuel and other supplies		5,004,403.06

Current Assets.

Agents and conductors balances	$3,020,565.43	
Accounts and bills receivable:		
Traffic balances	$264,793.37	
Miscellaneous accounts	3,611,025.31	
Bills receivable	14,550,912.71	
	18,426,731.39	
Marketable stocks and bonds (Exhibit C)	5,273,791.00	
Deferred payments on subscriptions to debentures	22,327,619.15	
Cash:		
In banks on current account and on hand	$7,612,370.22	
On special deposit for payment of interest and dividends	4,028,279.77	
	11,640,649.99	
		60,689,356.96

Assets in Special Funds.

Insurance fund (at cost)	$704,464.43	
Accident and casualty fund (at cost)	102,992.26	
N. H. & Northampton Co. sinking fund (at cost)	884,778.82	
Harlem River & Port Chester R.R. Co.'s 1st mortgage bonds special deposit	736,600.00	
Maine S. S. Co. sinking fund	95,821.21	
New London Steamboat Co. 1st mortgage bonds special deposit	166,440.00	
Connecticut Ry. & Lighting Co. sinking fund	184,640.01	
Woonsocket St. Ry. Co. bond redemption fund	10,000.00	
		2,885,739.73

Deferred Charges to Operating.

Prepaid insurance, pier rentals, etc.	$232,636.97	
Betterments to piers	180,670.71	
		413,307.68
		$374,770,119.52

Liabilities.

Capital stock	$121,878,100.00	
Less held by subsidiary companies	24,797,700.00	
		$97,080,400.00
Outstanding capital stocks, subsidiary companies (Exhibit D)		280,400.00
Funded debt:		
N. Y., N. H. & H. R. R. Co. debentures, including debentures assumed of merged roads (Exhibit E)	$146,965,400.00	
Debentures of subsidiary companies (Exhibit F)	24,173,000.00	
N. Y., N. H. & H. R.R. Co. bonded debt, including debt assumed of merger roads (Exhibit G)	32,339,000.00	
Bonded debt of subsidiary companies (Exhibit H)	25,232,000.00	
		228,709,400.00
Reserve for equipment and personal property taken over with leases		8,630,461.62

Current Liabilities.

Traffic balances	$2,561,121.74	
Audited vouchers	6,167,859.32	
Bills payable	3,077,700.00	
Miscellaneous accounts payable	887,479.08	
Unpaid wages	558,330.88	
Reserve for insurance and accident claims	751,043.55	
Rentals of leased lines accrued	230,753.39	
Interest due or accrued	3,093,562.22	
Dividends due or accrued	2,461,027.62	
Taxes accrued	16,460.89	
		19,805,338.69

Special Funds.

Insurance fund	$1,077,846.82	
Accident and casualty fund	148,145.69	
New Haven & Northampton Co. sinking fund	884,778.82	
Connecticut Ry. & Lighting Co. sinking and special funds	260,982.17	
Providence Securities Co. Guarantee Fund	490,327.16	
		2,862,080.66
Profit and loss account		17,402,038.55

Contingent Liabilities.

The N. Y., N. H. & H. R. R. Co. is liable jointly with other roads for any deficiency on foreclosure of bonds of The Boston Terminal Company [illegible]

$374,770,119.52

We have examined the books of the New York, New Haven & Hartford Railroad Company, and its subsidiary companies for the year ending June 30, 1907, and we find that the foregoing General Balance Sheet and Income and Profit and Loss Accounts are correctly prepared therefrom.

All profits and losses of subsidiary companies controlled and operated have been taken up in the account except that the interest on the bonds of the Providence Securities Company so far as it has not been met from the earnings of its controlled companies, has been charged to the guaranty fund provided by the stockholders of the Rhode Island Securities Company on the acquisition of that Company, and we hereby certify that the General Balance Sheet and relative exhibits are properly drawn up so as to show the true financial condition of the combined companies, and that the statements of income and profit and loss are [illegible]

PRICE, WATERHOUSE & CO., Chartered Accountants.
54 William St., New York City, Sept. 16, 1907.

EXHIBIT C.—*Marketable Stocks and Bonds.*

	No. of Shares.	Par Value	Book Value
Pennsylvania R. R. Co.	774	$38,550 00	$38,550 00
Merchants & Miners Trans. Co. 4 per cent. debentures, Due May 1, 1946		3,250,000 00	3,250,000 00
Central New England Ry. Co. 5 per cent. first mortgage bonds, Due December 1, 1919		190,000 00	199,500 00
Poughkeepsie & Eastern Ry. Co. 5 per cent. first mortgage bonds, Due November 1, 1964		500,000 00	500,000 00
Newburgh, Dutchess & Conn. R. R. Co. 5 per cent. collateral trust bonds, Due March 1, 1921		246,000 00	246,000 00
Bennington & So. Adams St. Ry. Co. 5 per cent. first mortgage bonds, Due February 1, 1927		445,000 00	445,000 00
Miscellaneous bonds		624,500 00	624,741 00
		$5,294,050 00	$5,273,791 00

EXHIBIT D.—*Outstanding Capital Stocks of Combined Companies Controlled by Stock Ownership.*

	Total Outstanding.	Held by Companies.	In Hands of Public.
New England R. R. Co., common.	$20,000,000 00	$19,983,800 00	$16,200 00
New England R. R. Co., preferred.	5,000,000 00	4,999,900 00	100 00
Rhode Island Securities Co.	12,000,000 00	11,986,900 00	13,100 00
Berkshire R. R. Co.	1,078,700 00	829,300 00	249,400 00
New Milford Power Co.	1,000,000 00	999,000 00	1,000 00
Hartford & N. Y. Trans. Co.	500,000 00	499,400 00	600 00
	$39,578,700 00	$39,298,300 00	$280,400 00

EXHIBIT F.—*Debentures of Subsidiary Companies.*

	Total Outstanding.	Held by Companies.	In hands of Public.
Providence Securities Co. 4 per ct. gold debentures, Due May 1, 1957	$19,898,000 00	.....	$19,898,000 00
New England Navigation Co. 4 per ct. debentures, Due Jan. 1, 1955	3,175,000 00	$2,500,000 00	† 675,000 00
New England Navigation Co. 4 per cent. gold debentures, Due Nov. 13, 1955	3,600,000 00	.....	* 3,600,000 00
	$26,673,000 00	$2,500,000 00	$24,173,000 00

†Held by N. Y., N. H. & H. R. R. Co., lessee Norwich & Worcester R. R.
*Held by N. Y., N. H. & H. R. R. Co., lessee Old Colony R. R.

EXHIBIT L.—*Rentals of Leased Lines.*

Old Colony Railroad	$1,453,028.22
New England Railroad	836,488.00
Boston & Providence Railroad	482,031.31
Providence & Worcester Railroad	395,908.75
Norwich & Worcester Railroad	286,772.34
Harlem River & Port Chester Railroad	25,400.00
New Haven & Northampton Co.	118,265.00
Boston & New York Air Line Railroad	32,038.89
Holyoke & Westfield Railroad	51,081.44
Berkshire Railroad	15,000.00
Providence, Warren & Bristol Railroad	7,630.08
Pawtuxet Valley Railroad	1,956.00
Plymouth & Middleborough Railroad	11,350.00
Milford & Woonsocket Railroad	3,000.00
Milford, Franklin & Providence Railroad	600.00
Chatham Railroad	4,036.54
West Shore Railway	4,321.51
Connecticut Railway & Lighting Company	$91,657.86
Worcester & Webster Street Railway	4,350.00
United Traction & Electric Company	2,062.50
Rhode Island Suburban Railway	283,056.66
Union Railway	660,102.67
Pawtucket Street Railway	27,591.67
Providence & Burrillville Street Railway	6,350.00
Woonsocket Street Railway	666.66
	$5,604,846.10

STATISTICS.

Passenger Traffic:	
Number of passengers carried earning revenue	75,333,846
Number of passengers carried one mile	1,371,516,126
Average distance carried ..... Miles	18.21
Total pass. revenue (excluding mails, express, etc.)	$22,263,434.51
Average amount received from each passenger	.29553
Average receipts per passenger per mile	.01623
Total pass. earnings (including mails, express, etc.)	26,758,929.06
Passenger earnings per mile of road	12,988.70
Passenger earnings per train mile	1.64877
Freight Traffic:	
Number of tons carried of freight earning revenue	21,370,230
Number of tons carried one mile	1,927,686,950
Average distance haul of one ton ..... Miles	90.20
Total freight revenue (excluding miscellaneous)	$27,687,484.56
Average amount received for each ton of freight	1.29561
Average receipts per ton per mile	.01436
Total freight earnings (including miscellaneous)	28,386,704.38
Freight earnings per mile of road	13,778.82
Freight earnings per train mile	3.49777
Total Traffic:	
Gross earnings from operation	$55,601,936.32
Gross earnings from operation per mile of road	26,989.00
Gross earnings from operation per revenue train mile	2.30615
Operating expenses	37,850,081.71
Operating expenses per mile of road	18,372.31
Operating expenses per revenue train mile	1.57008
Income from operation	17,751,854.61
Income from operation per mile of road	8,616.69
Income from operation per revenue train mile	.73637
Train Mileage:	
Miles run by passenger trains	15,991,475
Miles run by freight trains	7,877,496
Miles run by mixed trains	238,141
Total mileage trains earning revenue	24,107,112
Miles run by switching trains	6,454,511
Miles run by construction and other trains	767,469
Grand total train mileage	31,329,092
Car Mileage, etc.:	
Mileage of passenger cars	72,251,47
Average number of passenger cars in train	4.4
Average number of passengers in train	84
Mileage of loaded freight cars—north or east	8,599,511
Mileage of loaded freight cars—south or west	18,225,715
Mileage of empty freight cars—north or east	15,970,727
Mileage of empty freight cars—south or west	10,134,757
Average number of freight cars in train	24.63
Average number of loaded cars in train	17.72
Average number of empty cars in train	6.91
Average number of tons of freight in train	237.53
Average number of tons of freight in each loaded car	13.41
Average mileage of road operated during the year	2,060.17

IMPROVEMENTS AND BETTERMENTS.

Real estate		$2,473,274.13
New Bridges:		
Lyme	$360,751.86	
Stratford	342,859.26	
Niantic	44,130.22	
Mamaroneck	54,028.58	
Sundry places	171,676.97	
		973,446.89
New Haven cut improvements		908,525.42
Waterbury improvements		540,932.91
Second track, Naugatuck division		691,411.35
Readville shops		945,090.18
Providence tunnel		446,575.10
Electrification of New York division		2,610,789.40
Electrification of Middletown and Berlin branch		219,681.09
Housatonic second track		21,026.54
Eliminating grade crossings		55,175.26
New sidings		122,143.85
Boston freight terminal		175,555.16
Sundry improvements		526,482.94
		$10,688,679.22
New equipment, consisting of 51 steam locomotives, 32 electric locomotives, 47 coaches, 2 composite, 4 baggage, 4 parlor baggage, 4 baggage and mail, 15 baggage and smoker, 5 observation, 3 diners, 20 horse and carriage, 25 milk, 1,054 box, 500 coal, 500 flat, 2 steam shovels, 1 derrick, 1 rail unloader, 55 box cars converted into cabooses, less equipment sold and destroyed		1,062,560.84
Total steam railroad		$14,751,240.06
Double tracking street railways		$313,055.79
Betterment of track		154,842.98
Track extensions		474,602.52
Electrification new lines		421,460.05
Additional power		198,863.57
Miscellaneous		286,438.75
		$1,849,363.66
New equipment, consisting of 149 open cars, 100 closed cars, 4 express cars, 5 work cars, 4 coal cars, 8 snow plows and 2 sprinklers		954,592.44
Total street railways		$2,803,956.10
New steamers		$2,539,499.48
New lighters		162,698.96
Fire protection, Newport		10,851.71
Total steamship lines		$2,713,050.15
TOTAL ALL LINES		$20,268,246.31
These expenditures have been charged to:		
Cost of property		$12,251,093.03
Equipment		5,017,153.28
Profit and loss		3,000,000.00
		$20,268,246.31

STATEMENT OF INSURANCE FUND.

The assets of the fund June 30, 1906, amounted to		$996,480.36
The assets June 30, 1907, consisted of:		
Notes of N. Y., N. H. & H. R. R. Co.	$556,870.83	
$330,000 debentures of the Consolidated Ry. Co. (1930) of book value	295,417.50	
$207,100 convertible debenture certificates of Jan. 1906, of N. Y., N. H. & H. R. R. Co., of book value	235,265.60	
$50,000 debentures of the Providence Securities Co., of book value	43,937.50	
$1,500 debentures of N. Y., N. H. & H. R. R. Co., of book value	1,363.32	
$900 debenture scrip of the Consolidated Ry. Co., of book value	806.00	
$300 debenture scrip of N. Y., N. H. & H. R. R. Co., of book value	300.00	
Total investment	1,133,960.75	
Cash on hand	118,001.94	
Accrued interest	6,771.01	
	1,258,733.70	
Less estimated claims not yet settled	$164,000.00	
Less unearned premiums, etc.	16,886.88	
	180,886.88	
		1,077,846.82
Increase for the year		$81,366.46
Explained by the following statement of operation:		
Receipts:		
Interest and dividends on securities		$37,487.43
From the railroad company		225,000.00
Premiums from subsidiary companies		64,685.73
Salvage		377.05
Total		327,550.81
Disbursements:		
Losses paid operating department		$48,483.54
Premiums paid on outside insurance		11,936.56
Return of premiums paid by subsidiary companies		685.33
Expenses of administration		4,192.04
Estimated amount due operating department and subsidiary companies for losses		164,000.00
Unearned premiums, etc.		16,886.88
Total		246,184.35
Gain during the year		$81,366.46

DESCRIPTION OF STEAM RAILROAD EQUIPMENT.

Rolling Stock, Owned and Acquired from Leased Roads

	Owned by Company.	Acquired by Lease.	Total.
Locomotives:			
Passenger	349	168	517
Freight	333	104	437
Switching	151	37	188
Electric	34	...	34
Total	867	309	1,176
Cars in Passenger Service			
Coaches	938	409	1,347
Parlor and composite	137	7	144
Combination passenger and baggage	97	143	240
Combination passenger, mail and baggage	7	11	18
Sleeping	43	...	43
Dining	14	1	15
Mail	30	1	31
Baggage	184	42	226
Combination mail, baggage and express	22	17	39
Electric motors	43	7	50
Electric trailers	49	...	49
Total	1,564	638	2,202
Cars in Freight Service			
Coal	4,686	1,145	5,831
Box	9,570	1,474	11,044
Flat	1,931	310	2,241
Express freight	139	10	149
Machinery	277	94	371
Milk	82	7	89
Eastman heater	...	48	48
Refrigerator	1	...	1
Stock	2	...	2
Total	16,688	3,088	19,776
Cars in Company's Service:			
Officers' and pay	9	4	13
Air brake instruction car	2	...	2
Snow plows	30	14	44
Derrick	30	17	47
Caboose	296	56	352
Steam shovels	12	2	14
Work	181	22	203
Tool	25	17	42
Truck	18	...	18
Pile driver and tenders	14	2	16
Ballast, plow and spreader	305	...	305
Total	992	134	1,056

DESCRIPTION OF STREET RAILWAY LINES AND EQUIPMENT.

The Connecticut Company operates 640.17 miles of street railway lines, of which 411.01 miles are owned and 229.16 miles are leased, serving the following cities and towns:

Cities of New Haven, Hartford, Bridgeport, Waterbury, New Britain, Meriden, New London, Norwich, Middletown, Stamford, South Norwalk, Rockville, Derby, Ansonia, and the Towns of East Haven, Branford, North Haven, Wallingford, Hamden, Orange, Southington, Plainville, Putnam, Thompson, Killingly, Plainfield, Waterford, Montville, Norwich, Lisbon, Sprague, Portland, Wethersfield, West Hartford, Farmington, Bloomfield, Windsor, East Hartford, South Windsor, Manchester, Enfield, Gastonbury, Suffield, Greenwich, Stratford, Milford, Huntington, Fairfield, Westport, Norwalk, Darien, Naugatuck, Torrington, Winchester, Beacon Falls, Seymour, Cheshire, Newington, and Berlin, Connecticut; and the Towns of Rye, Port Chester, Harrison, Mamaroneck, and New Rochelle in New York State.

Statement of Equipment, June 30, 1907.

	Owned.	Leased.	Total.
Closed cars, double truck	214	56	270
Closed cars, single truck	251	144	395
Open cars, double truck	209	62	271
Open cars, single truck	352	130	482
Convertible cars, single truck	2	...	2
Total passenger cars	1,028	392	1,420
Express cars, double truck	3	4	7
Express cars, single truck	15	1	16
Snow plows	52	28	80
Work cars and miscellaneous equipment	125	35	160
Horse cars	8	...	8
Total	1,231	460	1,691

The Connecticut Company also operates the following gas, electric lighting, water and power plants:

At Branford..........Electric lighting and water.
At Waterbury..........Electric lighting.
At New Britain........Electric lighting.
At Greenwich..........Electric lighting and gas.
At Norwalk..........Electric lighting and gas.
At Naugatuck..........Gas.
At Suffield..........Electric lighting and power.
At New Milford........Power for furnishing electric lighting and power.

The Rhode Island Company operates 310.90 miles of street railway lines, of which 13.89 miles are owned and 297.01 miles are leased, serving the following cities and towns:

Cities of Providence, Pawtucket and Central Falls; and the Towns of Cranston, Warwick, North Providence, East Providence, Johnston, Cumberland, Lincoln, Barrington, Coventry, Scituate, Warren, Bristol and East Greenwich.

Statement of Equipment, June 30, 1907.

	Owned.	Leased.	Total.
Closed cars, double truck	102	124	226
Closed cars, single truck	...	170	170
Open cars, double truck	166	103	269
Open cars, single truck	...	115	115
Total passenger cars	268	512	780
Express cars, double truck	6	5	11
Express cars, single truck	1	2	3
Snow plows, double truck	...	1	1
Snow plows, single truck	30	27	57
Work cars and miscellaneous equipment	37	57	94
Total	342	604	916

Floating Stock.

Steamers:

Steamer Maryland, two compound engines 24 in. x 44 in., stroke, 9 ft.; carrying capacity 6 Pullman sleeping cars, or 6 passenger cars, or 12 freight cars.

Steamer Express, two compound engines, 26 in. x 28 in., stroke, 3 ft.; carrying capacity 10 passenger cars, or 19 freight cars.

Steamer Wm. T. Hart, inclined direct acting engines, cylinders 46 in. x 46 in. diameter; stroke, 9 ft.; carrying capacity, 10 passenger cars, or 20 freight cars.

Ferryboat Fairhaven, length over all, 94 ft.; breadth over guards, 26 ft. 2 in.; depth, 10 ft.; vertical beam engine, cylinder, 30 in. diameter; stroke, 6 ft.

Tugs:

Transfer No. 1, cylinder 26 in. x 26 in.
" " 2, cylinder 26 in. x 30 in.
" " 4, cylinder 30 in. x 30 in.
" " 5, compound engine, cylinders 22 in.-40 in. x 26 in.
" " 6, compound engine, cylinders 22 in.-40 in. x 26 in.
" " 7, compound engine, cylinders 20 in.-40 in. x 28 in.
" " 8, compound engine, cylinders 20 in.-40 in. x 28 in.
" " 9, (steam lighter), compound engine, cylinders 20 in.-40 in. x 28 in.
" " 10, compound engine, cylinders 22 in.-40 in. x 26 in.
" " 11, compound engine, cylinders 20 in.-40 in. x 28 in.
" " 12, compound engine, cylinders 20 in.-40 in. x 28 in.
" " 14, compound engine, cylinders 22 in.-48 in. x 36 in.
" " 15, compound engine, cylinders 22 in.-48 in. x 36 in.
" " 16, compound engine, cylinders 20 in.-44 in. x 30 in.
" " 17, compound engine, cylinders 20 in.-44 in. x 30 in.
" " 18, compound engine, cylinders 20 in.-44 in. x 30 in.
" " 19, compound engine, cylinders 20 in.-44 in. x 30 in.
" " 20, compound engine, cylinders 20 in.-44 in. x 30 in.

Car Floats:

10-car, 10; 12-car, 11; 14-car, 2; 16-car, 8; 22-car, 16; total, 47.

Derrick: "Americus," hoisting capacity, 20 tons.

DESCRIPTION OF STEAMBOATS OPERATED BY THE NEW ENGLAND STEAMSHIP COMPANY

Name	Class.	Dimensions: Length over all.	Beam over guard.	Gross tonnage.	Carrying capacity: No. of passengers.	Cars of freight.	
Priscilla	Paddle wheel, passenger and freight	440 ft. 6 in.	93 ft.	5,292	1,500	67	Owned
Puritan	" " " " "	419 " 1 "	91 "	4,595	1,500	59	"
Providence	" " " " "	397 "	88 "	4,365	1,500	90	"
Plymouth	" " " " "	366 "	87 "	3,770	1,500	75	"
Pilgrim	" " " " "	392 "	91 "	3,483	1,200	53	"
Boston	Twin screw " " "	318 "	60 " 6 in.	3,626	50	170	"
City of Taunton	Paddle wheel, " "	300 "	73 "	2,881	17	119	"
City of Fall River	" " " "	273 "	73 "	2,533	50	107	"
City of Brockton	" " " "	287 "	75 "	2,771	40	115	"
Maine	Single screw, " "	310 "	60 "	2,395	600	88	"
New Hampshire	" " " "	310 "	60 "	2,395	600	88	"
Pequonnock	" " freight	276 " 3 in.	62 "	2,930	....	159	"
City of Lowell	Twin screw, passenger and freight	336 "	66 "	2,975	1,000	84	"
Chester W. Chapin	Twin screw, passenger and freight	324 "	64 "	2,868	1,113	64	"
Mohegan	Single screw, freight	280 "	60 "	[illegible]	...	190	"
Mohawk	Single screw, freight	280 "	60 "	[illegible]	...	190	"
Richard Peck	Twin screw, passenger and freight	318 "	62 " 10 in.	2,906	1,000	80	"
Pequot	Single screw, freight	219 "	51 "	1,360	...	72	"
City of Lawrence	Paddle wheel passenger and freight.	250 "	64 "	[illegible]	400	45	"
Bridgeport	" " " "	260 "	66 "	[illegible]	1,769	36	"
Naugatuck	Single screw, " "	233 "	43 "	[illegible]	500	31	"
Block Island	Paddle wheel, " "	199 "	56 "	757	1,200	19	"
[illegible]	" " " "	299 "	75 "	[illegible]	40	102	"
City of Worcester	" "	310 "	80 "	[illegible]	700	69	"
Bunker Hill	Twin screw, " "	298 "	52 "	[illegible]	50	194	"
Massachusetts	Twin screw "	296 "	52 "	[illegible]	50	191	"
[illegible]	Single screw, steam lighter	109	30 "	[illegible]	...	6	"
[illegible]	Twin screw, steam lighter	129	30 "	412	...	12	"
[illegible]	Compound engine, cylinders 20 in. 31 in. x 26 in.				....	...	"
New Shoreham	Single screw, passenger and freight	166 "	31 "	[illegible]	500	...	Leased

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS.

THE BRITISH AND EASTERN CONTINENTS edition of the Railroad Gazette is published each Friday at Queen Anne's Chambers, Westminster, London. It contains selected reading pages from the Railroad Gazette, together with additional British and foreign matter, and is issued under the name Railway Gazette.

CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.

ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

OFFICERS.—In accordance with the law of the state of New York, the following announcement is made of the office of publication, at 83 Fulton St., New York, N.Y., and the names of the officers and editors of The Railroad Gazette:

OFFICERS:

W. H. BOARDMAN, *Pres't. and Editor*	RAY MORRIS, *Secretary*
	R. S. CHISOLM, *Treas.*
E. A. SIMMONS, *Vice-President*	L. B. SHERMAN, *Western Manager*

EDITORS:

RAY MORRIS, *Man'g Editor*	GEORGE L. FOWLER
BRAMAN B. ADAMS	FRANK W. KRAEGER
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CONTENTS

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The Atlantic City Hotel Men's Association submitted to the street railroad associations holding their annual meetings this week at Atlantic City a proposition having in view the building of a permanent structure in which to hold their conventions, the building to be used also for the annual gatherings of the Master Car Builders' and American Railway Master Mechanics' Associations. If agreeable to the railroad men to meet at Atlantic City for a period of five consecutive years, beginning in 1909, the plan is to be laid before the organizations of supply men responsible for the exhibits at those conventions. The scheme is to rebuild part of one of the piers which projects into the ocean from the boardwalk so that it would accommodate all the exhibits of the June and October conventions, including heavy cars and locomotives, and provide a suitable hall for meeting purposes—all to be under one roof. Exhibitors will pay a fixed sum for each square foot of space, as is now the case. The bare idea of establishing a permanent meeting place for all of the large steam and street railroad associations is thoroughly good. We are not prepared to commend all the details of the plan as evolved by the Atlantic City Hotel Men's Association, but with certain modifications the scheme could be made acceptable. Those modifications should provide, among other things, for a permanent exhibition of railroad appliances, one that could be visited at any time during the year by those interested. It would not only be valuable to those bent on learning, but would mean a saving of a considerable sum of money now spent by exhibitors for transporting and installing and removing their exhibits. It is to be hoped that the present agitation of the subject will result in a workable plan. As far as the place, Atlantic City, is concerned, it is ideal in respect to location and hotel accommodations. Its present facilities for taking care of the large and constantly growing exhibitions of railroad appliances are limited.

Robert Mather, President of the Rock Island Company, has the distinction of presenting more clearly than it has ever been presented before the curious and anomalous railroad situation into which we have been brought this year. His discussion is so good and so sound that we reproduce it almost entire in another column. The principal points which Mr. Mather makes may be listed somewhat as follows:

(1) The prosperity of the nation depends directly upon the efficiency of its transportation system, so that any decrease in this efficiency affects prosperity instantly.

(2) The national government and the states bargained with private capital for the production of the railroads; if the present-day restrictions to the earning power of securities had originally been made, the railroads would not have been built.

(3) Business has expanded faster than the ability of the railroads to raise funds with which to cope with it has expanded; hence there has been much unsatisfactory service.

(4) Rate reductions are the only effective weapons in freight competition, and the railroads have been the victims, not the beneficiaries, of rebates. No rebate was ever given that was not also received.

(5) Regarding the influencing of legislative action, a condemnatory people should remember that there have been legislative highwaymen, and that these highwaymen were their representatives.

(6) Loaded dice must be excluded from corporation security manipulation.

(7) Railroad regulation must be practical regulation; not a crusade for abstract righteousness.

(8) The power that regulates must also protect.

It is a discouraging reflection that this address, which views complex problems with such conservative wisdom, will, like other conservative addresses, be read by those already in sympathy with its doctrines, and will not be read, in any tangible degree, by those who need to read it the most. But if the Chicago Association of Commerce and all the other commercial associations in the country can be made to see these things clearly; the need to check abuses, but the paramount need to check the highwayman and the demagogue in legislative and executive authority, it may be that the fearful and wonderful crusade against property and prosperity may be deprived of the popular support on which it now so flourishes.

RAIL SECTIONS AND SPECIFICATIONS.

The work of deciding on a new rail section is now in the best hands possible; namely, the American Railway Association and the manufacturers of steel rails. This close relation of the manufacturing interests and the consumers will bring out all that can be said on either side of the question and the ultimate result will no doubt be a section of rail metallurgically correct as regards relation of metal in head, web and flange, allowing the low finishing temperature necessary to produce tough reliable steel and a freedom from great shrinkage strains that always occur in rail sections not properly balanced. The trouble with the American Association of Civil Engineers rail sections was the tacit assumption that the

metal in the 100-lb. rail would be the same as that in the 65-lb. rails; the rails were designed and metal distributed to give the best results as a girder, but the use of the heavier rails soon showed that something was radically wrong with them and it was found to be due more to the section of rail than any other cause. This, we feel confident, will be overcome in the proposed new rail sections which will no doubt be given out shortly and come into general use.

The machinery of the American Society of Civil Engineers has proven to be too slow and cumbersome to handle this problem. All the other societies* stood aside and waited on the American Society of Civil Engineers to give the country a better heavy rail section. Their committee has worked some five years on the matter and has up to this time only concluded that more metal was required in the web and flanges of the heavier rails but has not offered rail sections for consideration by the society. This course forced the matter on the Railway Association and the manufacturers, as a change of the heavier sections was found to be absolutely necessary.

The same can be said as regards the rail specifications. The work of the other societies has been thorough and has no doubt formed a basis of the proposed specifications now under consideration by the Railway Association and the manufacturers. The resulting specifications, we feel confident, will be satisfactory to the other societies which have had this work under consideration, although it is not to be expected that every point in the specifications will be settled at once. Some of the most important matters will have to be left open and tried out with rails rolled to the new sections. The matter of specifications and section of rails are so intimately related that the only satisfactory way is to give a section a thorough trial before stating absolutely what can be expected from it. This has more bearing on the reductions in rolling and final finishing temperature with the new sections. It no doubt will be easier for the mills to modify their methods of rolling with the new than with the old sections. It is to be hoped that the other societies will endorse the proposed specifications as far as possible, and if there are any points that they cannot agree upon, that a thorough series of tests will be made to cover these differences of opinion and that they be settled on their merits.

Many of the conflicting opinions on rails and rail sections today are due in part to the unsatisfactory manner in which rail failures have been reported by the railroad companies, and it is to be hoped that a uniform blank for reporting rail failures will come into general use. Also that the information given by the mill inspectors will be in better shape than heretofore, as it is only by securing better methods of manufacture and a check on same that the best results can be obtained from Bessemer or open hearth steel rails.

INCREASE IN WEIGHT OF FREIGHT TRAINS.

In our issue of July 12 we discussed the tendencies of increase in freight train weights during the last ten years, and showed that this increase had averaged some 60 per cent. We are now able to supplement the figures previously given, with those from another characteristic group of roads, although the increase for this group is somewhat less than the previous average and amounts to about 50 per cent. Insufficiency of the records for the early part of the period makes a more exact presentation of data impossible.

In the case of the Chesapeake & Ohio, for example, where the records have been carefully kept, the increase of weight of eastbound trains on the James river division was from 2,350 tons in 1896 to 3,450 tons in 1906, coupled with a corresponding increase of engine weight of from 118,600 lbs. to 181,400 lbs. This increase occurred during the last half of the period, as no changes had been made up to 1901. During this period the car capacity had also risen so that the length of train did not grow with its weight, having risen from 40 cars in 1896 to 50 in 1906. Summarized, this means a rise of 47 per cent. in train tonnage; of 55 per cent. in the weight of engines, and of but 25 per cent. in the number of cars in a train, while the average speed both while running and including stops remained constant at 16 and 10 miles an hour respectively. This eastbound traffic over the James river division is on favorable grades for nearly the whole length of the run and is in the direction of traffic. Westbound, the empty tonnage rose from 705 to 1,103 during the same period with a length of train of 45 and 56 cars respectively.

On the Richmond division the same maximum tonnage of 3,450 was reached from the 2,280 prevailing in 1896, giving a somewhat greater increase, or a full 51 per cent., while the average speed, including stops, rose from 11 to 12 miles per hour.

The records of another road, the Cleveland, Cincinnati, Chicago & St. Louis, from 1898 to 1906, show a somewhat lower increase, but one that was spread over the eight years instead of being concentrated in the last five. In 1898 the standard freight engine was a ten-wheeler (4-6-0) weighing 136,550 lbs., of which 111,400 lbs. was upon the drivers. In 1901, a consolidation had been adopted, weighing 185,800 lbs., with 170,000 lbs. on the drivers; weights that were increased to 211,500 lbs. and 187,500 lbs. respectively in 1906. The trains hauled by these engines weighed 819,892 and 1,132 tons respectively and consisted of 33, 32 and 39 cars, by which the increase of car capacity or loading is well set forth. Here there was an increase of 38 per cent. in train tonnage while that of the engine weights was but 14 per cent.

In the case of the Chesapeake & Ohio the same average speed was maintained throughout the whole period despite the fact that there was an increase of nearly 50 per cent. in the number of trains, but this average speed was low, and the average of delays in the two terminal years of the decade varied only three minutes. On the other hand, on the C., C., C. & St. L. there was a higher average speed throughout, but it dropped from 14.7 miles per hour in 1898 to 12.2 miles in 1901 and rose again to 13.3 in 1906. This was connected with a regular rise in the amount of traffic from 33 trains per day in 1898 to 36 in 1901 and 43 in 1906, coupled with an increase of passenger traffic from 13 to 15 to 23 trains per day, by which the freight work was delayed.

On the Central of New Jersey there has been an increase of about 5 per cent. in the weight of trains since 1901. If these figures are to be regarded as typical of what has taken place throughout the country, it will appear that the increase of about 50 per cent. in tonnage has been accomplished with an increase of about 25 per cent. in the number of cars per train, due probably to better loading and higher capacities. In each of the cases cited, furthermore, the average weights of trains that were given were somewhat below the maximum that had been hauled by the engine, so that the rating was apparently well within the capacity. Nor are these the highest records that have been made in daily work, but may be taken as good average practice of traffic handling in comparatively level sections of the country, and the maximum tonnage that can be hauled by the modern engine is such that in addition to the tonnage rating as to weight a limitation is also put upon the number of cars that are to be used. It is all well enough to raise engine weights and cylinder capacities to a point where the tractive effort is run up to great heights, but the question arises, how about the cars? The front drawbar of the first car must be capable of sustaining the full pull of the engine, and this link in the chain of the train is frequently too weak to sustain any such stress. There are some engines now at work that are confessedly too powerful for the draft rigging of the cars that they are to haul, and this being the case there arises the natural question of what's the use of going any further.

WHEEL AND RAIL SECTIONS.

It is repeating an old story to say that dissatisfaction has been expressed with more or less vehemence during the past year with the present conditions of rails and rail-making for American railroads. The dissatisfaction has extended not only to the quality of the rail but to the shape of its section as well as that of the wheel that is to roll upon it. The result has been that the Master Car Builders' Association has adopted, as recommended practice, a contour of tread and flange that differs slightly, but in what is considered an important respect, from the old long-established standard, and the Maintenance of Way Association has appointed a committee to look into the matter of rail sections and ascertain whether or not it will be possible to improve on the sections of the American Society of Civil Engineers which are now so extensively used throughout the country.

It is evident that in the redesigning of the wheel and rail contours three objects should be kept in view: the reduction of the wear of the rail, the reduction of the wear of the wheel, and the reduction of the rolling resistance of the wheel on the rail. Between 15 and 20 years ago a great deal of interest was manifested in the subject of the relation of the wheel to the rail; the matter was discussed before the few railroad clubs then in existence, and M. N. Forney read an elaborate paper on the subject before the Master

*See their specifications in parallel columns, *Railroad Gazette*, Sept. 6, page 250.

Car Builders' Association in 1884. This paper gave a careful analysis of the relations of the wheel and rail, it summarized the opinions of railroad men on the subject, as they existed at the time, and contained a number of recommendations that were only partially followed in the standards that were afterwards adopted. No experiments were made and matters were in such an unsettled state at that date as to gage of both wheels and track that it was impossible to do more than express an opinion which could not be verified by facts.

Since that time the weight of cars and rails has been increased and the 100-lb. rail that was looked upon as a dream of Sandberg, who suggested it, has become a reality and common practice. Meanwhile opinions based upon everyday observations have led some to believe in the wide head for the rail while others think a narrower top would do better service. The head of the A. S. C. E. section has a top curvature of 12 in. radius with corners of $^{9}/_{16}$ in. radius and vertical sides. The two weights of 100 lbs. and 85 lbs. which are perhaps typical of current practice have widths of heads of $2^{7}/_{8}$ in. and $2^{1}/_{16}$ in. respectively. Briefly the advocates of a narrower head argue that by so rolling it, the metal will be worked to a finer texture, and cite the fact that when a rail is examined under the microscope there is a very marked difference between the structure at the sides and at the center. On the other hand, the wider head is claimed to offer a greater surface of metal for the support of the wheel and for wear, while neither side seem to pay much attention to what is actually taking place as the wheel rolls over the rail.

This matter has never been thoroughly probed, but certain investigations, the results of which will soon be made public, have led to the conclusion that the determination of the proper contours of the wheel and the rail are of great importance and will have a most decided influence upon the three factors that have been set forth as the aim of the modifications that have been and are likely to be made.

Inquiry among the chief engineers of a large number of railroads has brought out the fact that this relationship of the wheel to the rail is almost universally considered "a matter of very great importance," and one that the "joint committee on wheel and rail section should take up." But no information as to facts was obtained. In one case the writer had "concluded after careful observation on a road where there are many curves, that the vertical side of the rails results, in the case of curves, in a delay of the period when the friction of the wheel against the rail shall not only be that due to the tread but also that due to the flange. In other words, the time when flange friction or resistance takes effect is when the side of the rail at the upper corner has been so worn by the wheel flange that it has approximately reached the shape of the flange itself; that is, when it has a sloping side instead of a vertical side, with a top of considerable radius. Under this condition the rail receives a sort of grinding wear, produced by the wheel flange, and the wearing away of the rail on the outside of curves after the shaping to the flange has been well started is quite rapid. This fact alone has been considered an argument for the vertical sides to rails, especially on roads where there is much curvature. In this there has been no discussion of the radius of the curve at the top of the rail. Possibly that adopted may be a little short, but it is probable that the differences, when compared, are very small. Certainly the radius should not be less than it now is."

On the other hand a few electric roads report that the impression has been formed that the sharp corner and vertical side tend to cut away new wheels quite rapidly and thus form sharp flanges, although one engineer of a large road does not consider that it is a "very important subject," this influence of the contours on rolling resistances.

It is, of course, impossible to so design the wheel and rail that wear and frictional resistance can be done away with for no matter what shapes are used at the outset, wear will alter them to suit surrounding conditions as was brought out in a discussion at the American Society of Civil Engineers. Though this may be true, the question arises whether it will not be worth while to make an investigation in order to ascertain whether shape cannot mitigate wear and thus lessen train resistance.

In the course of the wheel and rail investigations referred to, it was borne in on the observer that the contour of the wheel had much to do with the rolling resistance, though definite figures as to the exact value of the variations used were not obtained. It appeared furthermore that the so-called rolling resistance of the wheel on the rail was, for low speeds at least, the most important factor in train resistance. And it was shown that the area of contact between the wheel and the rail was such that, even with the maximum wheel loads of 100,000-lb. capacity cars, it covered but a small fraction of the width of the head of the rail. This held true when the wheels were worn as well as when they were new. As for the area of the section in contact it was so small on both new and old wheels that the average pressure put upon it, when the wheel load was 20,000 lbs., was such that it far exceeded the limit of elasticity or even the breaking strength of the metal of the rail. The reason, then, why the whole top of the rail appears bright is because of the travel of the point of contact from one side of the head to the other.

The rapid rise in wheel loads on all roads during the past few years has made many subjects of investigation important that in the times of light rolling stock in the past would not have attracted attention. As yet there is no precise data available as to the effect of form of tread and flange on train resistance or even of the difference of new and worn rails on that item of railroad operation, but there seems to be a strong indication that it does have an influence, and, if such is the case, it is certainly deserving of more than a passing notice.

Rock Island Company.

The Rock Island Company is a holding corporation in which is vested the ultimate control of the various railroads included in the Rock Island and the St. Louis & San Francisco systems. The arrangement is unusually complex, because there is an intermediate company between the railroads and the final holding company. This is the Chicago, Rock Island & Pacific *Railroad*, which owns directly $70,067,700 of the $75,000,000 stock of the Chicago, Rock Island & Pacific Railway and all of the $29,000,000 common stock of the St. Louis & San Francisco Railroad. The reason that this intermediate holding company was created was that bonds were to be issued in acquiring the stocks of the railroads which were taken over and bonds issued by a mere holding company would not measure up to the standard either of savings bank or investment requirements that bonds equally well protected issued by a railroad company would reach. Therefore, the Chicago, Rock Island & Pacific Railroad Company issues the bonds which financed the consolidation, while the stock which was given with the bonds in exchange for the stocks of the operating railroads is issued by the Rock Island Company. Control of the whole consolidation, involving 14,270 miles of operated line, is centered and brought to a head in the $54,000,000 preferred stock of the Rock Island Company which, alone of the total $150,000,000 stock of that corporation, has voting power. Thus, actual control of the whole great combination of systems can be held through ownership of $28,000,000 of the preferred stock of the Rock Island Company.

On the face of the returns shown in the Rock Island Company's report, the fiscal year lately closed was not a prosperous one, for the combined income account of the Rock Island Company and of the Chicago, Rock Island & Pacific Railroad shows a surplus of only $155,289 remaining available for dividends on the Rock Island Company's stock. But, as a result of the very complexity of the interrelation between the different companies, this proves nothing at all as to the profitableness of the year's operations. Simply by adjusting the amount of dividends declared on the stock of the Chicago, Rock Island & Pacific Railway so that they will cover the interest payments on the Chicago, Rock Island & Pacific Railroad Company's bonds, the surplus available for the Rock Island Company's stock can be reduced to a nominal sum, the rest of the surplus earnings remaining in the operating railroad company's treasury or being used for its benefit. This is the policy which has been pursued during the last two years, or since the 4 per cent. dividends on Rock Island Company preferred stock were stopped in November, 1905, and the policy of general improvement of the railroad lines begun.

The real ownership of the Rock Island Company's stock, however, is in the surplus earnings of its subsidiary lines. In the case of the Chicago, Rock Island & Pacific Railway, for instance, the Rock Island Company really owns 70.75 of its surplus available for dividends. Last year this amounted to $8,750,000. Similarly the Rock Island Company owns all the St. Louis & San Francisco's surplus after dividends which amounted last year to a little less than $4,000,000. Carrying the process on a step further, the Rock Island Company really owns the surplus after dividends of the Chicago & Eastern Illinois, all of whose stock is owned by the St. Louis & San Francisco. Still further, the Rock Island Company really owns most of the surplus of the Evansville & Terre Haute, nearly all of whose common stock is owned by the Chicago & Eastern Illinois. Fortunately, it is no longer necessary to carry this process still a step further, as the operating results of the Evansville & Indianapolis which has been controlled by the Evansville & Terre Haute, are now merged with the returns of that property.

This is, of course, a somewhat theoretical viewpoint, as in the case of each of the operating railroad companies, part of the sur-

plus for the year would be used by the company which earned it for itself, either for in additions and improvements or for miscellaneous deductions or amounts written off which would properly be charged against the income of the year. Yet the results obtained in this way are of value in estimating the actual earnings' resources behind the stock of the Rock Island Company. Assuming that last year in each case the operating company used half of its surplus for its own purposes, the other half accruing to the Rock Island Company, this remainder would have amounted to 5.6 per cent. on the $49,000,000 outstanding preferred stock of the Rock Island Company. The total of the surpluses of the operating companies, without deductions, amounted to 18.8 per cent. on Rock Island Company preferred stock. It is therefore evident that the dividend on Rock Island preferred stock was earned and might have been paid. That it was not is one of the strongest arguments for the ultimate success of this great experiment in railroad consolidation. As long as the railroads themselves, which are the only earning companies in the complicated scheme, are below standard in roadbed and equipment, the corporate pyramid is not firmly set on its foundations. Once improved to the point of efficiency the system as a whole can stand firm and strong. The work which is being done toward bringing about this result is described in detail in the reviews of the reports of the Chicago, Rock Island & Pacific Railway, and of the St. Louis & San Francisco on the following pages.

The combined income account of the 14,100 average miles operated by the Chicago, Rock Island & Pacific; the St. Louis & San Francisco; the Chicago & Eastern Illinois, and the Evansville & Terre Haute, including subsidiary lines, gives a view in the large of the Rock Island Company's system. Gross earnings were $112,500,000, against $95,400,000 in 1906, an increase of about 18 per cent. Operating expenses rose from $63,300,000 to $74,200,000, leaving net earnings of $38,200,000, against $32,000,000 in 1906. The net income available for dividends was $15,000,000, against $10,700,000 in the previous year, of which $5,600,000 was paid out in dividends and the balance, $9,500,000, carried to profit and loss. The total deductions from profit and loss for the year were $6,600,000, leaving a net increase in surplus just under $4,000,000. The year was a most prosperous one, in which much more than the year before was spent on maintenance of the property, less disbursed in dividends and over twice as much kept as final profit.

In order to complete the view of the Rock Island Company's system, as a whole, the following statement of the combined operated mileage, separated in groups according to the company's custom, is included:

	Miles 1st main track.	Miles 2d & 3d track.	Miles yard trk. and sidings.	Trackage rights included in 1st main track.
Rock Island Lines:				
The Chic., Rock Isl. & Pac. Ry...	7,356	289	1,644	622
Chicago, Rock Isl. & El Paso Ry...	112	...	17	83
The Chic., Rock Isl. & Gulf Ry...	471	...	61	84
Total Rock Island lines..	7,938	289	1,722	705
St. Louis & San Francisco R. R Lines				
St. Louis & San Francisco R. R..	2,862	17	618	4
St. L., Memp. & Southeastern R. R.	665	..	117	..
The K. C., Ft. Scott & Memph. Ry.	954	21	376	..
K. C., Memph. & Birmingham R. R.	286	...	99	..
Ft. Worth & Rio Grande Ry	196	...	28	..
St. Louis, San Francisco & Tex. Ry.	125	..	33	39
Paris & Great Northern R. R	17	..	7	..
Birmingham Belt R. R	..	..	25	..
Total, St. L. & S. F. R. R lines	5,061	10	1,303	14
Chicago & Eastern Illinois R. R. .	957	171	469	110
Evansville & Terre Haute R. R. (including Evansv. & Indianap. R. R.)	310		138	10
Grand total	14,270	501	3,632	896

This mileage is located in the following states and territories:

Indiana	564	Forward	8,918
Illinois	1,049	Oklahoma Territory	1,562
Iowa	2,102	Indian Territory	1,289
Missouri	2,309	Tennessee	20
South Dakota	83	Arkansas	1,199
Minnesota	282	Alabama	128
Kansas	1,842	Mississippi	143
Nebraska	250	Louisiana	92
Colorado	376	Texas	808
		New Mexico Territory	112
Forward	8,918	Total	14,270

The Rock Island Company's System.

Chicago, Rock Island & Pacific Railway.

The Chicago, Rock Island & Pacific has had a year of splendid progress both in earnings and in the general improvement of the property which was begun simultaneously with the suspension of dividend payments late in 1905 on the 4 per cent. preferred stock of the Rock Island Company. In the previous fiscal year ended June 30, 1906, a great deal was done toward raising the physical standards of the track and permanent way. In that year the cost of rail renewals increased 230 per cent. On June 30, 1905, there were less than two miles of rails heavier than 80 lbs. to the yard on the whole of the 6,735 miles owned. In the 1906 year 487 miles of 85-lb. rails were laid. Last year, while the increase in the expense of rail renewals was only 4 per cent., this is to be compared with the tremendously increased figure of the preceding year. There were 140 miles of 85-lb. steel put down during the year, besides 170 miles of 80-lb. rails. On the 7,233 miles of line owned on June 30, 1907, 43 per cent. of the main, second and third track now has 80-lb. or heavier rails. Two years ago 65 per cent. of the main and second track had rails lighter than 80 lbs.

This is one particular instance of roadway improvement. There are other interesting features in the maintenance of way and structures account for the past year. This division of operating expenses as a whole increased 29 per cent. over the previous year, whose expenditures on this account were an increase of 25½ per cent. over the year before. The largest increases, instead of being in the rail and the tie items, were in repairs of roadway, 29 per cent.; repairs and renewals of bridges and culverts, 30 per cent.; repairs and renewals of fences, road crossings, signs and cattle guards, 37½ per cent., and repairs and renewals of telegraph, 56 per cent. The expense of maintenance of way per mile of road was $1,164, against $1,021, in 1906. In 1905 the figure was $823 a mile. The 1907 figures include the 299 miles of the St. Louis, Kansas City & Colorado from St. Louis to Kansas City now included in the general results of the system. There were 1,695,000 ties renewed, of which 915,000 were treated. The seriousness, present and potential, of the tie problem may be judged from the statement that great difficulty was experienced in securing an adequate supply of ties for renewals; this by a railroad whose lines can draw upon both the Northwest and the Southwest for its supply of timber.

There were 233 miles of new ballast put in place and 102 miles of line reballasted. Of the 7,522 miles of track, 1,223 were on June 30 ballasted with rock, 446 with burnt clay, 2,050 with gravel and 524 with cinders, leaving 3,279 miles of sand or dirt, or, in other words, unballasted track. Heavy expenditures were made in replacing light bridges with heavier ones and in strengthening existing bridges to provide for the heavier equipment now in use. In such cases an amount equal to the cost of the original structures

or the estimated cost of renewing them in kind was charged to operating expenses. Over a mile (6,100 lin. ft.) of timber bridges were replaced with steel, against 2,417 ft. in 1906, and nearly 3 miles (14,471 ft.) of bridges and trestles were filled, against 1,208 ft. in 1906. These facts clearly illustrate both the physical weakness of the property when the present campaign of improvement was begun and the effectiveness with which the campaign is being carried out.

The improvement policy was not confined to the roadway department. During the year there were acquired 6 balanced compound Atlantic locomotives, 72 consolidation locomotives, 11 Pacific locomotives and 20 switch engines. The increased use of the Atlantic and Pacific types suggests that the passenger business of the road is growing in quantity and excellence of service, while the addition of over 30 per cent. more new consolidation locomotives than were owned a year previous shows the growth in heavy freight traffic. There were 95 new passenger train cars put in service, including 10 dining cars, 5 observation library cars and 1 passenger motor car. Thirty new passenger train cars and another motor car are to be delivered before the end of 1907. The number of new freight cars was 6,737, a net increase of 3,399, or 13½ per cent. in number, but over 31 per cent. in capacity over the cars previously in service. Nearly 3,000 more freight cars are on order. There also were acquired 1 inspection motor car, 1 derrick, 1 rail saw, 10 caboose cars and 100 Hart convertible ballast cars. Fifty more cabooses are to be delivered shortly. Most of the new equipment was acquired through the Rock Island Improvement Company, which issues the equipment trusts of the road. This list of new equipment does not include 14 consolidation locomotives, 6 passenger train cars, 10 caboose cars, 274 stock cars and 1,000 box cars bought at a cost of $1,500,000 for the Rock Island, Arkansas & Louisiana, which owns the line shown on the map directly south of Little Rock, Ark. As illustrating the method of equipment accounting may be noted the case of one special type consolidation locomotive purchased at a cost of $19,871 to replace an engine lost in the Cimarron river, of whose cost $7,623 was charged to property account to offset the deduction from that account for the value of the lost engine, and the rest charged to operating expenses.

The maintenance cost per unit of equipment was $2,440 per locomotive, against $2,614 in 1906; $861 per passenger car, against $773 in 1906; $60 per freight car, against $55 in 1906, and $71 per work car, against $74 in 1906. The report states that on account of the large number of new locomotives put in service, the lower cost of maintenance per locomotive denotes no reduction in the maintenance standard.

It is evident that the Rock Island has now reached the point where its maintenance expenditures are not only fully taking care of the current depreciation of the property, but making up for insufficient maintenance expenditures in the past. There is still a great deal of work to be done. Every added year of prosperity during which the present liberal maintenance standard can be maintained will mean much in the future history of the company. With its lines once brought up to first-class standard, the Rock Island will be in a very strong position as regards surplus earnings on its railroad property.

Gross earnings last year increased $9,000,000, or 18 per cent., and operating expenses were $6,000,000, or 17 per cent. larger, leaving net earnings of $19,200,000, an increase of $3,000,000, or 19 per cent. The net income after charges was 11.6 per cent. on the $75,000,000 capital stock, on which, however, only 5½ per cent. was paid. There was no special improvement appropriation as in the previous year, but the whole of the surplus after dividends was carried to profit and loss, from which was deducted besides other accounts $1,400,000 for depreciation of equipment (which is responsible for most of this amount), structures and tracks.

Of the increase of $9,000,000 in gross earnings, $3,000,000, as already pointed out, was saved for net earnings. Of the remaining $6,000,000, about $2,000,000 was spent for maintenance and $4,000,000 for increase in cost of movement and administration; that is, for conducting transportation and general expenses. The Rock Island was not as successful as the St. Louis & San Francisco in reducing conducting transportation cost. Conducting transportation was 57.07 per cent. of the total expenses, against 55.98 per cent. in 1906 and 58.25 per cent. in 1905. The still more significant ratio of conducting transportation cost to gross earnings was 38.88 last year, as against 38.31 in 1906, and 41.07 in 1905. Thus the actual cost of moving the traffic in a year when the cost of material, supplies and labor was greatly increasing and when there was likely to be that lack of economy which often comes from handling a great increase in traffic, only 0.57 per cent. more of the gross earnings were spent on conducting transportation than in the previous year. This true, there was naturally an increase in the trainload as one of its prime causes. Including all freight, the trainload now lacks only half a ton of being 300 tons. The revenue trainload was 266 tons last year, against 245 tons in 1906. There was also an increase in the average carload.

A year ago there were some startlingly large increases in the tonnage of various individual commodities. The same thing was true last year. The tonnage of wheat increased 40 per cent., of flour 30 per cent., of hay and straw 50 per cent., of cotton 34 per cent., of fruit and vegetables 27 per cent. and of other agricultural products 55 per cent. But grain and oats tonnage decreased so that the increase in the "products of agriculture" group was only 10 per cent. Other large individual tonnage increases were: in coke 55 per cent.; "other mineral products," 306 per cent.; "other castings and machinery," 112 per cent.; petroleum and other oils, 40 per cent.; wagons, carriages, tools, etc., 45 per cent., and household goods and furniture, 58 per cent. Manufactures, as a whole, increased 19 per cent., and merchandise, which includes all less than carload shipments, 17 per cent. The tremendously rapid growth and expansion of the Southwest are clearly evidenced in these figures of increases. The records of the industrial department emphasize the same fact. There were located along the lines of the road during the year 327 new enterprises at an estimated cost of $8,500,000. These are to employ over 8,000 people.

The balance sheet shows that cash stood at $9,900,000 on June 30. Against this, $7,500,000 of three-year notes fell due and were paid off the next day. This would leave a cash balance of $2,400,000. Current liabilities were $11,000,000, against current assets of $10,600,000, including this cash sum. There were, however, $855,000 in fundable advances for construction and equipment, material and supplies on hand valued at $4,400,000 and $10,000,000 in unpledged bonds in the treasury. The transfer of the St. Louis, Kansas City & Colorado to the property and franchises account added $16,900,000 to that item. There was $2,800,000 added in connection with the completion and equipment of the Rock Island, Arkansas & Louisiana.

The Rock Island is still expanding. The new line of the Trinity & Brazos Valley, the present status of which is described in detail in the review of the Colorado & Southern's report, will serve the Rock Island as well as the Colorado & Southern and the St. Louis & San Francisco as a Gulf outlet. The line which the Colorado Southern, New Orleans & Pacific is building between Houston and New Orleans is described in the review of the St. Louis & San Francisco. The Rock Island is to connect with this new line, not only at Houston, but over the Rock Island, Arkansas & Louisiana, which is to be finished to Eunice, La., on the Houston-New Orleans line, this month. The estimated cost of the last 57 miles of this line from Alexandria south to Eunice is a little more than $1,000,000, of which more than half had been spent on June 30, 1907. The new lines in Arkansas connecting this line with the Choctaw division at Little Rock were finished during the year, the branch from Fordyce to Crossett, 57 miles, having been put in operation on February 1, 1907, and the line from Tinsman to Eldorado, 36 miles, on June 23, 1907. These two lines are laid with 60-lb. rail, gravel ballasted and equipped with Rock Island standard bridges and buildings. Just north of Alexandria a part of the Louisiana & Arkansas is to be used under a trackage contract. Completion of the whole line to Eunice will establish a new through route connecting the Choctaw division, the old Choctaw, Oklahoma & Gulf, with New Orleans.

President Winchell speaks as follows in regard to the railroad legislation of the year. The truth of his statement that every opportunity is being taken to establish better relations between the railroad and its patrons is thoroughly borne out by the facts. There is no railroad in the country which is more alive to the necessity and advantages of publicity and frank dealing than the Chicago, Rock Island & Pacific:

> Legislation by the various states which your lines serve, respecting rates and operating methods of railroads, has been excessive in quantity and severe in character. The legislatures of five such states have passed laws establishing two cents a mile as the maximum rate of passenger fare, and other laws have been passed by the several states calling for serious reductions in freight rates. Doubtless a large part of this legislation has been due to misconception of the actual conditions. At every opportunity it is the policy of the officers of your company to endeavor to establish better relations with the people of the various states, and to impress upon them the fact that the progress of the section of the country traversed by your road, and the continued prosperity thereof, require candid co-operation between the railroads and the other business interests. The aim of all must be to promote the welfare of the country, and it is to be hoped that when the situation is thoroughly understood, a spirit of mutual co-operation will be the result.

The following table summarizes the last two years' results on the Chicago, Rock Island & Pacific:

	1907.	1906.
Mileage worked	7,780	7,128
Passenger earnings	$16,449,765	$13,917,031
Freight earnings	40,663,972	34,695,824
Gross earnings	60,238,420	51,237,858
Maint. way and structures.	8,754,307	7,302,490
Maint. of equipment	7,184,128	6,661,466
Conducting transportation	23,420,948	19,630,076
Operating expenses	41,044,142	35,067,059
Net earnings	19,194,278	16,170,800
Net income	8,750,517	6,785,832
Appropriations for betterments	.....	2,108,280
Year's surplus	4,633,789	.....

St. Louis & San Francisco.

A year ago, in reviewing the results of operation of this road, it was remarked that the St. Louis & San Francisco had two great problems: one, to develop a profitable business on a large mileage of new lines in new country; the other, to reduce the proportionate amount of earnings used up by the unproductive expense of conducting transportation. It could not then be known that the Southwest was during the next year to lead all other parts of the country in the rapidity of its growth, a circumstance which solved the first of the St. Louis & San Francisco's problems with great satisfaction. The second was solved by the officers of the road by reducing the proportion of operating income paid out in conducting the business in a year when the ordinary costs of operation were abnormally high.

The years from 1900 to 1905 were a period during which the St. Louis & San Francisco mileage grew by several hundred miles a year. In 1906 there was an increase of only 38 miles and last year there was an actual decrease of seven miles, due to remeasurements and abandonment of small sections of useless track. But the road stands on the threshold of another period of important expansion. On April 30, 1907, it leased for 999 years the Colorado Southern, New Orleans & Pacific Railroad, all of whose stock and bonds it owns. This company owns the Orange & Northwestern and the Beaumont, Sour Lake & Western, and the three roads are together building a through line from Houston, Tex., to Baton Rouge, La., which will be extended by trackage rights over the Yazoo & Mississippi Valley from Baton Rouge to New Orleans. This line, shown on the map of the Rock Island Company's system on another page, is to be in operation by the end of the year. Besides penetrating a local territory productive in cotton and sugar, it will be a competitor as a through line with the Southern Pacific from New Orleans to Houston. The total mileage under construction by the Colorado Southern, New Orleans & Pacific and its subsidiary companies is 303 miles. Including the trackage rights along the Mississippi river, the total mileage will be nearly 400 miles. This is all the construction which is directly at present under way. There are projected, however, a line from Oklahoma City, Okla., south via Lindsay, Ind. T., to Cornish, which is on another projected line from Ardmore, Ind. T., west via Waurika, Okla., to a point near Wichita Falls, Tex.; and an extension of the old Fort Worth & Rio Grande from Brady, Tex., south to San Antonio. Another through line of even greater importance, though it has not involved any direct construction, is the Trinity & Brazos Valley line from Fort Worth and Dallas, Tex., south to Houston and Galveston, giving the St. Louis & San Francisco as well as the Rock Island for the first time a Gulf connection. The Trinity & Brazos Valley will also be a feeder of the Houston-New Orleans line.

Thus the St. Louis & San Francisco will within the next year again have several considerable increases in mileage, this time by through lines in competitive territory instead of, as most of the additions in the recent past have been, lightly built local lines in undeveloped territory. It will be both interesting and important in judging of the future of the property to observe the effect of the acquisition of these two important through lines, of which the Fort Worth extension changes hitherto mainly local lines from Kansas City and from St. Louis south to Fort Worth, into parts of a new through line, on the earnings and detailed operating results. If the result is to secure a much larger proportion of through traffic, the new lines will furnish an element of great strength in regular traffic not dependent largely on the immediate growth and productiveness of the surrounding territory. More of such through traffic the road has always needed.

Last year's record of operations shows gross earnings 20½ per cent., and net earnings 19½ per cent. larger than in 1906; this as already mentioned, with no increase in the operated mileage. Operating expenses, to be sure, increased 21 per cent., faster proportionately than either gross or net earnings, but, largely owing to the reduction in proportion of conducting transportation cost, the net results were as satisfactory as shown. Conducting transportation amounted to 54.72 per cent. of the total expenses, as against 57.15 per cent. in 1906 and 57.9 per cent. in 1905. Its ratio to gross earnings was 35.25 against 36.64 in 1906 and 37.4 in 1905. This showing is a satisfactory one for any year, remarkably so for a year when the cost of conducting transportation on most roads rose more instead of less than any other operating cost.

The decreased proportion which conducting transportation showed to both operating expenses as a whole and to gross earnings was taken up by maintenance of way and structures which was 21.71 per cent. of total expenses, against 19.71 per cent. in 1906, 18.6 per cent. in 1905, and 17.6 per cent. in 1904; and, of gross earnings, 13.99 per cent., against 12.63 per cent. in 1906 and 12 per cent. in 1905. The same policy of greatly improving the property was carried out as on the Rock Island. The average expenditure for maintenance of way and structures per mile of road operated was $1,068, against $799 in 1906, an increase of $269, or 34 per cent., on each of the more than 5,000 miles operated. This is a striking showing of the improvement policy. The cross-tie renewals during the year amounted to 1,439,000; there were 1,186 ft. of wooden trestles filled; 625 ft. of stone or concrete arch culverts substituted for wooden culverts; 200 ft. of timber bridges replaced by steel structures, and 2,515 ft. of iron and steel bridges replaced with heavier steel bridges. Of new rail there were 21,329 tons of 85-lb., 2,788 tons of 75-lb. and 365 tons of 65-lb. laid in main track during the year. There were also 132 miles of track ballasted and 194 miles reballasted. These figures, which sum up the principal activities of the maintenance of way department, give an idea of how much has been done.

The equipment also was more liberally maintained than in the previous year. This account, as a whole, increased 24 per cent. Repairs cost $2,508 per locomotive, against $2,313 in 1906; $781 per passenger car, against $761 in 1906; $62 per freight car, against $50 in 1906, and $45 per service car, against $49 in 1906. The net increases in rolling stock equipment during the year were 63 locomotives, four passenger cars, 2,416 freight cars and 844 service cars. In addition, there are being delivered during the last half of the calendar year 90 locomotives, 87 train cars and 5,255 freight cars.

Gross earnings were $38,600,000, an increase of $6,600,000. Of this increase, freight earnings, which increased 22 per cent., furnished $4,900,000, and passenger earnings, which increased 16 per cent., $1,300,000. There was an increase of 26 per cent. in mail earnings, partly due to a new mail service operated in connection with the Missouri, Kansas & Texas.

Operating expenses were larger by $4,300,000. Maintenance of way and structures increased $1,400,000, or 33½ per cent.; maintenance of equipment, $900,000, or 24 per cent., and conducting transportation, $1,900,000, or 16 per cent. The increase in general expenses was 22 per cent. The St. Louis & San Francisco is very fortunate to be able to report a decrease of 5 per cent. in tax payments for the year. The net income available for dividends was 80 per cent. larger than in the previous year, and the dividend payments, owing to the passing of the 2 per cent. dividend on the second preferred stock in 1907, 62 per cent. smaller, so that the surplus after dividends was just under $4,000,000, as against a little less than $1,800,000 in 1906, an increase of 121 per cent. There was charged to the general profit and loss account $625,000 as depreciation in the value of buildings torn down, tracks taken up and equipment destroyed and dismantled during the year, the balance of the cost less salvage, being charged to operating expenses.

Freight earnings per mile of road rose from $4,331 to $5,304. The trainload was 224 tons, against 214 tons in 1906, a small increase. This is a road with a great network of branch lines which carry light traffic. The bulk of the business is traffic of this character; therefore an increase in the trainload is much harder to accomplish than on a heavy traffic road with through business, where it is necessary only to cut down the ruling grade or acquire heavier power to raise the number of tons carried per train mile.

There were increases of 21 per cent. in the tonnage of agricultural products, 15 per cent. in mineral products, 14 per cent. in forest products and 24 per cent. in manufactures. Wheat tonnage increased 36 per cent.; hay and straw, 52 per cent.; cotton, 16 per cent.; dressed meats, 69 per cent.; wool, 163 per cent.; bituminous coal, 16 per cent.; "other mineral products," 107 per cent.; petroleum and other oils, 45 per cent.; pig and bloom iron, 44 per cent.; "other castings and machinery," 46 per cent.; bar and sheet metal, 106 per cent.; wagons, carriages, tools, etc., 90 per cent.; household goods and furniture, 21 per cent., and "other manufactures," 29 per cent. The merchandise tonnage increased 11 per cent. and miscellaneous, including all carload shipments of commodities not separately mentioned, 45 per cent. The similarity of some of these individual increases to corresponding ones on the Rock Island will be noticed. The industrial department reports almost the same number of new industrial plants as those that located on the Rock Island lines during the year. The new industries on the St. Louis & San Francisco tracks number 338, cost about $9,000,000 and employ over 12,000 men. These figures are all further testimony to the great prosperity of the Southwest.

The balance sheet shows current liabilities of $13,600,000, against strictly current assets of $12,240,000. There are in addition fundable construction advances amounting to $865,000, supplies on hand amounting to $2,870,000 and unpledged securities in the treasury which cost $1,100,000. This company like the Chicago, Rock Island & Pacific is in no immediate straits for new capital, but if it were is possible to do so on reasonable terms could at once profitably enlarge its working capital.

The following table shows the operating results of the St. Louis & San Francisco, not including the Chicago & Eastern Illinois:

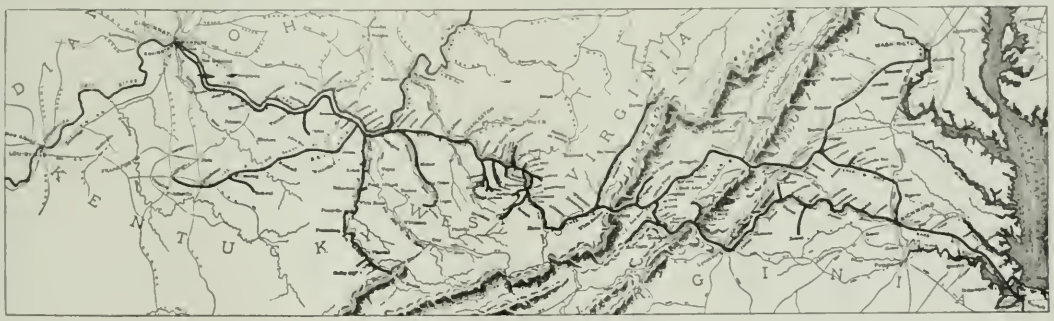
	1907.	1906.
Mileage worked	5,062	5,069
Passenger earnings	$9,169,400	$7,908,841
Freight earnings	26,848,665	21,955,975
Gross earnings	38,621,068	32,046,657
Maint. of way and struct.	5,406,107	4,049,094
Maint. of equipment	4,699,674	3,803,211
Conducting transportation	13,610,703	11,742,742
Operating expenses	24,872,579	20,545,533
Net earnings	13,748,488	11,501,123
Net income	4,158,583	2,309,136
Dividends	199,742	519,742
Year's surplus	3,958,841	1,789,394

Chesapeake & Ohio.

A change has taken place during the last year in the operating results of the Chesapeake & Ohio. The year ended in June, 1906, was far and away the most prosperous in every way in the company's history. Gross earnings increased 19 per cent. and net earnings 26 per cent. over the 1905 year, which in itself was very prosperous. Last year although gross earnings increased 5 per cent., there was a decrease of nearly $600,000 or 5½ per cent. in net earnings. As charges sharply increased, owing largely to an increase of 29 per cent. in taxes and the greater amount of equipment bonds outstanding, the year's final contribution to the profit and loss account was only a nominal one, instead of a surplus of nearly $1,500,000 as in 1906.

Gross earnings were affected unfavorably by the hard winter. Operating expenses were much increased by the rise in cost of materials and a general increase in wages. Furthermore, traffic on the lines in West Virginia and Kentucky was frequently interrupted by land slides and by river floods, the train service on the Cincinnati division having at one time been suspended for a week.

The Chesapeake & Ohio, like the Norfolk & Western, its near neighbor from the Ohio river to tidewater, and, for that matter, many other railroads, is at present in a discouraging situation. Great quantities of traffic are offering. The company has been and is hard put to it to provide enough equipment to meet this traffic. Even with the equipment provided, the necessities of the case are not met, for the existing lines, mostly single-track, are inadequate to promptly and efficiently handle the rush of traffic. More double-track is urgently needed. Gross earnings, to be sure, are increasing, but already the increases are more than eaten up by the rising cost of operation. Locomotives cost more, cars cost more, lumber costs more, general supplies cost more; in particular, labor costs more, while at the same time it is generally less efficient. In this situation the company is met with state laws reducing rates. Furthermore, its main hope of solving its problems—the extension and improvement of its plant through expenditures on capital account—is taken away by the fact that it cannot sell bonds.



Chesapeake & Ohio.

In commenting on this situation President Stevens calls attention to the fact that while the road last year earned more than 5 per cent. on its stock, the shareholders' dividend was only 1 per cent., a rate never exceeded since the formation by reorganization of the present company in 1888. Instead of distributing a fair share of profit to its owners, the company, in order to meet the needs of its shippers, has been compelled to apply its whole surplus income beyond the 1 per cent. dividend payment to buying additional equipment and furnishing more traffic facilities. But even by doing this, all of the vitally needed improvements cannot be carried out. Of 98 miles of new second-track authorized during the previous fiscal year, only 24 miles have been finished. Work on the rest has been stopped because the company cannot borrow the $1,315,000 necessary to finish the suspended work.

President Stevens next contends, and it would seem with justice, that the traffic of the road has not been burdened by excessive rates. An average passenger-mile rate of 2⅛ cents is low for a road most of whose mileage is in Virginia, West Virginia and Kentucky, and which has little or no commutation traffic to bring down the average rate. Still more true is this of the rate received per ton per mile for freight which was only 4⅛ mills last year, one of the lowest ton-mile rates on any railroad in the country. Assuming the further fact, which is confirmed both by a study of the report and a knowledge of the working of the property—that the road has been efficiently and economically managed, he reaches the conclusion that the return to the owners of the property has been entirely inadequate; so small that it would not be justified in any kind of business.

Mr. Stevens continues as follows:

"It would, therefore, seem to be to the interest of the communities and people served by your lines, that your revenues should not be lessened or your credit injured by further reducing rates that are now inadequate to meet the present requirements of the property and [illegible] the reason which you as shareholders may rightfully and reasonably expect. It seems clear that when all the leading railroads in the section served by your lines [illegible] has arrived when the increased volume of traffic offering is being exceptionally large expenditures for improvements, equipment and [illegible] and as the commonwealths through which they pass can only prosper through continued development of the resources and other industries which are served by the railroads, it necessarily follows that any legislation which reduces their credit and prevents the sale of securities at fair prices must work injury at a time to the people as to the railroad itself. It is believed that the communities along the lines of the system must in the end recognize the necessity of this statement."

There was an increase of 5 per cent. in the tonnage of coal and coke which together make up 61 per cent. of the road's traffic. Strangely enough in a year of such very general prosperity all other freight traffic increased almost not at all. There was a small decrease in ton mileage, but as the revenue per ton-mile was slightly larger, the freight earnings increased 3 per cent. There was a decrease of 2 per cent. in the freight density.

The revenue trainload rose from 586 to 596 tons. Including company freight the figure was 628 tons. These figures exceeded only by the Great Northern and short roads like the Bessemer & Lake Erie and the Pittsburgh & Lake Erie, which connect the iron and steel centers of the Pittsburgh district with the ore docks on the Lakes.

There were much larger proportionate increases in the passenger department. Passenger earnings increased 15 per cent. and passenger density 12 per cent., while passenger earnings per mile of road were 13 per cent. larger, rising to $2,675. Passenger earnings per train-mile, however, increased only 1 per cent., while freight earnings per train-mile were 4 per cent. larger.

The total increase in operating expenses was $1,780,000. Of this, $1,050,000 was in conducting transportation, the operating division of which account increased 14 per cent. Maintenance of way and structures increased $440,000 and maintenance of equipment $252,000, thus reversing the experience of many other railroads last year whose maintenance of equipment cost increased far more than maintenance of way. Per mile of line, maintenance of way cost $1,691, against $1,447 last year. It is therefore evident that the road has been well kept up, especially as about $1,000,000 of the extraordinary expenditures for the year was on maintenance of way betterments. The cost of repairs per unit of equipment was $1,973 per locomotive, against $2,114 in 1906; $1,047 per passenger car, against $1,091 in 1906, and $87 per freight car, against $94 in 1906. The passenger car figure for both years is high.

Even including materials and supplies, which stood at $2,240,000 on the balance sheet on June 30, 1907, current assets were $1,700,000 less than current liabilities. Excluding this item, the current assets were $1,700,000 less than the one liability item "unpaid vouchers and pay rolls." Last fall there were reports that the directors were planning to rearrange the company's finances in such a way that a large general bond issue available for improvements and extensions would be created. The Chesapeake & Ohio has been much handicapped by the fact that it had few bonds of uncompleted issues available. Most of its new construction has been financed by means of branch-line bonds. The stock market debacle of last spring probably prevented the formation of such a general and inclusive financial plan. To take care of immediate needs, however, the directors resolved on June 14, 1907 to recommend the creation of $10,000,000 general equipment and improvement 10-year 5 per cent. bonds. This mortgage was unanimously authorized at a special meeting of the stockholders on July 31. As of July 1, $5,000,000 three-year 6 per cent. notes secured by $6,500,000 of these bonds were sold. The proceeds of these notes would, therefore, offset the excess of current liabilities over assets as of June 30, 1907. It is obvious, however, that this note issue does very little toward providing for the general expansion needs of the company and that once

investment conference is re-established, a general and comprehensive finance plan is likely to be adopted.

The following table sums up the last two years' operations:

	1907.	1906.
Mileage worked	1,827	1,793
Passenger earnings	$4,888,139	$4,242,556
Freight earnings	19,974,861	19,395,648
Gross earnings	25,796,861	24,602,988
Maint. way and structures	3,090,037	2,649,557
Maint. of equipment	4,721,346	4,469,590
Conducting transportation:		
Traffic	482,444	434,755
Operation	7,955,064	6,959,355
Operating expenses	16,650,307	14,869,649
Net earnings	9,146,554	9,733,339
Net income	3,392,999	4,607,223
Improvements and equipment	2,684,221	2,532,739
Years' surplus	61,071	1,426,577

Colorado & Southern.

This is a period of great expansion for the Colorado & Southern, which was organized from two branch lines which were lopped off from the old Union Pacific property when the present Union Pacific was formed. These were the Denver, Leadville & Gunnison and the Union Pacific, Denver & Gulf. The latter turned back to the Union Pacific the Julesburg branch by which the Union Pacific now gets its entrance from the east to Denver, on the formation of the Colorado & Southern, which began operations with 1,537 miles of line, including the Fort Worth & Denver City Railway, which it controlled through ownership of a majority of its stock. This brought the system to Fort Worth, Tex. Here it stopped for eight years. The present year has seen, or will see, its extension to Houston and to the Gulf at Galveston, the second largest port of export in the country.

This new construction, which is shown on both the Colorado & Southern and the Rock Island Company maps in this issue, has been carried on through the Trinity & Brazos Valley, a subsidiary corporation, all of whose issued and to be issued stock and issued bonds are owned jointly by the Colorado & Southern and the Rock Island Company, controlling the Rock Island and the St. Louis & San Francisco. Operation of the line from Fort Worth to Houston was begun on February 10, 1907, and on July 1 the Dallas connection with this line was opened. By the close of the year 1907, trains will be operated into Galveston. Construction work is still going on north of Houston in order to prepare the road to handle efficiently the large amount of business which is likely to fall to it. That the business will be large is not a doubtful expectation, for, as mirrored in the joint ownership of the Trinity & Brazos Valley, it is to be used, both from Fort Worth and from Dallas, as a Gulf connection for the Rock Island and the St. Louis & San Francisco, as well as for the Colorado & Southern. Besides, the new lines open up new country and are the shortest railroads between Fort Worth and Galveston and between Dallas and Galveston.

At Fort Worth the Trinity & Brazos Valley uses the terminals of the Fort Worth & Denver Terminal Railway, while at Dallas temporary arrangements have been made with the St. Louis Southwestern. At Houston temporary arrangements have been made for use of the Santa Fe terminals, supplementing the terminal facilities of the Houston Belt & Terminal Railway, now in course of construction. This terminal railway is jointly controlled by the Trinity & Brazos Valley, the Santa Fe, the St. Louis & San Francisco, and the St. Louis, Brownsville & Mexico. At Galveston terminals are being built by the Galveston Terminal Railway, organized and controlled by the Trinity & Brazos Valley. Galveston is reached from Houston by trackage contract over 53 miles of Santa Fe tracks. Operation of this line by the Trinity & Brazos Valley is to be begun this month, while all of the authorized terminal construction at Galveston is to be finished this fall. The total operated mileage of the Trinity & Brazos Valley will then be 422 miles. There had been advanced by the Colorado & Southern up to June 30, 1907, $190,000 for terminals at Fort Worth, $127,000 for terminals at Dallas, $197,000 for terminals at Houston, and $111,000 for terminals at Galveston. In each of the last two cases the same amount had been advanced by the Rock Island Company.

The Trinity & Brazos Valley lines, of which 272 miles were in operation on June 30, are not included in the Colorado & Southern returns. There was, however, a considerable addition to the mileage during the year through completion of the Wichita Valley lines, whose complete operation dates from January 1, 1907. This is a branch line 175 miles long, running from Byers, Tex., on the Red river, across the Fort Worth & Denver City at Wichita Falls, and then southwest and south to Abilene, Tex., on the Texas & Pacific.

The Colorado & Southern has also been expanding in Colorado north of Denver, where 37 miles of branch lines were built during the year, 17 miles by the Fort Collins Development Railway and 20 miles by the Colorado Railroad. In addition, a line 18 miles long, to serve the important territory between Denver and Boulder and the coal mining camps about Boulder, is being built by the Denver & Interurban Railroad. This is to be finished by next spring. It will permit operation of 44 miles of line in all by electricity for frequent passenger service. A map and description of this project was printed in the *Railroad Gazette* of June 21, 1907. The Denver & Interurban is also building an electric passenger line in Fort Collins, Colo., which is to be in operation by December. Advances up to June 30, 1907, to these various companies, were as follows: Fort Collins Development Railway, $50,000; Colorado Railroad, $172,000; Denver & Interurban, $254,000.

Not the only expansion of the year was in mileage. The income account shows large increases in earnings. Gross earnings were $13,500,000, an increase of $1,800,000, or 15 per cent.; operating expenses increased $1,300,000, or 17 per cent., and net earnings were $4,200,000, an increase of $500,000, or 12 per cent. The net income for the year was over $2,000,000, an increase of 18 per cent. over 1906. As was natural with such a showing, dividends were begun on the $8,500,000 second preferred stock. The first payment ever made on this issue—2 per cent.—was paid April 1, 1907. Four per cent. was also paid on the $8,500,000 first preferred, against 2 per cent. in the previous fiscal year and nothing in 1905.

Freight earnings increased 13 per cent. and passenger earnings, as well as express, mail and miscellaneous earnings, each increased 22 per cent. The average ton of freight was carried further and paid more per mile. The increase in the average distance carried, from 134 to 151 miles, is a prophecy of what is likely to happen as soon as the Gulf extension is completed and in smooth working order. It is highly probable that not only will there be a large export traffic by this line, but also that a considerable proportion of the shipments from the East to Colorado will go by steamer to Galveston, thence north over the Colorado & Southern lines. The average passenger was carried 47 miles, against 42 miles in 1906, and paid slightly more per mile than in that year. The gross earnings per mile of road increased from $7,007 to $7,244, while the net earnings per mile of road were about the same as in the previous year, $2,266, against $2,256 in 1906. Taxes per mile of road decreased, which is a more fortunate experience than most railroads can boast of during the year just passed.

Of the increase in operating expenses, maintenance of way and structures furnished $267,000, an increase of 14 per cent.; maintenance of equipment, $250,000, an increase of 15 per cent., and conducting transportation, $788,000, an increase of 20 per cent. Largely on account of this last item, the operating ratio rose from 68 per cent. to 69 per cent. The principal increases under this head were in locomotive fuel, train service, station service and car mileage. There was an increase of 82 per cent. in the item of lost and damaged freight, and of 62 per cent. in the item of injuries to persons. The cost of clearing wrecks rose from $42,000 in 1906 to $59,000, an increase of 42 per cent.

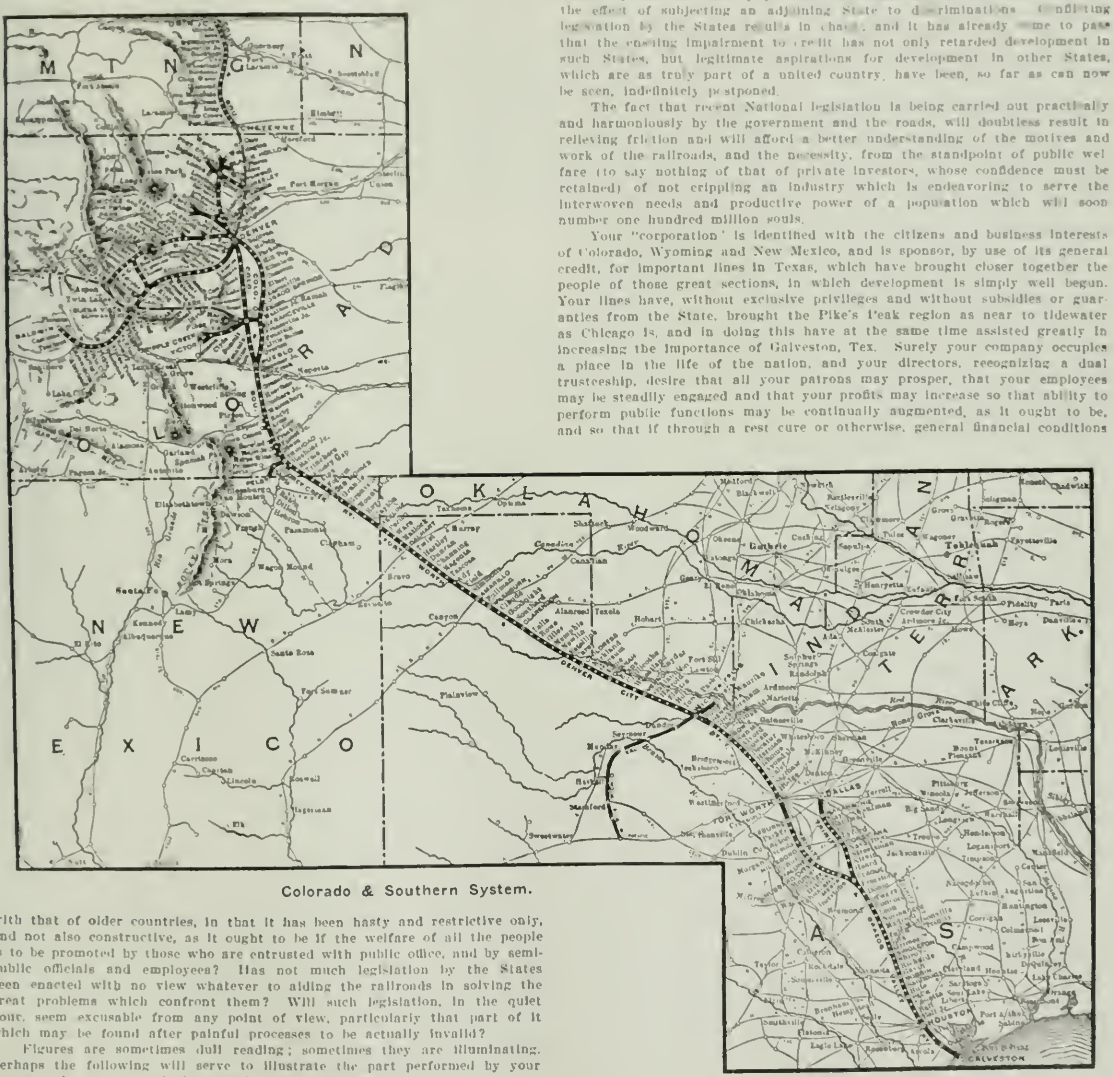
Maintenance expenditures were in general more liberal than in the preceding year. Per mile of road owned, maintenance of way cost $1,238, against $1,178 in 1906. There were 167 miles of new rails laid, against 128 miles laid last year, all of 77-, 80- or 85-lb. steel. Over 800,000 ties were laid, as against 550,600 in 1906. Maintenance of equipment per unit of equipment owned at the beginning of the fiscal year cost $2,725 per locomotive, against $2,509 in 1906; $796 per passenger car, against $832 in 1906, and $79 per freight car, against $66 in 1906. Especially as 386 of the 1,858 miles of the Colorado & Southern are narrow gage line, and a similar proportion of equipment is narrow gage, these are liberal maintenance figures.

The principal item of the Colorado & Southern freight traffic is mineral products, of which 4,440,000 tons were carried last year bringing in a revenue of $4,280,000, being 63 per cent. of the total tonnage and 44 per cent. of the total revenue, as against 67 per cent. and 47 per cent., respectively, in 1906. There was a great increase in lumber traffic during the year. The lumber tonnage rose from 133,000 tons, bringing in a revenue of $609,000 in 1906, to 488,000 tons, with a revenue of $811,000 last year. The 1906 tonnage was 2 per cent. of the total, and the revenue 7 per cent. of the total, while last year, with a tonnage equal to 7 per cent. of the total, the revenue was a little more than 8 per cent. of the whole. The added lumber tonnage must have been carried at much lower rates. Although the agricultural tonnage remained at about the same proportion, there were one or two noticeable increases, in particular in cotton, fruit and vegetables, and potatoes. Fruit and vegetables, which furnished nearly 5 per cent. of the tonnage, yielded only 2 per cent. of the total revenue, while potatoes, with a little over 1 per cent. of the tonnage, brought in nearly 5 per cent. of the total revenue. This apparent anomaly is probably due to the fact that most of the fruit and vegetables were carried only a short distance, while Colorado potatoes were shipped south to Texas. The total tonnage was 7,090,901 tons, against 6,245,948 tons in 1906.

Under the heading "Public Service," President Trumbull gives his views in regard to the relation of railroad companies to the public. His remarks in full are as follows:

> Railroad companies have for years led all corporations in publicity, and in an annual report like this, some allusion to your company's attitude

toward current economic discussions may properly be included. Much has been said, of late, concerning the shortcomings of corporations. It is doubtless true that they have not been infallible, but have they in that respect been in complete isolation? If one looks at the vast field served by railroads, the greatly diversified interests they have to satisfy and contend with, and the army of over one and one-half million employees, which like an army, must have efficient leaders and thorough discipline if safety and success are to be achieved, and if one considers that the development of the country and its business growth have been so rapid that it has been impossible for other industries to keep pace with it, is it not remarkable that the railroads are meeting as well as they are, the demands made upon them without a substantial increase in rates, particularly as the cost of everything which goes into their construction, improvement, maintenance and operation has enormously increased? Within the past year a multitude of laws have been enacted for the regulation of railroad companies. In view of the valuable and far reaching public services that must be performed by them, may it not be true that much of such legislation has been amateurish, in comparison with that of older countries, in that it has been hasty and restrictive only, and not also constructive, as it ought to be if the welfare of all the people is to be promoted by those who are entrusted with public office, and by semi-public officials and employees? Has not much legislation by the States been enacted with no view whatever to aiding the railroads in solving the great problems which confront them? Will such legislation, in the quiet hour, seem excusable from any point of view, particularly that part of it which may be found after painful processes to be actually invalid?



Colorado & Southern System.

Figures are sometimes dull reading; sometimes they are illuminating. Perhaps the following will serve to illustrate the part performed by your company the past year, in its capacity as a public servant:

The number of passengers carried was 2,801,699, at an average rate of 2.44 cents per mile—a trifle more than a two-cent postage stamp—and this partly in a section where physical operations are most difficult and where wages are probably the highest in the world. Compare this, for example, with England and Wales, with an area of 58,000 square miles (about one-half of Colorado or about one-fifth of Texas), where the number of passengers carried is more than in the whole 3,025,000 square miles of the United States. In England, with much lower wages, the regular third-class rate is two cents per mile, and first-class passengers (only 3 per cent. of the total) pay over three cents. The railroad mileage of Great Britain is about one-tenth of that of the United States, but it carries nearly one-half as much capitalization.

The number of tons of freight carried by your company during the year was 7,090,9[illegible], at an average cost to the shipper of 1.[illegible]5 cents per ton—2,000 lbs. carried one mile—for about the equivalent of a one-cent postage stamp. You distributed during the year

For labor and material employed in productive operations, over	$[illegible]	
(An increase over the previous year of more than $1,[illegible],000.)		
For taxes, over	[illegible]	
For improvements and new equipment, over	4,[illegible]	
For new construction, over	6,[illegible]	
		$20,3[illegible]
To investors for interest, a little less than		2,[illegible]
To investors for dividends		510,000

Doubtless two-thirds or more of the payments for material and for improvements, new equipment and construction went to labor in one form or another.

Legislation affecting the vast transportation necessities and interests of a unified country should, like that of older countries, protect, as well as supervise; for duty is reciprocal and is not bounded by State lines. As a Federal Judge has recently pointed out, legislation by one State may have the effect of subjecting an adjoining State to discriminations. Conflicting legislation by the States results in chaos, and it has already come to pass that the ensuing impairment to credit has not only retarded development in such States, but legitimate aspirations for development in other States, which are as truly part of a united country, have been, so far as can now be seen, indefinitely postponed.

The fact that recent National legislation is being carried out practically and harmoniously by the government and the roads, will doubtless result in relieving friction and will afford a better understanding of the motives and work of the railroads, and the necessity, from the standpoint of public welfare (to say nothing of that of private investors, whose confidence must be retained) of not crippling an industry which is endeavoring to serve the interwoven needs and productive power of a population which will soon number one hundred million souls.

Your "corporation" is identified with the citizens and business interests of Colorado, Wyoming and New Mexico, and is sponsor, by use of its general credit, for important lines in Texas, which have brought closer together the people of those great sections, in which development is simply well begun. Your lines have, without exclusive privileges and without subsidies or guaranties from the State, brought the Pike's Peak region as near to tidewater as Chicago is, and in doing this have at the same time assisted greatly in increasing the importance of Galveston, Tex. Surely your company occupies a place in the life of the nation, and your directors, recognizing a dual trusteeship, desire that all your patrons may prosper, that your employees may be steadily engaged and that your profits may increase so that ability to perform public functions may be continually augmented, as it ought to be, and so that if through a rest cure or otherwise, general financial conditions in America again improve, your company's sphere of influence may seem to capital and enterprise an inviting field for further expansion.

The following table sums up the last two years' operations:

	1907.	1906.
Mileage worked	1,858	1,663
Passenger earnings	$3,173,856	$2,603,691
Freight earnings	9,723,962	8,592,527
Gross earnings	13,456,489	11,653,446
Maint. way and structures	2,226,504	1,959,184
Maint. of equipment	1,769,803	1,519,913
Conducting transportation	4,807,630	4,019,982
Operating expenses	9,246,919	7,902,212
Net earnings	4,209,571	3,751,234
Net income	2,216,146	1,766,212
Dividends	510,000	170,000
Year's surplus	1,328,689	1,221,056

NEW PUBLICATIONS.

State Railways: Object Lessons from Other Lands. By Edwin A. Pratt, with a translation of M. Marcel Peschaud's articles on Les Chemins de Fer de l'Etat Belge, in the *Revue Politique et Parlementaire*. London: P. S. King & Son, 1907. Paper; one shilling.

We know of no other publication in which the observer of railroad conditions can get for a shilling as many arguments against government ownership as in this concise little book by Mr. Pratt, already well known for his clear and scholarly studies on transportation topics. Just half the book is devoted to condensed comment—sometimes rather too condensed, it must be admitted—on government ownership in Belgium, Prussia, Denmark, Italy, Australia and New Zealand; the balance is a translation from the French of M. Peschaud, who discusses Belgian railroad conditions in detail. Mr. Pratt, in his general comments, cites examples of the well known objections to government ownership; inflexibility of rates and service; subjection to political influence; high cost of operation; bureaucracy; use of railroad employees to build up a political machine; bad bookkeeping, etc. For example, he quotes Sir Joseph Ward, the New Zealand Premier, as to the fact that goods rates could not be levied until they had been passed upon by the Governor in council, who, also, alone could modify them.

"If you wanted to carry 10,000 tons of cheese for 100 miles," said Sir Joseph, "and if the freight for cheese was 7s. 6d. per mile, you would be charged 7s. 6d. for each ton of the consignment, just as you would for one or two tons; no one could vary the charge." Mr. Pratt rightly comments that if a railroad can afford to carry a single ton of cheese a hundred miles for 7s. 6d., it can well afford to carry a consignment of 10,000 tons the same distance for a lower amount per ton, and that in New Zealand the wholesale man is, in effect, penalized, in order that the retail man shall have no possible excuse for cherishing a grievance against the politicians who control the operation of his state railroads.

Mr. Peschaud shows that of a total of 2,637 miles of railroad in Belgium, all but 344 miles is operated by the state. He criticises the state working on the grounds that train service is bad and speeds are low; the state operation does not economize in the least; it is bureaucratic and involved in much red tape; it is worked neither on commercial nor on industrial lines; the work done by government employees is less efficient, often by one-third, than the work done by private employees; the system has no flexibility, and breaks down in emergencies; the government has gradually made itself less and less amenable to damage claims; it aims to give satisfaction to those without real, but with electoral interests; the number of the staff on the state railroads is 152 per kilometer, as against 107 on the private railroads; the promotion of employees rests on political considerations; the capital accounts have been altered until they are purely fictitious. Further, the government is a poor bargainer, and pays far higher prices for its supplies than the private managements do, and, in 1905, the total proportion of expenditure to receipts was 45 per cent. on the Belgian lines worked by companies and 61.97 per cent. on the lines worked by the government.

Locomotives, Simple, Compound and Electric. By H. C. Reagan. New York: John Wiley & Sons. 932 pages; 5½ in. x 8 in.; 494 illustrations. Cloth. $3.50.

To quote from the preface; "the author, who is a practical engineer, attempts in this book to write a treatise on the locomotive engine, and has tried to describe the manner in which the locomotive is handled while in service." In a way he has succeeded, though to dignify it as a "treatise" is to somewhat stretch the courtesy of the word. It is rather a description of various types of locomotives and certain appliances used thereon, than a book to convey an idea of the construction and working of the locomotive to one who is not familiar with the subject. So much has been published regarding locomotive construction that the author passes lightly over the usual descriptions, using a somewhat original order of treatment and stows away in the first 100 pages all that he has to say of the front end, cylinders, frames, rods, rod accidents and valves and their setting, to each of which a chapter is devoted, and a liberal portion of even this space is given up to examination questions on the subject. He very truly observes that a man "will learn more by watching repairs, etc., * * * than if the method were described in so many words." So the book apparently makes no attempt to show and describe the construction of the various parts, but merely calls attention in many cases to peculiarities of construction, so that it would serve as a good guide if it were to be read in the presence of the locomotive and the several items mentioned were to be studied as they were brought up.

Following these general descriptions, there is a long chapter on compound locomotives. In this no attempt has been made to discuss the subject from the theoretical or practical standpoint of operation. There is not a word of introduction to the chapter, but the reader is plunged at once into a description of the several types of compound locomotives that have been presented for consideration. Some of these have held their own on the basis of the survival of the fittest, others have been withdrawn from the market and converted; while others were almost stillborn. In this respect the chapter will serve as a work of reference for those who wish to study the variations in type without entering into the details of the construction. In these descriptions there are also included a number of foreign locomotives that have never been built in counterpart in the United States, thus making the chapter all the more valuable for the purpose for which it is especially adapted. After this there follows a short chapter on superheaters, very short, in fact, when the importance of the subject and the interest that it is attracting is taken into consideration.

The chapter on air-brakes is one of prominence, but is defective in that it ignores the latest development of the Westinghouse triple-valve with the delayed release and special recharging features. It would be interesting also to learn why the author splits his treatment of the boiler into two chapters separated by hundreds of pages, instead of putting the whole subject together.

The book closes with descriptions of a number of electric locomotives preceded by a sketch of the general features of electric current generation. In this the author does not appear to be thoroughly at home. Not that there are appreciable errors but the language is not that of a man who is a master of the subject. Still this section of the book is worth while as a reference.

Taken as a whole the book may be regarded as a very useful hand-book of the locomotive, to be used for reference and a guide to a more thorough study as pointing out what has been done and the principal appliances that are used on the ordinary American machines.

The Railroad Problem.*

BY ROBERT MATHER.

If the rails of the land should melt over night, the loss tomorrow morning would be less in the falling quotations of railroad bonds and stocks than in the utter destruction of the values on farms and in mines and mills and factories that to-day we count as the nation's wealth. Such sudden and miraculous solution of the problem is, of course, unlikely; at least it has not yet been advocated in Presidential speech or message. But any diminution of the industrial efficiency of our transportation lines would affect in like manner, though in lesser degree, all the varied interests that would go down to destruction with the annihilation of those lines. It is not alone, therefore, the few thousands who own the securities of the railroads, or the million and a half employees engaged in their operations, or the ten millions whom the wages of these employees support, that are directly and peculiarly interested in the proper solution of the railroad problem. The question comes home as well to the pockets of the millions of farmers and miners and millers and manufacturers and merchandisers, with all their added millions of dependents. In short, it is a question that touches us all, not because the charge for transportation is a large element in the cost of what we consume, but because without efficient railroad transportation our commerce could not be profitable. The gross earnings of all our railroads for the fiscal year ending June 30, 1907, were $2,325,765,167. Divided among the population this would be $25 each. A 33⅓ per cent. reduction in freight and passenger rates would mean $8 per annum for each of us, but a reduction by one-third of the capacity of our transportation lines to move the tonnage of the country would mean ruin to us all.

This critical generation would do well to recall how our railroads have been created. Upon the invention of the steam engine the industrial world faced a difficult situation. It had from time immemorial been the practice and the accepted duty of the state to provide and to maintain the highways upon which the citizen might either haul his own freight, or as a common carrier transport the persons and property of others. But the new style of iron highways that the steam engine had introduced was expensive to construct. States were poor, their revenues insignificant and their credit correspondingly bad. Many shrank entirely from the risk that the new task offered; others undertook the work and early became involved in debt, in loss and in shame. In this predicament private enterprise was given the opportunity to undertake the duty which the states themselves were unable to perform. That is, the states employed private capital, on certain terms, to build the highways which the states should have built for the people's use. One of the terms of this employment was that the corporation that built the highways should alone have the right to operate trains over it, and that the public could use the highway for the movement of their goods or persons over it, only under rules and regulations and rates prescribed by the corporation. This worked a restriction upon that free use of the common highways to which the citizens of the state had heretofore been accustomed. For, while any one could carry on the occupation of a common carrier over the ordinary highways of the state, only one common carrier—namely, the corporation that had built it—was permitted to conduct the business of a common carrier on this new kind of a highway. But it had never been the

*From an address before the Chicago Association of Commerce, Oct. 12, 1907.

duty or the function of the state to be a common carrier. The corporation, then, though it exercised a function of the state in *building* the highway, did not exercise a public function in transacting over it the business of a common carrier. That was always has been, and is to-day a private occupation. It is true it is an occupation with respect to which the law has always exercised certain rights of regulation, but it is not on that account a public function any more than the conduct of the business of an innkeeper, a miller, a hackman or an auctioneer, with respect to which the law exercises the same right of regulation, is the exercise of a public function.

To undertake a task too vast and perilous for the state itself to perform, there must have been held out to private enterprise the hope of a far greater reward than a mere interest return on its investment. And such hope was held out. While it was then the law, and therefore a part of the bargain between the state and the corporation that the carrier should charge only a reasonable rate for the service of transportation, it was clearly contemplated by both parties that great values beyond the actual cost of building and equipping the line might flow from the successful carrying out of the scheme. That hope was capitalized by the issuance of shares of stock beyond the face amount of the cash expenditure. If the plan succeeded the hope was realized either in the sale of the shares or in the payment of dividends upon them. If the plan failed, as it often did, the hope was dashed and the certificates that represented it became worthless paper.

Now, let us suppose that the states, in making their bargain with private capital for the building and operation of these public highways, had said to the proposed builders.

"You will not be permitted to issue bonds and stock in face amount greater than your actual expenditures;

"You will never be permitted to make more out of this project than 4 per cent. per annum upon the money actually invested;

"You will, however, be taxed upon the actual value of your property, as ascertained from time to time, and, if your securities find favor in the market and reflect greater than actual values, taxes will be levied upon that basis;

"The state will prescribe the methods of keeping your accounts and will examine them at its will;

"The state will determine the number of trains you shall run and designate the stations at which they shall stop;

"The state will prescribe the number of men you shall employ in operating your trains, and will fix their hours of labor and the conditions of their employment;

"The state will establish rates of fare and of toll from time to time at its arbitrary discretion, without consideration of their reasonableness;

"If any other methods of regulating you occurs to the state hereafter, they will be adopted;

"You will accept without objection all regulations now or hereafter imposed by the state, and if you appeal for the protection of the federal constitution to the federal courts, the state will revoke your charter."

All this and more the states have said to the railroads in recent or in threatened legislation. Had the states been as frank and specific when bargaining with the corporations that were planning to build these public highways, there would have been presented a beautiful exemplification of the principles of the square deal, but it is doubtful if the railroads would have been built.

After completing its compact with the state, the railroad corporation began the construction of its line. With rare exceptions it spent its money not on the faith of things that were, but in the hope of things to be. Our railroads were almost uniformly built, not like those of Europe, from market to market, through industrial communities long established, with tonnage awaiting them at every stage from starting point to terminus, but into the comparatively unsettled and often untracked lands of the future. Their cities were largely unfounded, their factories unbuilt, their mines unopened and their farms unpeopled. Their revenues were not in sight, except to the eye of faith and courage.

They built their lines to suit their situation. They chose the easiest path through the territory they were to serve. Grades and curvature conformed largely to the contour of the country. Highways were crossed at grade and streams on wooden trestles. Light steel was laid in a single track, and ballast dreamed of but forgotten. The cost of terminals in such cities as there were prohibited provision for the future, and only such facilities were acquired as were needed for the traffic immediately in sight. Some light engines and a minimum of cars of small capacity were acquired, and the railroad was "completed"—and put in operation.

The cost, of course, had exceeded the estimates, and a floating debt stood between the stockholder and his dream of dividends. Hardly, too, had the operation of the railroad started before it was realized that the "completed" line was barely begun. As the lands were settled and the cities grew, and the mines and mills began to turn out their product, it was found that the single track, with its light rails, its heavy grades and curves and its inadequate terminals and equipment could not move the traffic it was built to serve. The task of enlargement, improvement and reconstruction was begun. Grades were reduced, curvature cut out, lighter rails in steel, heavy rails laid down, the line double-tracked, the required ballasted grade, crossings eliminated, heavier motive power and rolling stock acquired, and vast terminals, at multiplied cost, bought in the hearts of cities that, when the rails were first laid, were villages or passing tracks.

But the railroads could not rebuild and enlarge their facilities as fast as the traffic grew. In the decade from 1896 to 1906 the railroad mileage of all tracks, including second, third, fourth and yard and siding tracks, had grown from 240,120.12 miles to 317,085.19 miles, an increase of 32.8 per cent. In the process the capitalization of the railroads had increased from $10,566,865,871 to $14,771,421,478, or 26.2 per cent. But the tonnage of the railroads within the same ten years had climbed from 95,328,369,278 ton miles to 215,877,571,241 ton miles, an increase of over 125 per cent.!

Then the railroads confronted a crisis. Unable to handle the traffic that multiplied three or four times as fast as their facilities grew, they turned to further plans for enlarging their capacity, only to find that, in the height of their prosperity and in the stress of the greatest demands upon them, their securities could no longer be sold and money for their improvements was not available. Then, instead of moving with greater speed to provide the tracks and terminals and cars and engines for lack of which less than a year ago grain lay rotting in the fields and communities suffered for want of coal, they slackened perforce their already too slow pace. And to-day, condemned by public opinion, by reports of commissions and by their own consciousness as inadequate to their task, causing daily loss to commerce by the insufficiency of their facilities and equipment, the railroads are impotent to relieve the situation.

This is a national calamity. Its force is felt not only in the falling prices of the stock exchange, but in the falling tide of commercial activity, in the lowered price of the commercial metals and in the slackened demand for human labor. There is not a man, from President to the least of the laborers in this great industrial organization that we call the nation, who is not directly and personally interested in discovering the causes for the inability of the railroads to raise funds for their needs, and in doing his utmost to remove them. This is the railroad problem; this is the national problem.

Three theories are commonly advanced in explanation of the unsalability of our railroad securities. One is that a world-wide money stringency, due to great and general commercial activity, restricts investment in all kinds of securities. I am not a banker and should not presume to have an opinion upon this proposition, but it does not strongly impress me in the face of the fact that three-fourths of the fabulous five billions of dollars that Mr. Hill would have the railroads spend in the next five years in furnishing additional facilities, to-day stands to the credit of depositors in our savings banks alone. I believe the money exists and could be had if our railroad securities appealed to the confidence of our investors.

I count as first among the causes that have made their securities unsalable—the misdeeds of the railroads themselves.

I do not include in this term, for the purpose of this discussion, the payment of rebates. I would not deny under present conditions the perniciousness of the practice, or decry the efforts of government to terminate it. On the contrary, I hold it as much to the interest of the railroads themselves as of the country at large, that violations of the Elkins Act should be made impossible. And I know of no surer way to accomplish that end than for a righteous and determined executive to keep both carrier and shipper for the future in terror of the confiscatory fines which that drastic act imposes for its violation. I see no end to be gained, however, beyond unnecessary further irritation of an already inflamed public feeling, by wholesale and spectacular punishments of past offenses.

I protest further against imputing to the railroads alone the responsibility for these violations of our statutory law. Note my emphasis of this term, *statutory* law. When railroads first became the common carriers of the land, neither law nor custom denounced the giving of a rebate. The only limitation upon a carrier's discretion in the fixing of his rates was that they should not be unreasonable. Subject only to this limitation he could charge as he willed, demanding less from one and more from another and carrying free for whom he pleased. This theory and tradition passed into the railroad business at its inception. It was accentuated by the policy of the states in permitting the free incorporation of railroad companies and encouraging the multiplication of competing lines. The only effective weapon of competition the railroads had was their rates. In passenger traffic, it is true, competition of service counted for something, but it meant nothing in the movement of a car of grain or of hogs that the roadbed was smoother and the scenery more inspiring by one route than by another. It was the rate that moved the traffic. And as it was important both to the shipper who sold his tonnage and to the carrier that bought it, that the transaction should not be known to the competitor of either, the secret rebate came into vogue.

In the beginning this method of competition was not deemed

hurtful, and it was far from being stamped as immoral. The business of the country was more individual and less aggregate than to-day, and the task of getting the best rate that was going was as necessary and legitimate an element of business as were the problems of buying in the cheapest market and keeping down the cost of production. When rebates were general—and time was when no shipper was so poor as not to be able to get them—their only effect was to reduce by so much the general level of rates of the carriers. The railroads were the victims—the commerce of the country the beneficiary, of the practice; for the level of the secret rates tended, eventually and inevitably, to become the level of the open rates.

The railroads anticipated the law in an effort to put an end to the growing practice of rebating. But their pools—formed, it is true, in the hope of conserving their revenues, but well designed to accomplish the laudable end of maintaining stable rates—were denounced as unlawful in the Act to Regulate Commerce, passed in 1887, which also for the first time prohibited discrimination in rates on interstate shipments. Thus the carriers were commanded to resume the policy of open competition which their pools had restricted, and at the same time forbidden to use the only effective instrument of competition at their command—namely, manipulation of their rates. But as this latter prohibition carried no penalties for the shipper who should receive a rebate, and as proof of an offense by the carrier was difficult, the shippers' clamors for secret rates and the carriers' fears for the loss of their tonnage to their competitors overcame the dread of conviction, and the law was regularly and notoriously violated. The Elkins Act in 1903 for the first time made the receiver of a rebate equally liable to punishment with the giver, and made easy the task of proving the offense.

I may justly assume from the name of your association that you fairly represent the great body of shippers of the country. Let us be frank with each other. You know that a rebate was never given that was not also received. You know that the purpose of the railroads in paying rebates has not always, or often, been to enable a great trust to crush its competitors. You know that if the Elkins Act bore date a few years earlier than it does, and if no beneficent statute of limitations could be invoked to your aid, your accumulated fortunes could be wiped out by universal enforcement of that law. You know that whatever of obloquy in the public mind, or of condemnation in the courts, should rightfully be visited upon the participants in the past practice of rebating, should be shared by the shipping class as well as by the carriers.

I will go a step farther. There has never been any difference in morals, and since the passage of the Hepburn Act there is no difference in law, between the giving of a rebate and the giving of free or reduced passenger transportation. In these days when the mask of pretence is being universally lifted, it should not give offense to call the roll of those who have participated with the railroads in this discrimination. Statesmen who regulate the railroads, judges who fine them, preachers who condemn them, and the press that spreads among the people, with no too careful pen, the stories of their misdoings, all decorate the list. The railroads in this respect are in the position before the people of the woman taken in adultery and brought by the scribes and Pharisees before Christ for condemnation. And there is need again for the voice of a Master to say: "He that is without sin among you, let him first cast a stone."

Nor do I include among the misdeeds of the railroads that are responsible for the condition we are now discussing, their past activity in political affairs. I trust that the government of the American people, no matter what form it may assume, will never be so arbitrary that a great property interest, subject to governmental regulation, shall not be privileged to be heard in argument and in protest before the legislative body that determines the nature and extent of that regulation. If, in the past, other and more improper methods have been employed to influence legislative action, I subordinate my zeal to that of no man in demanding that such offenses shall both be punished and made impossible of repetition. Again I protest, however, against fastening upon the railroads alone the shame of these offenses, in the commission of which there must have been at least two offenders. Much of what has been alleged against the corporations in this respect has been but the natural response of the victim to the highwayman. I mention this not in extenuation of the act of the victim, who in the interest of public morals should have lost his life before parting with his money, but to remind a condemnatory people that there *was* a highwayman, and that he was *their* representative. And I think it no more than a square deal that part of the responsibility for this unspeakable shame should willingly be borne by a people that has been so careless of its liberties as to be supinely content to be thus represented in its legislatures.

The misdeeds of the railroads to which, in my judgment, is chargeable the hesitancy of the investing public to take their securities, are acts that more directly affect the securities themselves. There is a prevailing public belief, based on facts publicly shown, that railroad corporations have issued corporate obligations and applied the proceeds to purposes other than for which such obligations may lawfully be issued. Directors are understood to have purchased the securities of corporations, of which they are trustees, and to have sold property of their own to the corporations, making personal profit through their dealings with the trust estate. These and like operations violate certain world-accepted principles of prudence and of honor, and for that reason are condemned by the common mind. The fact that they are understood to have occurred in certain of our corporations suggests the natural inference that they are characteristic of all our corporate managements, and investors are suspicious of the securities of corporations conducted so at variance with the principles of business, of law and of morals.

There can be but one remedy for such a situation, and it should not await governmental action. If the corporations cannot or will not themselves find a way to repudiate these abuses, and to make impossible their repetition, we are in a poor way indeed to regain the confidence which their perpetration has disturbed. I speak impersonally. I describe a condition which I believe is generally realized and which seriously affects the public estimate of our corporation securities.

I place second in the list of causes of the want of confidence in railroad securities the uncertainty as to the kind and extent of governmental supervision and regulation to which the railroads are yet to be subjected.

The regulation that threatens peril to the railroads and the commerce of the country to-day is the regulation of the states. It is in the nature of things that such regulations can be neither logical nor consistent nor comprehensive. The local needs, the local prejudices and the local grievances all find reflection perforce in these local laws. It is the good of the state, not the good of the nation, that they seek to accomplish. Nebraska, Minnesota and Iowa, with population averaging 200 persons per mile of railroad, prescribe the same maximum passenger fare as does Pennsylvania, whose density of population is three times as great. And it is insisted that this rate of fare, already declared confiscatory in Pennsylvania, shall be adjudged compensatory in the states of one-third the population. The great grain-producing states reduce below the point of profit the rates on this tonnage that so vitally affects them, leaving to the carriers to make up, if they can, the reasonable return to which they are theoretically entitled, out of traffic in which the regulating states are not so directly interested. Local situations or influence dictate varying regulations of the hours of work, the rates of pay and other conditions of the employment of labor. Local wisdom decides what kind of headlights locomotives shall carry, what kind of safety signals and appliances shall be employed, and how the accounts of the carriers shall be kept. These conflicting regulations incalculably confuse the conduct of business, while they measurably decrease gross revenues, increase the expenses of operation, diminish the net returns, impair credit and limit the capacity of the carriers to make adequate provision for the growing traffic.

It will benefit us but little to debate the causes that produced the curious wave of animosity toward corporate interests that last winter carried this movement of restrictive legislation to high-water mark. Let us neither abuse the high source from which much of the suggestion proceeded, nor blame too harshly the men who sat in legislative seats and recorded the clamor that filled their ears. Let us rather, as students of our past history and builders of our future prosperity, take note of the fact, measure its significance and prepare to deal with it. There must be some way to bring home to the intelligence of the American people a realization of the truth that no man who has property to conserve or labor to sell can profit in the end by unjust or unwise treatment of our great instruments of transportation. And I cannot help but feel that it would tend greatly to wisdom and justice, and even to moderation in the treatment of this subject, if the people realized that the railroads would willingly submit to a plan of regulation that was wise and just. This point being gained, I believe it would be possible to convince the people that a wise and just regulation of the subject is only possible under a single and centralized authority.

The day is passed for unyielding opposition to all policies of federal control of our carrier corporations. Nay, more, the day has dawned in which to welcome that control. The railroad manager reads without heeding the lessons of the past, if he fails to acknowledge both the right and the power of the federal government to exercise that control; he comprehends but little the spirit of the times if he does not realize the fixed determination of the people to effect that control, and he looks but darkly into the future if he cannot see benefits to flow from it.

We must assume that the President, in preaching regulation of the railroads, has in mind practical regulation, designed to benefit in broadest sense the commerce that constitutes at once the wealth and the greatness of our nation, and through which alone our ninety millions of people live and prosper. It is not to be presumed that his is to be a crusade for mere abstract righteousness, in which business must be forced to the wall if perfection of spirit cannot be attained. Surely we are not to be led by a St. Louis, willing that his country should suffer financial ruin in order that the custody of the Crown of Thorns may be wrested from infidel hands. Nor by a

Marat, eager to prove the equal rights of man by the arbitrary use of the guillotine. And while the President may talk in general terms of more or less terrifying sound to the tumultuous and applauding crowds he meets on his journeys, we have a right to expect that precision and wisdom and conservatism will formulate his final recommendations to Congress. And, if that expectation is realized, the railroads of the country should co-operate with Congress and the Executive in an effort to terminate harmful agitation by securing speedily a plan of federal regulation that shall be sane and effective and final. If, on the other hand, we are cheated of this hope, I believe the country should, and will, turn to a leadership that promises treatment of these vital problems along sound and conservative lines.

There should be great care in experimenting with regulation that offers as warrant of its effectiveness the arguments of theorists rather than the practical proof of experience. Among the proposals thus to be tested is the one for federal limitation of the capitalization of interstate corporations. If the purpose and effect of such action is to invalidate in the courts or to depreciate in the exchanges what are now denounced as watered securities, the blow will fall not on the persons responsible for their creation, but on the victims who parted with money to acquire them. Such an act of vicarious punishment could only be justified by the unquestioned conviction that the continued existence of the assailed securities is a menace to the public welfare. The only ground for such belief is the unfounded fallacy that the amount of securities outstanding against a railroad property determines the rates it charges for transportation. The sufficient answer to this is the fact that the Union Pacific Railroad, with capitalization of $92,000 per mile of road, competes very comfortably, and upon equal rates, with the Atchison, capitalized at $50,298 per mile, and with the Great Northern, whose capitalization is $42,350 per mile. And the same rates between the same points serve for the Illinois Central, whose capital is $56,495 per mile, the Eastern Illinois, with $62,599, and the Alton, with nearly $115,000 per mile.

If the purpose of the proposed new federal power is to limit the future issue of securities by railroad corporations, the people, as is too often the case with hasty legislation designed to benefit them, are likely to be the losers. The issuance of stock beyond the face amount of the actual investment in railroad building has always represented the hope and faith of the builder in the success of his project, and has been the lure that has drawn him into the always uncertain and often desperate undertaking. If the promise of that possible profit be taken away, the independent railroad builder will abandon the field, and railroad extensions into territory now unserved will await the initiative of existing lines. The Hill lines and the Harriman lines each encircle vast empires now without railroad facilities, and other systems are not without their own private pastures. It would admirably serve the interests of these great systems if government limitations of the creation of capitalization should make it impossible for the railroad builder to invade these promising preserves, and thus leave their development to the convenience and selfishness of existing lines.

If, however, the scope of the suggested federal control of corporate capitalization be to insure publicity of their affairs, every honest corporate management should speed its early enactment.

There should be no objection to such federal supervision of the railroads as the national government now exercises over the national banks. It would be a source of strength and of improved credit to the railroads to have it known that the government inspected their accounts and made sure of the existence and value of their assets. It might make impossible, too, such misuse of the funds and credit of the corporations as recent revelations have disclosed. I do not understand, however, that the national government concerns itself with the rates of toll that the banks charge their customers. It may not be so in Chicago, but in New York, I am told, there is no subject on which the ingenuity of lawyers is more regularly taxed than in devising means to evade the usury laws. It seems that the government itself is not quite sure of these carefully regulated institutions, for while it holds them out to the people as a safe place in which to deposit their money without security, the government requires good collateral against its own deposits in the banks. Nor am I informed that, as a result of long-continued supervision by federal authority, there is greater righteousness among the banks and bankers than pervades the railroad business. We read from time to time of bank defalcations and embezzlements. Over $5,000,000 of the people's money was so stolen in the first six months of the calendar year. And the wasting of the assets of the bank and the money of its depositors in private speculation by its officers is not unknown to the history of banking. It is true that these crimes are quite generally punished, and it may well be that the fact that there are more bank presidents than railroad presidents in jail may not have the same significance that it now seems to have, after the railroads shall have been for so long a time under similar governmental control. But we should not delude ourselves with the belief that righteousness will altogether prevail in the railroad world when its operations come under such supervision as the national banks enjoy.

I rode not long ago down the river Ithine. I was not particularly impressed with the beauty of its scenery. The Hudson far passes it in that respect. I saw with interest its storied castles, but the glamour of romance no longer glorified them, and they held my interest only while they could be seen. The fact that did impress me concerning the Ithine was the amazing use that was made of it as a highway of commerce. I trust that the still more wonderful possibilities in that direction of the Mississippi may not longer be neglected by our people.

But the castles of the Ithine took on new interest for me as the vast tonnage floating on the bosom of the stream reminded me that in those strongholds had dwelt the great traffic regulators of the Middle Ages. And the reflection came to me that it was not only by reason of the moderation of their regulations, but also because they protected the traffic from molestation or assault by other powers that they kept the golden stream of commerce flowing past their doors.

I mean to imply by this that the power that regulates should also protect. And I favor an open acceptance of federal regulation because it is only through adequate and effective assertion of the federal power that governmental control can be made uniform or just and the commerce of the country saved from the conflicting regulations of forty-six separate sovereignties.

It is now more than a year since the rate-making power was conferred upon the Interstate Commerce Commission. The wisdom that has moved the Commission to refrain as yet from exercising that power goes far to justify the placing of the power in its hands. Under this power the Commission has intimated that it would require that no through rate should exceed the sum of the locals. From this it results that the states now make the interstate rates. Let us suppose that the rate on grain from Oklahoma points to Galveston is 25 cents. The Texas Commission reduces its local rate to 7 cents; the Oklahoma Commission—soon to be born—does the same. The rate from Oklahoma points to Galveston thus becomes 14 cents instead of 25. If the Kansas Commission should fail to act, and if the railroads should maintain former rates to Galveston from Kansas points, the latter would be subjected to that undue disadvantage to localities that the Interstate Commerce Act prohibits under pain of heavy penalties. But the Kansas Commission would act, and the reduction in its local rate would effect a reduction of the through rates from Kansas to the Gulf. This, in turn, would reduce the rates on grain from the Missouri river to the Atlantic seaboard. And the Interstate Commerce Commission, though convinced of the reasonableness of the former through rate and desirous of preserving to the railroads the revenues accruing therefrom, would be practically powerless to restore it.

This illustration is not peculiar. It could be duplicated without limit and in any locality. The state of Arkansas fixes the passenger fare from St. Louis to the Gulf, over lines of travel that do not touch Arkansas soil, when it enacts that 2 cents shall be the maximum charge for the carriage of passengers from point to point within the state. Missouri prescribes rates of freight from the Mississippi river eastward to the Atlantic, and from the Missouri river westward to Utah, when she fixes the tolls for traffic passing wholly within her borders between the Missouri and the Mississippi rivers. Minnesota, in an act designed to be purely local, has legislated on interstate rates for the Dakotas, and has forced her railroads by state enactment unwillingly to violate the federal laws.

I need not press the argument farther. It is too plain for dispute that a state act prescribing rates of fare and of freight between points wholly within the borders of the state not only may, but in cases now before the courts actually does, so directly affect interstate commerce as to control and displace the rates prescribed under federal law. There can be but one outcome to such a conflict. It has been the law of the land since the famous case of Gibbons v. Ogden, that a state law directly affecting interstate commerce must give way to Congressional action on the same subject. If, in order to apply this principle to the existing situation, there be needed, in addition to the Act of Congress conferring upon the Commission the power to make interstate rates, further federal legislation declaring that the rate-making power thus conferred shall extend to the making of local rates that may control or affect the interstate rate, that is the kind of federal regulation that the next Congress should give us.

There is in this no invasion of state rights, no straining of the Constitution, no assertion of principles that have not long been familiar and often applied. The list of state laws that have been set aside as being in conflict with congressional action on the same subject is a long one. The right of the state to license and regulate navigation on the waters within its borders; to license importers to make sale of their importations; to authorize the damming or bridging of navigable streams; to regulate pilots in its ports—all were powers long exercised by the states, but perpetually denied to them when Congress finally assumed to regulate the subjects. There need, therefore, be no hysteria about the destruction of the rights of sovereign states when the growing needs of our national commerce force this further step forward under the Constitution.

Exhibits at the Railway Signal Association Convention.

The exhibits were shown in a large room on the fourth floor of the Public Service building, in which the convention was held, under the auspices of the Signal Appliance Association. More space was occupied than at any previous convention.

Adams & Westlake Co., Chicago, New York and Philadelphia.—Semaphore and switch lamps; new flat flame long time burner; tower lamp with shade reflector.

American Railway Signal Co., Cleveland.—Automatic signal operating one or two blades in two or three positions; one two-arm mechanism; two motor dwarf signals, one designed specially as a starting signal for side tracks; electric switch lock; switch indicator; switch boxes; track relays, two, three and five point.

American Vulcanized Fibre Co., Wilmington, Del.—Vulcanized fibre for track insulation.

Battery Supplies Co., Inc., Newark, N. J.—"Bsco" primary battery; Gladstone-Lalande battery. The exhibit booth was in the shape of a mammoth battery cell.

Bossert Mfg. Co., Utica, N. Y.—Signal plate clasp, one and two bolts; insulated rail joints, adjustable switch bracket.

Bryant Zinc Company, Chicago and New York.—Gould storage batteries; Waterbury primary batteries; Mock insulated joints; American instruments, D. D.; ammeters and voltmeters; portable and switch board line.

Continental Signal Co., Chicago.—A new electric-motor semaphore mechanism shown in operation; can be used at top or bottom of post, for two or three positions, and for upper or lower quadrant movement; a switch-box; a four lever mechanical interlocking machine of new design.

Dressel Railway Lamp Works, New York.—Semaphore and switch lamps; special lamp, oil and electric, for use in the Washington (D. C.) railroad tunnel.

Duplex Metals Co., New York.—Copper clad signal wire with both weather proof and rubber insulations; spring seats for mechanical purposes.

Electric Storage Battery Co., Philadelphia.—Signal batteries and plates; the "chloride" and the "exide" plates; Missouri Pacific and Harriman lines standard cells.

Fairbanks, Morse & Co., Chicago.—Four h.p. special electric engine with direct-connected generator for electric lighting and battery charging; gasolene-motor velocipede car; gasolene four-wheel car.

Federal Railway Signal Co., New York, Albany and Chicago.—All-electric interlocking machine; switch mechanism; high semaphore signal; motor dwarf signal; switch box; indicator, electrical hand release.

Galena Signal Oil Co., Franklin, Pa.—Perfection signal and railway safety oil.

General Electric Co., Schenectady.—Three-position top mast motor signal of B. & O. standard; similar signal of new B. & O. type with Patenall-Loree upper quadrant spectacle; two-arm home and distant top mast motor signal with independent mechanisms; upper quadrant two or three-position topmast motor signal. All of these were in operation. Mercury-arc rectifier for charging storage batteries from alternating current circuits; signal relays.

General Railway Signal Co., Rochester, N. Y.—A large display of photographs of apparatus used in automatic electric block signaling and all electric interlocking on the New York Central electric zone; similar displays showing apparatus for interurban service, and for the two Hudson River tunnels; views of automatic semaphores as installed on the Great Northern (upward inclination).

General Storage Battery Co., New York.—Different types of Hijur batteries used in signal work.

Gordon Battery Co., New York.—Gordon cells and supplies.

Gould Storage Battery Co., New York and Chicago.—240 A.H., 120 A.H., 40 A.H. batteries; various sizes of couple types; a new type of portable battery for signal service.

Handlan-Buck Mfg. Co., St. Louis.—Non-sweating switch and semaphore lamps; engine and tail lamps; metallic flags; new electric station lamp; long-time burner with flame 7/8 in. wide.

Hall Signal Co., New York and Chicago.—Style E electro-gas signal mechanism; style F electric motor mechanism; various types of relays and lightning arresters.

Hayes Track Appliance Co., Geneva, N. Y.—Hayes derail model A, size 5, with operating stand.

McClintock Mfg. Co., St. Paul.—Mercury-contact polarized relay; mercury contact interlocking relay; lightning arresters.

Northwestern Mfg. Co., Milwaukee.—Standard Browning motors, six sizes; motor generator set furnishing twelve volt circuit for operating the American Railway Signal Co.'s exhibit.

Quincy, Manchester, Sargent Co., Chicago and New York.—Q. & C. American insulated joint of the style in service on the Chicago & Alton for three years; also a new type of Q. & C. insulated joint.

Rail Joint Co., New York and Chicago.—Weber and continuous insulated rail joints; insulating fibre.

Railroad Supply Co., Chicago.—Four styles highway crossing signals; electric lock for outlying switches; the Railroad Supply Co. derailer; track relays; channel pins.

Railway Specialty & Supply Co., Chicago.—Arc lamp lightning arrester; pin and block wire joint; "1908" channel pin; test connectors; P. & M. rail anchor; Smith improved nut.

Stevenson, Arthur E., Buffalo.—A new design of electric mechanism for throwing either switches or signals.

Union Switch & Signal Co., Swissvale, Pa.—Combination outside motion plate detector bar; a new inside, motion-plate, detector bar; two-arm three-position electro-pneumatic signal movement; circuit controller operated by semaphore shaft operated circuit controller; battery charging switches; variable resistance coils; combination relay and indicator.

Westinghouse Machine Co., Pittsburg.—Westinghouse storage battery for block and interlocking signals.

Whall & Co., Boston.—Fibre for insulated rail joints.

A Method of Uniform Signaling.*

In accordance with the instructions of the Executive Committee and the action of the association at the last annual meeting, when the report then presented was referred back for further consideration, the committee submits the following report:

Introduction.—The committee has considered the Standard Code of the American Railway Association in all its discussions and conclusions and has departed from it only when the requirements of a consistent system apparently warranted changes. The intent of the committee is to recommend, not revolution in present practice in signaling, but rather evolution to meet changes that are demanded, and it has been guided in its deliberations by the principle that the object of the work of each and every department is the safe, expeditious and economical movement of traffic.

		REQUISITE INDICATIONS	APPLICATION
STOP	1	Stop here until authorized to proceed	(a Interlocking signals (b Manual block signals
	2	Stop here and then proceed	c Automatic block signals
	3	Stop here and investigate	(d Stop signs (e Home switch signals
	4	Stop within certain limits	f Train order signals
PROCEED Clear	5	Proceed on unlimited speed route; next signal at proceed	a Interlocking signals
	6	Proceed on limited " " " " " "	a Interlocking signals
	7	Proceed	a Interlocking signals b Manual block signals c Automatic block signals
	8	Continue	e Switch signals g Track tank signs
	9	Restriction removed	h Signs (removing slow sign restrictions)
Caution Approaching	10	Proceed prepared to stop at indicated point ahead	m Distant signals for Nos. 1, 2, 3
	11	Proceed on unlimited speed route next signal is at stop	a Interlocking signals
	12	" " limited " " " " " " "	a Interlocking signals
	13	Proceed prepared to pass next signal at limited speed	n Distant signals for No. 6
Here	14	Reduce speed	o Slow signs
	15	Proceed on low speed route next signal at proceed	a Interlocking signals
	16	" at low speed	a Interlocking signals
		SUPPLEMENTARY INDICATIONS	APPLICATION
		"A" Take siding here	b Manual Block signals
		"B" Take siding at next station	b " " "
		"C" Proceed block is occupied	b " " "

NOTE: Manual Block includes Telegraph Block, Staff Block, Controlled Manual Block.
NOTE: Indication No. 8—This indication may also be given at Interlocking Signals which are not Block Signals where Permissive Blocking is used, at Block Signals (Block Station Closed), at Train-order Signals (No orders) and at Flag Station Signals (No Passengers).
NOTE: Indication No. 14—This indication may also be given at a signal to show that "19" orders are to be received.

Exhibit No. 1—Outline of Indications for Method of Uniform Signaling.

Basis of System.—A system of fixed signal indications may be based upon either of two assumptions:

1. That signals should indicate to the engineman what is required of him in the control of his train and also the reason for the required action.

2. That the engineman needs to know only what is required of him in the control of his train.

Since the purpose of signals is to give to the engineman of moving trains information or instructions that must be acted upon without hesitation, it is plain that the indications of the signals and the means of giving them must be such that the meaning can be grasped instantly, without conscious study or effort. It is taken to be self-evident that, as the number of different instructions conveyed by the signal aspects increases, it becomes increasingly difficult for the engineman to remember the meanings of the aspects used, especially any that are not often met with in his daily routine, and the chance of wrong reading increases. In addition, the practical difficulties in the way of displaying a large number of distinct aspects must be taken into account. Tested by these considerations, the first assumption, followed to its conclusion, is found to require too many aspects.

While it is assumed that the engineman must be fully acquainted with the unchanging physical characteristics and the running rules of the road, or portion of the road over which he runs, including locations of fixed signals, it is realized that the engineman's mind should be relieved, as far as possible, from the necessity of remembering what each signal is for; and plainly this can be done only by giving more indications than would be required in a system based strictly upon the second assumption.

*Report of Special Committee on Interlocking and Block Signals before the Railway Signal Association at Milwaukee, Oct. 9.

It is, therefore, the conclusion of the committee that, in a system of signal indications, the aspects should primarily serve to indicate what is required of the engineman in the control of his train, and secondarily should provide for the giving of certain additional useful information, limited by the reasonable practicability of displaying the necessary aspects and the added burden upon the engineman's memory that will result from the use of many aspects.

Indications and Requisites.—Taking this view, the committee has developed the indications deemed requisite, with their applications as shown by Exhibit No. 1, from which it has deduced the necessary requisites of installation and adjuncts (which follow), illustrated by certain typical aspects shown in Exhibit No. 2.

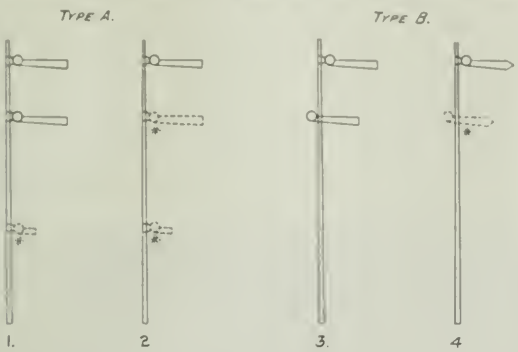


Exhibit No. 2—Typical Aspects for Method of Uniform Signaling.

NOTE.—Type A, "Stop here until authorized to proceed." Type B, "Stop here and then proceed." The aspects here shown are recommended for display of STOP indications Nos. 1 and 2 of Exhibit No. 1, and are typical representations of interlocking and block signals. Arms shown in dotted lines and marked with an asterisk are to be used only when necessary.

REQUISITES OF INSTALLATION.

The numbers in the columns at the left indicate the corresponding Requisites in the Standard Code. Departures from the wording of the Requisites in the Standard Code are indicated by *—new Requisites by X.

Signals affected.				
Interlocking	Manual Block	Auto. Block	Other	
1 *	1 *			Signals of prescribed form, the indications given by not more than three positions and either by three arms, the upper two of which, when horizontal, shall have their ends in a vertical line, or by arm or arms of distinctive form; and, in addition, at night by lights of prescribed color in a vertical line.
		1 *		Signals of prescribed form, the indications given by not more than three positions and either by two arms which, when horizontal, shall have their ends in a diagonal line, or by arm or arms of distinctive form; and, in addition, at night by lights of prescribed color in a diagonal line.
			x	Signals of prescribed form, the indications given by not more than three positions and by arm or target of distinctive form; and, in addition, at night by lights of prescribed color which, when there are two, shall be in a horizontal line.
x	x	x	x	A distinctive position of the arm for the caution (or approach) indication.
2 *	2 *	2 *	x	The apparatus so constructed, that the failure of any part directly controlling a signal will cause it to give its least favorable indication.
3 *			x	Signals, if practicable, either over or upon the right of and adjoining the track to which they refer.
	3 *	3 *		Signals, if practicable, either over or upon the right of and adjoining the track upon which trains are governed by them.
4	4	4	x	Semaphore arms that govern, displayed to the right of the signal mast* as seen from an approaching train.
5	5			The normal indication of Home Signals—Stop.
		5		Switches in the main track so connected with the block signals that the Home Block Signal in the direction of approaching trains will indicate Stop when the switch is not set for the main track.
6 *				The interlocking of signals with switch locks, railroad crossings or draw bridges so that a clear or caution indication at a Home Signal cannot be given unless the route to be used is clear and stop signals displayed for all conflicting routes.
	6 *			The apparatus so constructed that the failure of the block signal instrument or electric circuit will prevent the display of the clear or caution indication at the Home Block Signal.
		6		Signal connections and operating mechanism so arranged that a Home Block Signal will indicate Stop after the ..... of a train shall have passed it.
7				The interlocking of switches, locks, railroad crossings, draw bridges and signals through levers, or their equivalent.
	7			The relative position of the home signal, and track instrument or releasing circuit, such as to make it necessary that the rear of a train shall have passed ..... feet beyond the Home Block Signal before the signal at the preceding block station can be released.
8				Interlocked levers, or their equivalent, by which switches, locks and signals are operated.
9 *				The apparatus so constructed that the failure of any part directly controlling a switch or lock will prevent the display of a clear or caution indication at the Home Signal.
10				Facing point locks, for all facing point switches in main routes.
11				Detector bars, or their equivalent for all facing point switches in main routes.
12				Pipe, or its equivalent, compensated for changes in temperature, for connecting levers, in mechanical interlocking, with switches and locks.
13				Latch locking, or its equivalent.
14				The established order of interlocking such that: A clear or caution indication at a Home Signal cannot be displayed until derails or diverging switches, if any, in conflicting routes are in their normal position, and the switches for the required route are set and locked. The display of a clear or caution indication at the Home Signal shall lock all switches and locks in the route as far as the point to which such signal gives permission to proceed, locking all opposing or conflicting signals and releasing the corresponding Distant Signal, where such signal is used. Where Distant Signals are used, the display of a clear Distant Signal shall effect the same locking as that accomplished by the display of a clear or caution indication at the Home Signal.
15				Interlocking and Block Signals interconnected, where both are operated from the same station.
x				Interlocking signals so arranged that the permissible speeds, in not more than three gradations—unlimited, limited and low speed, shall be indicated.
x				Short arms and short range lights for all low speed indications and dwarf signals.
x	x	x		Adequate approach indications for all high speed signals.
x	x	x		Aspects used for conveying information or specific instructions, combined with the aspect of interlocking or block signals when it is necessary to give information or instruction indications at such signals.

Explanation of Action.—While two lights in horizontal line are recommended for the night aspect of signals which, when in stop position, give indication No. 3, it is the sense of the committee that, in connection with a switch target, one light is sufficient.

The committee, by vote of six to five, included in the outline, Exhibit No. 1, the indication, "Stop within certain limits," because

it conforms to present practice on a great many railroads in respect to Train-order Signals, although such practice is not sanctioned by the Standard Code. On all other points covered by the report the action of the committee was unanimous.*

Recommendation.—The committee concludes that, by accepting certain basic principles as outlined, it has established the number of essential and practicable indications; and it recommends that the indications and requisites submitted be approved and transmitted to the American Railway Association.

Railway Signal Association History.

Recent attempts to write the history of the Railway Signal Association, which was started in 1895, at Chicago, as the Railway Signaling Club, have not been entirely successful, the data required to answer some interesting questions having been lost. In consideration of this fact, and with a view to making the history of the association as complete as possible we give herewith a photograph, recently resurrected by Mr. Rudd, the newly elected president of the association, which was taken at Easton, Pa., about 1895 or 1896. While this picture is, in a sense, ancient history, it will be seen

The Railway Signaling Club in Its Infancy.

1. C. H. Dressel
2. Geo. M. Basford
3. Charles Hansel
4. Frank Rhea
5. A. J. Wilson
6. G. H. Pfiel
7. Henry Johnson
8. W. H. Elliott
9. G. W. Hill
10. G. W. Blodgett
11. G. Hansel
12. W. W. Salmon
13. C. C. Rosenberg
14. J. W. Lattig
15. T. H. Patenall
16. W. S. Logue
17. W. A. D. Short
18. E. M. Seitz
19. W. W. Young
20. A. H. Rudd
21. W. J. Gillingham, Jr.
22. E. D. Wileman

that those faces in the group which are still familiar at the meetings of the association, looked about the same then as now. It must be that these men are still young.

Notes from the North-Western Bulletin.

DISTRIBUTING CARS TO SHIPPERS.

No definite rule regarding the tabulation of car orders can be made to work to the best advantage at all stations. But there are some general rules. All orders for cars must be placed on Book Form No. 422 for the purpose of keeping record of car orders furnished. * * * To get on proper footing with your shippers, study their wants, keep track of what they will have to ship, and make them understand that there will be no favors shown. Some years ago one of the patrons at my station offered me my winter fuel at cost, which seemed quite a favor; possibly saved me seven or eight dollars, but as long as this man was in business he was constantly asking favors of me, and seeking preference over other shippers. I promised myself then that I would never sell myself to one of my patrons. Handle your business in such a way that you fear no one, and be just and fair with your patrons, and I think you will have no trouble. * * * Another thing. Sum up the situation each day. Interview your patrons as often as possible. Talk matters over with them. Explain to them the importance of expediting the unloading and reloading. Assist them by suggesting to them some of your ideas. Keep them on the good side of you, and the best of results are sure to follow. Notify them promptly on arrival of all loads, that they may get their men to work immediately as soon as car is placed. During the month of February we handled 86 cars, all loaded, and not an empty box car received during the month. We unloaded our cars and filled the orders for empties from them and kept things moving.—*W. H. Leak.*

FREIGHT HOUSE WORK.

We are closely following the new rules for loading merchandise which have been prepared to insure economical and safe loading and adherence to the rule of loading in station order. It has been found necessary to have the men memorize the loading list, otherwise there is loss of time. To prevent errors I have issued rules to have the loading numbers placed on shipping tickets by some one man; to have each check clerk make a mark on the shipping ticket when goods are received from wagons; to require each check clerk to call the loading number to his caller before the number is marked by the caller on the truck load; requiring the check clerk to see that the caller marks the right number on the truck load, right-side up for the trucker to read; and, under the loading number, the check clerk's initial must be marked. The caller must call off the number in a clear voice to the trucker. The trucker leaves his load on the platform opposite the proper car and picks up and takes the nearest empty truck to the nearest check clerk. The chief check clerk must examine each car before it is closed and make a note of the fact. In April we had occasion to dismiss 134 men and in May 112. With the warehouse force thus constantly changing errors are, of course, inevitable. The rush of business also interferes with accuracy. In one day recently we sent out 2,746 L. C. L. shipments.—*H. S. Jaynes*, Agent at Omaha.

FRANKNESS.

It is absolutely essential to give out no information that may have a tendency to mislead and confuse. It is far better to acknowledge our inability to answer a question where there is any doubt in our minds as to the ultimate outcome. Much harm is being done by endeavoring to answer questions on which we are not conversant. It leads to confusion, invites criticism, and sometimes forms the basis upon which damage claims are made.—*G. D. Brandt.*

Work is progressing with considerable rapidity on the Katanga Railroad, all but a few miles of which will be in Portuguese West Africa, extending westward from the Atlantic at Lobito Bay, near Benguela, about 800 miles to Katanga, in the southeastern part of the Congo State, around which are very valuable mines. The contract for the road has been taken by the English firm of Griffiths & Co. Fifty miles along the coast are in operation, and work is progressing on 200 more with a force of 8,000 men, 1,500 of whom are Hindoos brought from Natal.

*This indication (No. 1) was cut out by the Association.

Railway Signal Association.*

The eleventh annual convention of this association was held at Milwaukee, Wis., October 8, 9 and 10, between 300 and 400 members and guests being present. President J. A. Peabody (C. & N. W.) occupied the chair. The association was welcomed to Milwaukee by the Mayor of the city, who reminded his hearers that the place was renowned not for beer alone. The value of the beer made yearly is about 26 millions, but of iron products and machinery, Milwaukee produces over 87 millions a year.

President Peabody, in his address, spoke of the rapid growth of the association, the membership now being over 900, and reminded the members that this growth is of the right kind, the new acquisitions being largely active members who, under the amended constitution, are likely to be representative members. The amendment providing for representative membership was necessary in order to assure the proper financial support for important committee work. This committee work should result in standards which, when adopted, will effect marked savings to the members. The President referred to the inconvenience which results from having a meeting in September, only one month before the annual meeting, leaving an insufficient time for the preparation of the results of the September meeting for action in October. He congratulated the association on the recognition which is now accorded it by the American Railway Association, and called upon the members to do full justice to the opportunity thereby offered them to make real progress in the art of railroading.

The first business was the consideration of a number of amendments to the constitution, which were adopted unanimously. These provide, in substance, as follows: The membership shall henceforth consist of five classes—active, representative, junior, associate, and honorary. The term "active member" now means the same as was formerly meant by senior active member; and a representative member is a person eligible for active membership and having a practical knowledge of signaling, who is the duly appointed representative of a railway. An applicant for membership must remit the amount of the annual dues as an entrance fee, which will be in lieu of all dues for the year in which he is elected and which will be refunded in case he fails of election. Election is by two-thirds vote of the entire executive committee. No railroad or system under one general manager shall have more than one representative member. Each such member, in voting on the approval of standards or other important questions, shall have one additional vote for each 500 miles of road and one for each 500 working signal arms or disks. Representative members, in addition to personal dues, must pay each year an assessment, to be fixed by the executive committee, which, however, shall for each vote be not more than the amount of the annual dues. The officers of the association must be elected from the active members. Article 8, section 1, of the constitution is amended to read:

> Any proposition looking to the approval or recommendation by the association, of definitions, nomenclature, specifications, standard construction or standard practice, or aimed at defining formally the position of the association on any matter of importance, shall be presented in writing and shall be accompanied by drawings if the latter are necessary for a clear understanding of the subject. No such proposition shall be acted upon by the association unless it has been published in the advance notice, provided for in the constitution, of an annual meeting and has been submitted to the association at such meeting for discussion. After discussion a vote of the active members shall be taken at the same meeting to decide whether the proposition shall be submitted for decision by letter ballot. If the vote is affirmative the secretary-treasurer, within three months from the time when the vote is taken, shall send by mail to each active member a blank ballot and a copy of the proposition with a report, approved by the executive committee, of the discussion thereon. The ballots are to be filled up, signed and remailed to the secretary-treasurer, who shall count all the ballots received within thirty days from the date on which they were sent to the members. He shall then announce the vote in such manner as the executive committee may prescribe. A proposition for which two-thirds of the votes cast are affirmative, provided that ballots properly filled up have been returned by not less than twenty active members, shall be adopted by the association.

All-Electric Interlocking.—After finishing with the constitution the meeting took up the report of committee No. 8, on standard specifications for electric interlocking. This report filled over 25 pages. The meeting spent the rest of the day discussing it in great detail, but only about half of it was gone over, and the next morning, Wednesday, the whole was referred back to the committee. This report was made by a committee of nine prominent members, of which Vice-President L. R. Clausen (C., M. & St. P.) was chairman. It had been prepared with great care and was commended by a number of members as a highly satisfactory code of specifications, but the committee was subjected by individual members to persistent questioning concerning every detail in which there was room for a difference of opinion, and, in consequence of this action, the association spent the whole day in inconclusive committee work. A number of changes in words or sentences were quickly agreed to by the meeting and accepted by the committee; but others on which there was room for a variety of views, were left for the committee to deal with hereafter. For example, the clause requiring the railroad company to blast and remove rock preparatory to the installation of interlocking apparatus was quickly changed to read *solid* rock, and the clause providing that defective material will be returned upon *written* request of the contractor of *his expense* was quickly put into the form here shown, the italicized words having been left out of the original draft. But the clause providing for an endurance test for generators had to be referred back to the committee because, like many other clauses, it was a matter which could be settled in committee, but could not be settled in a large meeting. This was true of the provision concerning the lock-rod and plunger and their respective dimensions, and many other features.

Comprehensive Signaling Scheme.—On Wednesday substantially the whole of the day was taken up with a discussion of the report of the special committee on interlocking and block signals. This is the committee that prepared the "comprehensive signaling scheme" which was presented one year ago and was printed in the *Railroad Gazette* of October 26, 1906; and the present report was in the nature of a supplement to that one. The committee now consists of A. H. Rudd, chairman; L. R. Clausen, vice-chairman, Azel Ames, Jr., C. C. Anthony, H. S. Balliet, Charles A. Dunham, G. E. Ellis, M. H. Hovey, J. C. Mock, F. P. Patenall, J. A. Peabody, Frank Rhea, Thos. S. Stevens and H. H. Temple. With few exceptions these same men constitute the signaling committee of the Railway Engineering and Maintenance of Way Association, and, acting for both associations, an exhaustive discussion of the subject under consideration was recently held at Detroit, occupying 10 days and nearly as many nights.

The action of last year, with what had preceded it, was reported in the *Railroad Gazette* on pages 350 and 368 of the date above mentioned. The chief changes from present general practice were: to approve the upward inclination of the semaphore arm; the use of three-position signals, thus abolishing the distant signal; and the requirement of at least two lights on all high signals at night, those on automatic signals to be staggered instead of being placed vertically one above the other.

The principal feature of the report now presented is Exhibit No. 1, consisting of an outline of the indications requisite in a reasonably complete system of uniform signaling which shall provide for the present needs of American railroad practice (including some features which are unscientific and ought to be abolished), while, at the same time, adhering to a reasonable consistency, and to the principle of employing only the best method for each particular purpose. The report is given in full in another column.

After brief discussion the meeting approved the last paragraph under the head of "Basis of System," that beginning, "It is, therefore, the conclusion of the committee," etc. The different items of Exhibit No. 1 were then explained in detail by Mr. Rudd. Objection was made to the use of the word "requisite" in the heading, on the ground that this use of this word here, meaning things requisite in the scheme prepared by the committee, would be confused with the use of the same word in the standard codes of the American Railway Association, but a motion to strike out the word was lost. At the end of the discussion the items of Exhibit No. 1 were adopted as reported, with the exception of No. 4, which was ordered cut out. This action was based on the view that the common practice, with train-order signals, of permitting a train to stop with its front end at some point beyond the signal is not consistent with good signaling.

The requisites of installation, as arranged in the report, are put into a single code, those for interlocking and those for block signaling together; but it was voted that before sending the report to the American Railway Association these requisites shall be rearranged into five separate chapters, namely, interlocking, manual blocking, controlled manual blocking, automatic blocking, and miscellaneous.

The report was then approved and it will now go to a letter ballot, and, after approval by the association in that way, it will be laid before the proper committee of the American Railway Association.

THIRD DAY.

On Thursday morning the report first taken up was that of Committee No. 5—Specifications for Automatic Semaphore Block Signals, Operated by Direct Current, for Steam Railroads. Most of the time allotted to the meeting having been taken up, this report was not discussed and was accepted as a progress report. The Specifications for Mechanical Interlocking, Committee No. 15, received the same treatment.

The next business was the report of Committee No. 11, on Signal Lamps. This report, which will be given later, deals mainly with the method of fastening the lamp to the post and with sizes of lenses. It was accepted as a progress report, final acceptance being objected to on the ground that there is need of better fitting sockets and brackets. Experiments are going on

*List of exhibits on page 456.

to accomplish this improvement. The report of Committee No. 14, on How to Remedy the Effects of Foreign Current on Automatic Block Signals, was accepted and the committee discharged. The committee was congratulated on its twelfth conclusion. This report is printed in another column.

The report of Committee No. 2, on Maintenance of Automatic Block Signals, was briefly discussed. It deals mostly with conditions on roads of light traffic and is, therefore, silent on some features which are important on roads of heavy traffic; but the criticisms were few and comparatively unimportant. It was pointed out that zincs need not always be taken out as soon as recommended by the committee, it being practicable to use them in high-resistance circuits. Concerning the opening of sealed relays by maintainers, it was declared that the instructions should be the same to all the men, whether experienced or inexperienced, and none should open a relay except when necessary to put a signal in service. Another member called attention to the fact that in many cases it was desirable to use for track batteries four cells instead of two. The report was accepted.

The report of Committee No. 12, on Rubber-covered Wire and Cables, was vigorously discussed, but diversity of view was developed on important points, and the report was referred back to the committee. This committee presented specifications for cables for circuits carrying 600 volts or less, and recommended that the specifications adopted last year for solid conductors be changed in two features: (a) the required degree of insulation resistance, and (b) the time of immersion for the insulation resistance tests. For insulation resistance a new table was presented making less severe requirements, and it was recommended that the 48-hour term for the immersion test be made 12 hours. For the small sizes of wire a period of 12 hours is believed to be ample, and on the larger sizes the committee holds that the manufacturer will, for his own protection, immerse the wire a sufficient time. The reduction of time should reduce the cost of the wire to the consumer. There was a spirited discussion on a proposal to modify paragraph 2, of the specifications adopted last year, so as not to require that 70 per cent. of an insulating compound shall consist of mineral matter only. This proposal, with one for a similar loosening of paragraph 10, relating to acetone extract, was made with a view to admitting, under the specifications, an insulating compound the composition of which is kept secret; but the meeting finally voted unanimously to retain the present strict requirements, the prevailing view being, evidently, that a secret compound should be sold on its reputation, secrecy being radically inconsistent with the theory of detail specifications, which are designed to promote the most complete publicity.

In response to the criticism that the specifications would cause the rejection of the "copper-clad" steel wire recently described before the association, the title of last year's specifications was changed to read, "Specifications for rubber insulated *copper* signal wire."

The report of Committee No. 13, on the Maintenance of Manual Controlled Signals, was accepted for publication.

C. C. Anthony, for the Committee on Definitions, reported the action of the Executive Committee on the "Railway Signal Association Dictionary," which is to be published by the *Railroad Gazette*. This proposed work is to be similar in form and arrangement to the well-known "Master Car Builders' Dictionary" and the "Locomotive Dictionary," issued by the same publisher. The "Signal Dictionary" will be edited by Messrs. Adams and Hitt, Associate Editors of the *Railroad Gazette*. Mr. Adams is author of "The Block System" and Mr. Hitt is editor of the "Master Car Builders' Dictionary." Mr. Anthony briefly described the plan of the work. A committee of the association has been appointed to supervise it. This committee consists of Messrs. Anthony, J. C. Mock and Azel Ames, Jr. On motion of B. H. Mann (Missouri Pacific) it was voted unanimously to approve the scheme for the dictionary and the action of the Executive Committee thereon.

The Secretary's report showed a membership one year ago of 664, and on October 1, 1907, of 897; and it was informally stated that new members since admitted would bring up the total to 925. The Treasurer reported total receipts, including balance at the beginning of the year, of $6,703. The balance on hand October 1, 1907, was $1,718.

The meeting passed an enthusiastic vote of thanks to Vice-President Clausen for the very satisfactory arrangements which had been made for the Milwaukee meeting, and, after selecting Washington, D. C., as the place for the next annual meeting, and electing officers, adjourned. The election resulted in the choice of the following:

President, A. H. Rudd, Pennsylvania Railroad, Philadelphia; Vice-President, H. S. Balliet, Grand Central Station, New York City; Secretary-Treasurer, C. C. Rosenberg, Bethlehem, Pa.; Eastern Member of Executive Committee, F. P. Patenall (B. & O.); Western Member of Executive Committee, C. E. Denny (L. S. & M. S.). Vice-President Clausen holds over and the new Executive Committee will consist of Messrs. Rudd, Clausen, Balliet, Rosenberg, Patenall, Denny, Peabody, Morrison and Mock.

Alexander H. Rudd, the new President of the Association, is Signal Engineer of the Pennsylvania Railroad. He was born in 1867 and graduated from the Sheffield Scientific School of Yale University in 1886. He began railroad work that fall as a draftsman in the real estate department of the Pennsylvania. After a few months he was transferred to the signal department as a draftsman, and in 1892 went to the New York Central & Hudson River as signal inspector of the Hudson division. The next year he was appointed assistant superintendent of signals in charge of that division, and in 1894 went to the New York, New Haven & Hartford as foreman of electric signals and signal engineer of the Hartford division. In 1900 he was appointed signal engineer of the Delaware, Lackawanna & Western. In the spring of 1903 he resigned and returned to the Pennsylvania to take the position of assistant signal engineer, from which he was a few months ago promoted to the place he now holds.

A. H. Rudd.

On Wednesday evening about 300 of the members and guests, including 40 or more ladies, attended a banquet at the Hotel Pfister. The feature of the banquet, aside from the gowns of the women and the decorations of the room, was the address of Colonel H. G. Prout, Vice-President of the Union Switch & Signal Company, who spoke on the relations of the signal manufacturer to the consumer. Speaking of the true ethical basis of a bargain or contract, which, to be right, must be satisfactory and profitable to both sides, and declaring that this must be the cornerstone of the policy of any intelligent manufacturer who desires to establish an enduring business, Colonel Prout continued:

The signal manufacturer nowadays is compelled to assume toward his customers the attitude of the professional man toward his clients, and our customers may, without distortion of the sense of the word, be properly called our clients. The man who is building and selling engines or bridges, or machine tools or signaling and interlocking apparatus, is constantly called upon to take in trust the interests of his customer exactly as the lawyer or the doctor or the engineer takes in trust the interests of his patient or client. That is, we are constantly called upon for professional advice, either directly or indirectly, and very often it is quite directly. We are called upon to assist in scheming the interlocking of the signaling of a given proposition. We are called upon to recommend apparatus and methods. We are called upon to design special apparatus. It would seem that with the greater employment by railroads of higher class and competent engineers, the call upon signaling manufacturers for this professional service must be diminished, but it continues. It is of the utmost importance that the signal maker and the signal user work together, because of the intricate nature of their work. The important work of simplification of standards is still before us. The Union Switch & Signal Company manufactures and sells 156 different semaphore castings, 130 different pipe poles for signals, 95 different front rods, and 140 different lock rods. We carry on our lists and keep manufacturing and storeroom accounts with 37,500 different, separate articles, to say nothing of some unknown thousands that are not listed. With such a multitude of details there are constant chances for mistakes. Even if there were no mistakes, the clerical work and correspondence must be enormous, and a single mistake may lead to $25 worth of correspondence, though perhaps it has to do only with a dollar's worth of material. With more brains and more care the dealings between the maker and the railroad could be greatly smoothed. The saving that could be made if the railroads and manufacturers could get together and abolish about three-quarters of the present patterns, drawings and dies is in some degree indicated by the fact that at the beginning of last month the Union Switch & Signal Company had on hand $1,736,000 worth of material.

Colonel Prout complimented the members on their high ideals, especially as shown in their efforts to establish proper standards of construction and operation, and to secure the approval of the American Railway Association for such standards; but he slyly suggested that the last-named association had not always made lightning speed in its promotion of improved practice.

Electrification of the Rochester Division of the Erie Railroad.

BY W. N. SMITH,
Electrical Engineer Westinghouse Church, Kerr & Co.

(Concluded.)

A very simple type of pull-off was devised for curves in span construction, and it so happens that both the Rochester and Mt. Morris yards have considerable curvature. The pull-off consists simply of a spool type insulator, with a piece of pipe cemented through the center, this pipe being slipped over the hanger spacing rod joining the messenger and trolley clips, thus giving an insulating connection through which an ordinary pull-off cable can be attached to both messenger and trolley wherever required. The division of the horizontal pull between the messenger and trolley wires is easily adjusted to suit the conditions, by shifting the spool type insulator up and down the spacing rod, by inserting longer or shorter nipples of pipe underneath it. In general, when near a span wire, the messenger cable is supported rigidly on its insulator and the trolley wire needs all the side pull; but in the middle of a span the pull must be equally divided between messenger and trolley wire.

The presence of several through truss bridges over streams, and two low bridges over the Erie right of way, necessitated the employment of special construction at these points, particularly at the bridge at Clarissa street on the outskirts of Rochester. The original clearances here were so low that the roadbed had to be excavated out and the track lowered about 2 ft., the minimum clearance between the rails and the trolley wire being finally 18 ft. The messenger is fastened to a horizontal spool type insulator mounted at the center of a substantial piece of turned oak, which is long enough to carry two more similar insulators, one on either side of the center one.

The steel hangers reaching down from the overhead bridge structure carry the two side insulators, so there are always two insulators in series between the 11,000-volt messenger cable and the steel work of the bridge. These insulated supports are suspended at short intervals from the under side of the steel work of the bridge, and are further supplemented by the use of steady strains which prevent any side displacement of the trolley wire. The shortest sizes of hanger spacing rods are used in such places. Where the bridge trusses are high enough to permit it an iron stirrup is employed like that used in span work, which carries the standard form of straight line insulator, and the regular type of catenary suspension is employed.

At either side of these overhead obstructions it was necessary to provide warnings for brakemen upon the tops of freight cars as substitutes for the warnings of hanging pieces of rope previously used. In the accompanying photograph is given a view of the Clarissa street bridge, showing both the old arrangement of ropes and the new one for electrified tracks which supplanted it. It will be noted at this point only one of the two tracks is electrified and freight trains are here obliged by rule to use the unelectrified track; but to insure that the place shall be absolutely safeguarded, the electrified track is fitted with warning signs of the type shown. They consist of a horizontal suspended swinging wooden rod, mounted with its axis at an angle, so that it swings up as it is pushed to one side. The pantagraph trolley is fitted with a set of springs on each side, one of which strikes this warning sign a blow as it passes under and instantly throws it to one side. The blow is struck upon a heavy leather strap held taut by a coil spring of steel wire in tension, the whole contrivance being fastened to the lower half of the pantagraph trolley mechanism so that it is at the right height for striking the warning sign. The swinging rod is mounted upon the pole by means of insulators, effectually preventing any leakage to the ground, even though a car might stand still directly under the sign and make contact with it for an indefinite length of time.

Nearly all the telephone and telegraph wires which cross over the 11,000-volt trolley wire have been put underground, particularly in the case of the leads composed of only a few wires, but where the line is crossed by heavy telephone trunk lines they have been protected by the basket type of construction, so designed as to effectually prevent a broken telephone wire from falling across the messenger or trolley wire. This consists primarily of four galvanized steel cables stretched between opposite ends of two cross arms, one placed above and the other below the wires of the intersecting telephone line, and the four cables are joined by a basket work of light strap iron ribs placed at intervals of 3 ft. to 4 ft. across the whole span, forming the sides and the bottom of the cradle and effectually preventing a broken telephone wire from dropping any further. This construction was also followed in the case of an electric light wire at Avon.

The telegraph department of the railroad, in connection with the signal department, built a private telephone line of two copper wires between Rochester and Avon, with instruments at all signal towers and stations in the despatcher's office, and at the substations, and car shed, and master mechanic's office. This telephone system is run upon the trolley bracket poles, transposed every third pole, and has worked satisfactorily.

Lightning protection for high tension single phase railway line not having as yet been standardized, only a part of the line was equipped with line lightning arresters, which are of a swinging fuse gap type of construction, made by the Westinghouse Electric & Manufacturing Co. This type of lightning arrester consists of a gap one side of which is connected directly to the trolley through a No. 4 copper wire, and the other side being directly connected to the ground rod through a fuse enclosed in a tube which, while the fuse is intact, is maintained in an inclined position like a pendulum held back from its position of rest, but when the fuse is blown a latch is released which allows the fuse tube to swing to a vertical position which shows conspicuously from the ground, and signifies to the patrolman that the fuse should be replaced. The fuse tube can then be lifted off the suspending lugs by a pair of insulating tongs made for the purpose, and the fuse renewed and replaced in a few moments.

On the other half of the line lightning arresters were not installed. During the summer two of the poles were struck by lightning, but the metal work of the brackets and truss rods being entirely grounded, these poles were not damaged below the topmost point of attachment of the truss rods, which is generally not over 18 in. from the top of the pole. In a number of instances the lightning arrester fuses have blown, but it is not known how many of them have blown simultaneously. Although the extent to which this type of arrester is fully protective is hardly established as yet, at no time since regular operation started has any injury to the car equipment resulted from lightning, though there were several severe storms during June and July.

The trolley line is divided into seven sections—one comprising the Rochester terminal, one the Avon yard, three sections in the main line between Rochester and Avon, and two sections south of Avon. The sections are divided by trolley section insulators made by the Westinghouse Electric & Mfg. Co. They are of the overlapping type, made of impregnated wood, and are of sufficient length to insure insulation at 11,000 volts. Each section insulator is carried upon two brackets mounted on poles spaced 10 ft. apart. As the trolley and messenger must both be completely insulated on opposite sides of the breaker, heavy strain insulators are introduced upon which the messenger is dead ended, the two insulators being connected across the gap by a heavy steel rod. This entire combination is supported upon standard insulators mounted upon the regular brackets. One of the breakers, that opposite the substation at Avon, is different from the above mentioned type, in that it is not of the overlapping type, it being necessary to absolutely separate the two halves of the trolley line in order to utilize the separate phases of the trolley current of each half.

The only feeders necessary are those connecting the substation with the trolley on opposite sides of this section break. The principal object of cutting the trolley into additional sections is to facilitate the locating of line trouble. The conditions of electric traction on this line are such that no feeder is necessary besides the trolley wire, and consequently there is no necessity for feeding the sections separately. A jumper is therefore provided at each section insulator in which is placed a hook type knife switch that can be operated in case it is desired to cut that section out. Normally, however, the switches are closed and the effect of the jumpers is to make the trolley wire continuous.

Another detail peculiar to the catenary type of trolley construction is the "deflector"—a sort of mechanical fender placed in the angle formed by the intersecting trolley wires at switches. The type of deflector here used consists of four or five bars of flat steel, ½-in. x ⅛-in., suspended by riveted hangers from crossbars spaced 5 ft. apart which in turn rest on standard trolley clamps fastened to the trolley wire. The particular advantage gained by this construction is that no extra tension is needed to keep the bars from sagging and bending, this type of deflector being of minimum weight and entirely self-contained. They are placed in both angles of each switch. The object of the deflector is to prevent the end of the pantagraph shoe, when traveling under either wire, from becoming hooked over the other.

CARS.

The car equipment fitted with electric apparatus consists of six motor cars which together with their trucks were furnished by the St. Louis Car Company. The electrical apparatus was installed on the cars and trucks by the engineers at the railroad company's car shops in Buffalo, N. Y. The cars are 51 ft. 4 in. over bumpers, 40 ft. over corner posts, 29 ft. 4 in. between truck centers, 8 ft. 9 in. wide over sheathing, and 13 ft. 8⅝ in. in height above the rail. Four of the six have two passenger compartments, the other two having a baggage compartment about 14 ft. long, and a small smoking compartment with six seats, besides the regular passenger compartment.

The underframe of the cars consists of side sills of 5-in. x 8-in. yellow pine, with 6-in. steel channel fillers, intermediate sills of 4½ x 6-in. yellow pine, and center sills of 6-in. I-beams, with fillers. All the cars have upper and lower truss rods and needle beams of 5-in. I beams. End sills are 8-in. x 6-in. oak. The flooring is double, and trap doors are fitted over the motors.

All the lower side windows are equipped with sash balances,

and the interior of the car is finished in mahogany with light green veneering in the ceiling. The seats are of the "Walkover" type, upholstered in dark green plush in the main passenger compartment, and in rattan in the smoking compartment. There is a continuous basket rack on either side over the windows. The end doors are of the double sliding type and the vestibule doors are of the single sliding type, and trap doors are fitted over the steps. Each vestibule is fitted with a double-acting swinging door so arranged as to form the motorman's cab, and when not so used it is folded back to completely enclose the control apparatus and brake gear, and leaves the vestibule unobstructed for passengers.

Each car is fitted with a 50-candle power headlight, at each end, on top of the hood, and it is also fitted with a gong, air whistle, and with a standard train air signal used by the Erie Railroad. The toilet is in the center of the car, adjacent to the partition between compartments. The "Standard" steel type of platform buffer is used, and the regular M. C. B. coupling, air hose connections

Overhead Construction at Mount Morris Terminal; Erie Railroad.

and safety chains are provided, so that the cars can couple up to any of the standard Erie railroad car equipment.

There being an open space between the abutting vestibules when two motor cars are coupled together, due to the rounded and projecting buffer beams of the platforms, this opening being nearly 18-in. wide, which is wide enough to allow a person to fall between the cars, there were provided canvas curtains about 5 ft. high with snaps attached which enable them to be quickly stretched across the space, one on each side of the vestibule end door, so as to insure the safety of trainmen and passengers when walking from one car to another, with the train in motion.

The trucks are both alike, the wheel base being 6 ft. 8 in. The axles are 6½-in. diameter. The trucks are of the standard M. C. B. swing bolster type and inside hung brakes.

The heating equipment consists of 32 Consolidated Car Heating Company's electric heaters of the truss plank type, 450 watts capacity each in the main portion of the car, and two "No. 192 M. S." heaters in each cab.

The electrical equipment of the cars consists of four No. 132-A Westinghouse single-phase railway motors, with a nominal rating of 100 h.p. each, the gear ratio being 20:63. The suspension is of the nose type, and solid gears are pressed upon the axles.

The control system is of the Westinghouse electro-pneumatic type, and includes three distinct circuits, the high potential, the low potential and the control circuit.

The high potential circuit includes the pantagraph trolley, line switch and the transformer. The pantagraph trolley mechanism is operated by a pair of springs and by an air cylinder. The trolley is raised and held against the wire by means of springs against its own weight, and it is lowered by the application of air pressure to pistons working in cylinders that form part of its base. When down it is automatically locked, and the latch of this lock can only be withdrawn by applying air pressure to another small piston which then unlocks the pantagraph allowing the springs to raise it. This trolley mechanism is so connected with the control circuit through the line relay that any interruption in the supply of high-tension current immediately causes the trolley to be lowered by applying the air to the main cylinders in the trolley base.

The line switch is equivalent to a main high-tension circuit breaker. It is opened and closed by air pressure, admitted by electrically-operated valves. In case the supply of air is exhausted, as when the car has stood for some time unused, the line switch must first be held in mechanically by means of a handle provided for the purpose until the air pump, which can then be thrown into operation, has compressed air to about 50 lbs. pressure, which is enough to properly actuate the control system. To raise the trolley when there is no air pressure, there is provided a small automobile tire pump placed underneath one of the car seats, which is connected by a three-way cock into the trolley air piping system, and enables the air-operated trolley latch to be withdrawn and power obtained that will start the air compressor and set going the motor generator set, which is used for charging the storage battery and supplying current to the control circuit.

The transformer is of 200 k.w. capacity, and is of the oil-insulated type. It has three high-potential and eight low-potential

taps, the latter running from 300 down to 110 volts, at which latter pressure current is provided for heating, lighting and auxiliary purposes.

The high tension wiring of the car is done mainly with varnished cambric cable, drawn through loricated iron conduit. A small amount of high grade rubber cable is used, but it is thoroughly protected with varnished cambric tape wherever there is danger of a brush discharge to ground breaking down the insulation.

In the main low potential circuit are the switch group, the preventive coils and the reverser. The switch group is a set of air-operated switches controlled by magnet valves, all mounted in one frame. It is placed athwart the car as near as possible to the low-tension end of the main transformer. The switches of the group are all provided with interlocks, which automatically govern the connections in such a way that each switch of the group acts only when the current in the motors has reached a predetermined value, thus making acceleration automatic. Preventive coils are used across the terminals of some of the switches of the group to prevent excessive current flowing at the instant of closing the switch. Each switch in the group is fitted with its own blow-out coil. There are two reverser switches actuated by air pressure, one for each pair of motors.

Current from the main motor circuit is led through the motor limit switch, which makes effective the functions of the interlocks on the switch group, and renders it impossible for the successive switches to be thrown in unless the limit switch is closed.

The control circuit includes a master controller, in each vestibule, the train line wires and their connections to the valve magnets and interlocks, a storage battery supplying current for these wires, and a motor generator set, which is used either to charge the batteries or to actuate the control system. The master controller makes the proper connections by means of which the 15-volt storage battery actuates the valve magnets which control the action of the air-operated main contactors in the switch group and the reversers. The controller handle is normally held in a vertical central position by springs unless it is moved to one of the running points by the motorman. When released from the grasp of the hand it flies to the vertical position, cutting off the power and enabling the emergency application of the brakes by means of a brake relay valve alongside of it. There are two holes in the face of the master controller directly under the handle, and attached to the handle by means of a chain is a plug which may be inserted into either of these holes. The master controller is not operative unless this plug is pushed all the way into the lower hole, which closes the line switch, connects the generator and battery, and puts the brake relay valve into circuit. This is the ordinary running position of the plug. In case the line switch is opened by an overload, which generally causes the trolley to be lowered, the plug is taken out of the lower hole and placed in the upper, which action immediately closes the line switch, releases the trolley, and allows it to spring up against the wire. As soon as the power is thereby returned to the main circuit the plug is taken out of the upper hole and replaced in the lower one.

There is a push button upon each side of the bottom of the master controller case. That on the right hand side is used for dropping the trolley and opening the line switch. When the button on the left-hand side is pressed, the switch group is stepped up to the last or high-speed notch and remains in that position until the handle of the controller has been returned to the off position.

There are four distinct notches on each side of the controller, the first corresponding to the coasting position, with the power off, the others enabling such gradations of speed as may be desired. Reversal is effected by moving the controller handle to the opposite side of the center or dead point. If the controller stops on the dead point, as it will if released by the hand, it will immediately apply the brakes.

The motor generator set is a compact machine of about ½ k.w., the motor being of the self-starting induction type, wound for 110 volts, the generator being normally of about 23 volts. It is placed under one of the seats in the car, and is covered by a box with removable lid, so that it can easily be reached for such attention as it requires. It is mounted upon rubber bushings, and runs so quietly that its presence in the car can hardly be detected.

The storage battery consists of seven cells contained in a wooden

Overhead Catenary Construction at Clarissa Street Bridge, Rochester, Showing Section Break and Bridge Warning.

box with handles, carried in an enclosed box underneath the car. No other auxiliary lines for any purpose are connected to the control circuit in order to prevent it from being disabled by accidental grounds.

In one vestibule there is located in an asbestos lined compartment enclosed with steel doors, a slate switchboard panel upon which are carried all the switches and fuses for the control of the battery and motor generator set, the lighting circuits and heaters, and also the main connection from the low-tension side of the transformer to the auxiliaries.

The control circuit is fitted with junction boxes, branches running to receptacles at each of the four corners of the car directly under the end sills. The jumpers for connecting the cars and the receptacles are of the 12 point type, there being 12 wires in the main control circuit.

The low-tension wiring between the transformer and switch group and motors is all enclosed in a boxing of Transite, to insure its protection against mechanical injury, as the inductive effect of heavy currents at low potentials renders the use of iron conduits impossible for this part of the wiring.

The air brake and electrical equipment were placed on the cars by the engineers at the Buffalo car shops of the Erie Railroad.

CAR INSPECTION SHED.

Adjacent to the substation is a car inspection shed, a brick building that will accommodate four cars. It is 136 ft. 6 in. long, 30 ft. 5 in. wide and 20 ft. high in the clear, between the track and the bottom of the roof girders, and 24 ft. high from the top of foundation to the top of the parapet. The general style of construction is similar to that of the substation. It is well lighted, there being a window in each bay, 6 ft. 11 in. wide by 13 ft. 6½ in. high. Two tracks run clear through the building, the ends of which are enclosed by rolling steel doors of the Wilson type, about 12 ft. wide and 18 ft. 9 in. high. One of the two tracks is provided with a pit about 110 ft. long and 4 ft. 4 in. wide, in the clear, and 3 ft. deep from the top of the rail to the top of the convex brick floor. The roof is a 4¼-in. reinforced concrete slab, supported by steel girders, slightly pitched in one direction. There are no partitions or separate rooms in the building.

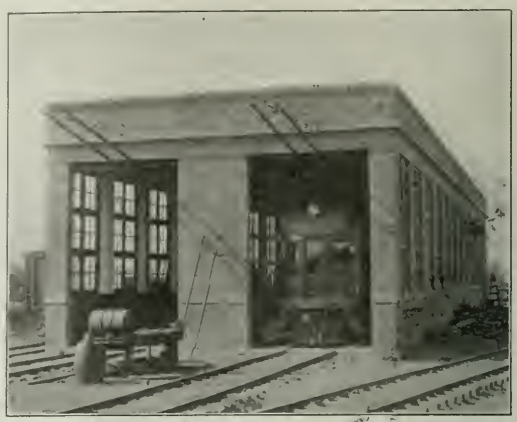
A trolley hoist is provided at the rear end of the building, traveling across it on the bottom flanges of an I-beam attached to one of the roof girders. A third track not connected with the outside tracks runs up and down the middle of the building between the two car tracks. A transfer table is located in a cross pit situated about midway of the building, by means of which a car standing on the floor track may have a truck taken out from under it and shifted over to the center track on which it can be run under the trolley hoist in case repairs are needed. The sides and bottom of this transfer pit are made of concrete. The floor of the car barn other than that taken up by the repair pit and transfer pit is paved with second grade paving brick, laid on sand, which was well packed down with water.

The station is supplied with light by 77 incandescent lamps in pairs and clusters, connected up by a conduit system and steel plate switch cabinet to the auxiliary light transformer in the substation. The pit is also provided with ten incandescent lamp outlets and extension plugs. No electrical means are provided for moving the cars in the station, there being always steam locomotives available for shifting the cars in and out of the building.

The facilities in the inspection shed for making electrical repairs are supplemented by the regular division repair shops, located alongside the steam locomotive roundhouse at Avon, which are equipped with the usual complement of machine tools. At the Rochester terminal a concrete inspection pit 60 ft. long is provided on one of the side tracks close to the passenger station.

OPERATION.

The equipment above described was intended to be sufficient for operating single-car trains with one stop per mile over the entire road, at an average schedule speed of 24 miles an hour, or to haul one trailer making stops about 2½ miles apart, at the same schedule speed. The company has furnished shelters where the public highways cross the line, there being 22 of these flag stations, besides the regular intermediate way stations at which steam trains stop, six in all, or a total of 28 stations at which electric cars may be required to stop. Practically the electric cars stop at all the regular way stations, but at only a portion of the flag stations. A single passenger coach is frequently attached to a motor car, and on some trains baggage, milk or postal cars are regularly hauled. When two trailers are hauled two motor cars are required, making a four-car train, as shown in the accompanying photograph. The service has proved very popular throughout the Genesee valley, through which the line passes, and it is intended to increase the number of motor cars in order to handle the business a little more comfortably next season. It is found that the electric trains on their 31 miles of line can be depended on to keep to their running time rather better than the steam passenger and freight trains operating over the main line.



Car Inspection Shed at Avon; Erie Railroad.

Four Car Electric Train at Avon; Erie Railroad.

SIGNAL SYSTEM.

The railroad company has installed the manual block system for insuring the safety of trains with the frequent headway at which they are obliged to be run upon the single track road, which must also handle steam passenger and freight traffic at the same time. The blocks extend between the regular way stations, or where such blocks are too long block towers are added, making the blocks average about four miles in length from one end of the line to the other. The siding switches are fitted with electric locks controlled by the block operators, in the towers, or in the way stations. The towers are all connected by the private telephone line, while the way stations retain the usual telegraphic communication with the train despatcher's office at Rochester. All train orders are transmitted by telegraph and written out on Form 31.

TELEGRAPH SYSTEM.

As is well known, the single-phase trolley system causes interference with telegraph lines, along the right of way, and unless both the electrostatic and electromagnetic induction are properly compensated, there is always danger of telegraphic communication being seriously affected. The static effect is particularly annoying, as it is absolutely continuous, as long as the trolley line is charged, whether or not there are any cars moving. Various means were proposed and tried by the Western Union Telegraph Company for the elimination of the static induction, which always causes the telegraphic relays to chatter, but the most successful thus far found was that devised by E. W. Applegate, quadruplex expert for the Western Union Telegraph Co., who has developed a very simple means for overcoming static interference. The Applegate "static pickup," for which a patent has been applied, comprises a back contact relay and a high resistance shunt. The current enters the relay 1 and 2, through a 150-ohm coil or magnet, attracting the armature C. When the line opens by any operator opening his key the armature C falls back and through the back contact connects point C and D by the aid of a spring S. The shunt A consists of 350 ohms of carbon stick and provides a better path for the static current than do the magnets, pacifying the magnets to a certain extent. When the line opens and the armature connects with the back stop C and D, both the A and B shunts are in series with the main line and pick up the static, which escapes through shunt A, relieving the agitation of the armature so that it can respond to the closing of the line. The shunt A robs the relay of main line battery current very materially, so that it responds to the home key sluggishly. Consequently the auxiliary battery F is inserted in shunt B. When the armature C falls back, this battery acts upon the magnets and assists its prompt response to the home key or to any other operator to such an extent that the shunt A does not cause noticeable drag. No matter what the line static may be these shunts "pacify" the instruments and the static is not felt.

The armature spring is adjusted high enough to overcome the wave of static that escapes A and B shunts. The aid of the seven-volt battery overcomes this adjustment and leaves the relay very prompt and satisfactory.

The resistance of the shunt A must be determined by the distance from the ground and battery at each end of the line. The nearer to the ground the less is the resistance of the shunt, as in close proximity to battery and ground the static is more pronounced and the effect of the main battery upon the relay is likely to be correspondingly diminished.

By this arrangement all the telegraph wires are "singled," and metallic circuits, the necessity for which was at one time pending, were discontinued, and the repeater service which they necessitated was also discontinued. There is now a spare wire between Rochester and Mt. Morris through the entire zone of static interruption.

Speech over the telephone line is very clear and distinct, and although the wires and instruments have a heavy static charge, a few simple precautions prevent any trouble. It is intended to carry portable telephones on the cars.

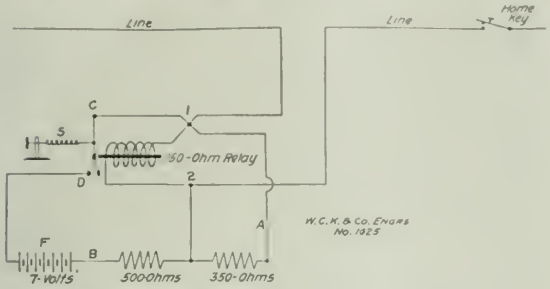
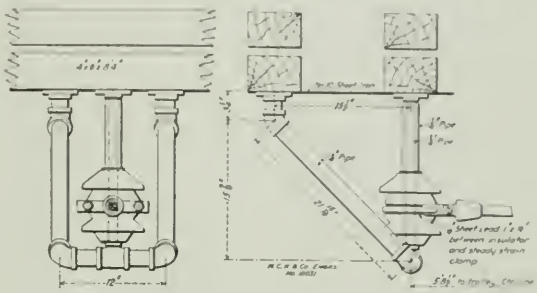


Diagram of Applegate Static Pickup for Telegraph Lines.



Steady Strain Bracket for Low Bridge Trolley Construction.

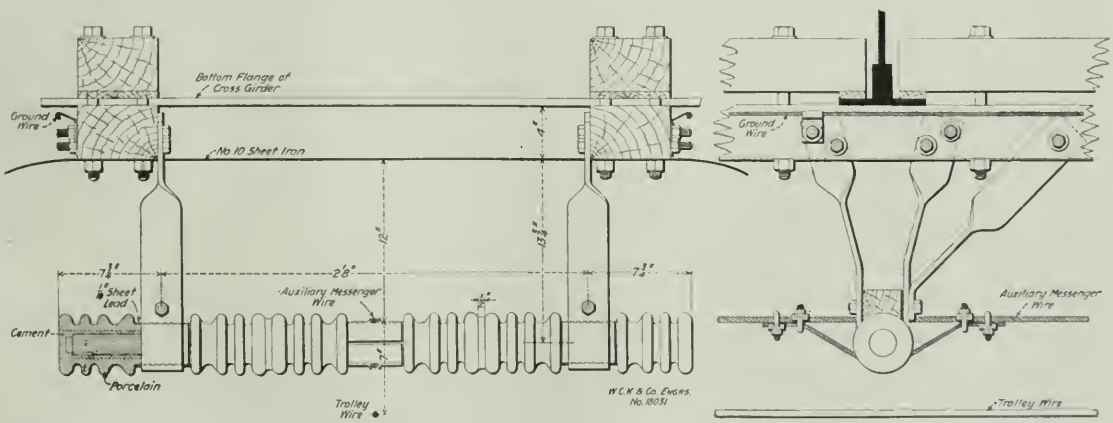
ORGANIZATION.

The single-phase system was recommended for the electrification of this division by the Electric Traction Commission of the Erie Railroad, and after authorization by the company was installed under the general direction of J. M. Graham, Vice-President and head of the construction department of the Erie.

The engineering and the construction work were carried out, and the system brought into operative condition by Westinghouse, Church, Kerr & Co., who designed and erected the buildings and the catenary trolley construction, bonded the track, and installed the electrical apparatus in the substation and on the cars.

The adjustment of the telegraph system was carried out jointly by the Western Union Telegraph Co. and the telegraph department of the railroad company.

The order was given to the engineers on June 6, 1906, and although the activity in construction work all over the country at that time rendered it difficult to secure materials and labor promptly, the work was pushed so rapidly that about 7½ months later, on Jan. 22, 1907, the first official trial trip was run between Avon and Rochester. The severe winter weather thereafter prevailing delayed the completion of the work until spring. During April and



Details of Trolley Construction Under Low Bridge; Erie Railroad.

May the whole equipment of substation apparatus, lines and cars was thoroughly tried out in a course of experimental operation, which also enabled the railroad employees to become familiar with the new system. On the 18th of June commercial operation began and has since continued permanently with marked success.

How to Remedy the Effects of Foreign Current on Automatic Block Signals.*

The present committee has carefully considered the report previously made to the Association and the discussion thereon. As the conclusions recommended by the previous committee were not acted upon by the Association, they are herewith re-submitted for adoption in the form recommended by the present committee. The conclusions now recommended are as follows:

1. For situations where foreign currents follow the track rails, although there may not be a crossing or connection with an electric road, it is recommended that the conditions be carefully studied and exact information obtained as to the course, direction, amount and pressure of foreign current and provision should then be made for removing or blocking out this current.

2. When there is a crossing of an electric road with a steam road, batteries must be placed at each end of steam road track next to crossing and battery current arranged to flow through the relay in direction with foreign current if the foreign current is found to flow in a definite direction. The connections, through block section for control signals, must be made by means of line wire circuits.

3. If there is sufficient foreign current to improperly work the track relay when an insulated joint has broken down, two relays should be used for each track circuit, one being placed at either end and connected in multiple arrangement. However, it should be understood that complete protection is not given by the multiple arrangement of relays, for if there is a broken rail or bond wire, a foreign current may energize the relay at one end of the section before the relay at the other end of the section has been shunted and thus cause the signal to give a clear indication when there was a train in the section.

4. To minimize as far as possible the effects of foreign current on line wire circuits, it is regarded as important that trunking be kept above the top of the ground, the rubber and other insulations be kept in first class condition, and the common wire limited to a length of 10 miles.

5. For multiple arrangement of track circuit relays, a resistance of 16 ohms is suggested for relay at battery end and 4 ohms for the relay at the other end of track circuit.

The resistance of the relay at the battery end of the track circuit that will give the best results is dependent upon the insulation of the track rails, the rail bonding and the voltage and ampere capacity of the battery. The recommended resistance of 16 ohms is deemed the best for those situations where the track circuit conditions may be considered good. For sections where the rail insulation is poor and batteries are not efficiently maintained, a lower resistance may be used to advantage if failures are to be kept within reasonable limits. The greater the resistance of the relay, the higher the voltage required to pick up the armature and the easier it will be to shunt the relay.

6. For track circuits having but one relay, a resistance of 9 ohms is recommended for circuits 500 ft. and under, and a resistance of 4 ohms for circuits of greater length than 500 ft.

While it is recognized that the best results are to be obtained by using a relay having a resistance proportioned to the resistance of the circuit, the benefits do not compensate for the disadvantage from a maintenance standpoint, of having to keep in stock track relays of a number of different resistances.

7. It is advisable to thickly coat with a heavy oil or other insulating compound the parts of an insulated joint before the joint is put in place.

If there is interference from foreign current, it is advisable to put a heavy oil or other insulating compound on the joint and particularly around the exposed ends of the fiber at least every two months.

8. For direct-current track circuit connections run in trunking, a $^{2}/_{32}$ in. rubber insulation wall for No. 8 B. & S. gage wire or larger is recommended.

9. For signal circuit connections run in trunking, a $^{5}/_{64}$ in. rubber insulation wall for No. 12 B. & S. gage wire is recommended.

10. Trunking, when run parallel with the track, should be kept clear of the ground. When run across tracks, trunking should be put in with top clear of the ballast and with top of capping not less than $^{1}/_{2}$ in. below bottom of rail.

11. The standard ground should be made by burying in moist earth an annealed copper plate $^{1}/_{16}$ in. thick, 2 ft. square, to which has been brazed for a length of 12 in. a No. 4 B. & S. gage soft drawn bare copper wire. The plate to be buried in clay or in a 6 in. layer of fine charcoal, and the connecting wire is not to exceed 150 ft. in length. The effectiveness of the ground should be tested by a Wheatstone bridge.

12. If the effects of foreign current on D. C. track circuits cannot be overcome by the methods above outlined, the desired result can be secured by the use of alternating-current track circuits having the proper current frequency.

W. H. Elliott, Chairman; J. M. Waldron, J. D. Phillips, W. F. Follett, C. A. Christofferson, W. M. Post.

*Report of Committee No. 11, presented to the Railway Signal Association at Milwaukee Oct. 9.

Railroad Commissioners' Convention.

The 19th annual meeting of the National Association of Railroad Commissioners was held at Washington, October 8, 9, 10 and 11, Vice-President C. C. McChord, of Kentucky, in the chair. On the call of the roll by states on Tuesday morning, there were represented the following 19 states, together with the Interstate Commerce Commission and representatives of the Railroad Accounting Associations: Connecticut, Georgia, Illinois, Iowa, Kentucky, Maine, Minnesota, Montana, Nebraska, New Jersey, New York (first and second districts), North Carolina, Ohio, Oregon, Pennsylvania, South Carolina, Washington, Wisconsin. As in former years, the Association indulged in a number of long discussions on such subjects as rate making, uniform classification and the valuation of railroads which are not susceptible of profitable treatment in a meeting of this kind, and on which no useful results were accomplished. The most definite action taken was that on the report of the committee on safety appliances. This report, which was made by the Chairman alone, and was avowedly a rambling paper, declared that the block signals now in use have become inadequate, and that the most advanced (?) schemes for keeping trains constantly in communication with stations by electric currents and for providing absolutely perfect automatic provision against collisions should be put in operation on the railroads throughout the country. These over-enthusiastic demands appear, however, to have been discounted by the convention and the meeting finally resolved, unanimously that:

> The Congress of the United States be requested to enact a law to compel railroad companies, both steam and interurban electric roads, to protect tracks by an automatic block system to be approved by the Interstate Commerce Commission, a certain number of miles to be protected each year until all the main track lines shall be so protected.
>
> The members of this association pledge themselves to ask the assistance of the senators and representatives of the several states . . . and to seek the passage of a law by each state to accomplish the same end. . . .

These resolutions, it will be seen, are by no means conservative, though in spirit they are more so than the other declarations of the report. As many of the commissioners represent states in which hundreds of miles of road do not earn $2,000 per mile per year, the use of the word "automatic," in the first paragraph of the resolutions, is doubtless to be explained by the prevailing lack of knowledge as to the meaning of that word in railroad signaling.

A considerable proportion of the 283 pages of the proceedings is filled up with committee reports and essays; 18 pages are taken up with a paper by A. T. Gillette, of New York, on the Valuation of Railroads and the discussion thereon. Mr. Gillette has been employed in a valuation for the state of Washington during the past year. James Peabody, of the Atchison, Topeka & Santa Fe, gave a talk on Uniform Classification, expounding his theory of how to make one. The Committee on Statistics, on which are Prof. Henry C. Adams, Prof. B. H. Meyer and Mr. C. I. Sturgis, made a long report, with copious appendices showing what the different states require in annual reports from railroads, and a paper by S. L. Lupton showing in great detail the features in which uniform action by the different states is desirable. Prof. B. H. Meyer contributed a ten page paper on the analysis of railroad operating expenses.

The Committee on Uniform Classification made a long report and again demanded that Congress authorize the Interstate Commerce Commission to prescribe one. The report of the Committee on Legislation, presented by M. S. Decker, of New York, declares that the time has come when this association, now 18 years old, should carry out its original purpose of securing harmony in railroad legislation. The need of securing greater safety to railroad passengers and employees, and to persons at highway crossings, alone constitutes a pressing demand which should receive the earnest attention of the Association.

The report of the Committee on Rates and Rate Making, presented by Mr. Staples, of Minnesota, fills, with the discussion thereon, about 30 pages, but we cannot discover that any new light is thrown on the subject.

C. C. McChord, of Kentucky, was chosen President of the Association for the ensuing year, and William H. Connolly, of Washington, D. C., Secretary. Mr. Connolly is Chief Clerk of the Interstate Commerce Commission. He takes the place of Mr. Moseley, who is no longer able to give the time necessary to attend to the duties of the secretary of the Association.

GENERAL NEWS SECTION

NOTES.

At Los Angeles, Cal., the Atchison, Topeka & Santa Fe has been found by a jury guilty of paying illegal rebates on freight.

Governor Comer, of Alabama, has issued his call for an extra session of the Legislature November 7, to further regulate the railroads.

The Indiana State Railroad Commission has determined to take upon itself the distribution of coal cars to the mines on the Southern Indiana Railroad.

According to newspaper reports, the Chicago & Alton has had to dismiss seven train auditors for co-operating with ticket scalpers —or, in plainer language, for stealing.

The Wisconsin Central has issued notice that until further notice 90 days' free storage will be given on all carload or L. C. L. shipments, up to the extent of the available space.

It is announced that trains of the Baltimore & Ohio will run to and from the new union station at Washington, D. C., October 26. The Pennsylvania will begin using the station three weeks later.

Near Middletown, N. Y., on Monday last a trestle on the Erie & Jersey Road, a new line under construction, broke down beneath a work train and 20 men were seriously injured, six of them fatally.

It has been informally announced that the tunnel under the East river, New York, from the Battery to Borough Hall, Brooklyn, will be in regular operation by January 1 and to the Long Island Railroad station by May 1.

The Chicago, Rock Island & Pacific Railroad Company has withdrawn its appeal to the Supreme Court of the United States in its controversy with the Territory of Oklahoma over the question of wheat rates.

In Kansas certain railroads have asked permission from the state authorities to collect 3 cents a mile from passengers who board trains without tickets. In Illinois this is permitted by a clause in the 2-cent law passed this year.

At the opening of the present college year, there were 415 freshmen registered in the Sheffield Scientific School of Yale University and 383 in the Academic department. This is the first time that the Sheff. registration has exceeded the Academic.

The Canadian Pacific has made an increase in the pay of telegraph operators of 12½ per cent. The Atchison, Topeka & Santa Fe has increased the pay of telegraph operators an average of 8 per cent., and of apprentices in the shops 20 cents a day.

The Grand Trunk has notified all trainmen that they are to take eight hours rest after 16 hours on the road, under penalty of dismissal. Rather than have trainmen start out without sufficient rest, the company would prefer to omit running that train.

The Lusitania, of the Cunard Line, on her second westbound trip, which was made last week, crossed in 4 days, 19 hrs. and 52 min., having made an average speed of 24 knots per hour. The largest single day's run was 617 knots. Each of these figures beats all previous records.

Conductors of the Chicago, Milwaukee & St. Paul in Wisconsin have received a circular calling attention to the legal liability of conductors who carry passengers, either adults or children, at less than the published rates. Stress is laid on carrying children over 12 years at half-fare rates.

At Jackson, Miss., Judge Potter has fined four railroads $100 each for failing to file with the Railroad Commission reports of the number of passes issued. All of the roads pleaded guilty, though they had not been furnished with blanks by the state; one at least had made a request for blanks but without result.

The State Railroad Commission of Texas has issued to the railroads new rules under which they are to keep their accounts and make their reports to the Commission. The rules, it is said, are so different from those prescribed by the Interstate Commerce Commission that the railroads are going to protest against their enforcement.

In the Federal Court at Kansas City October 11th the Secretary of State of Missouri was enjoined from attempting to forfeit the charter of the Chicago, Milwaukee & St. Paul. The offense of the railroad on which the Secretary proposed to act was that of transferring to the Federal Courts damage suits filed against it in the State Courts.

The telegraph school of the Pennsylvania Railroad at Bedford, Pa., although less than a month old, has already been enlarged to accommodate the increasing number of students. Fifty more instruments have been put in and there is to be a miniature railroad to illustrate the working of the block system. The Erie Railroad has established a telegraph school at Kenton, Ohio, and, according to the newspapers, will continue the practice of clerks now in the employ of the company, who go there to take instruction in telegraphy. The company will also pay their expenses while at school.

Offers of promotion and high wages by the Great Northern and Northern Pacific on new branch lines have led some Burlington firemen and brakemen to seek similar positions with the northwestern roads named. A number of the employees of the Galesburg division have gone west because of a recent change which would compel them to transfer to other divisions.

At Hartford, Conn., Conductor Maroney and Engineman Wilson, who were responsible for the collision near that city June 23, causing the death of ten laborers on a work train, have been convicted on a charge of manslaughter and sentenced each to nine months' imprisonment. At St. Thomas, Ont., October 9, an engineman of the Wabash Railroad was sentenced to six months' imprisonment for causing a fatal accident on that road in August, 1906.

The railroads centering in St. Louis have finally agreed to absorb the bridge toll on the Eads bridge for all freight shipped to St. Louis or East St. Louis from a distance exceeding 100 miles, by whatever conveyance the freight is carried across. That is to say, consignees' or truckmen's wagons hauling freight across the bridge will be relieved of the toll the same as in the case of freight which is carried across in freight cars. The same rule applies to outward freight.

Arthur Hale, Chairman of the American Railway Association Committee on Car Efficiency, has issued Bulletin No. 7, showing surpluses and shortages of freight cars September 18 and October 2. As compared with previous reports, this one shows marked decreases in the surplus and corresponding increases in shortages. The number of roads reporting on October 2 was, however, 23 less than on September 18, so that the difference between these two days is not particularly instructive.

Oren Root, General Manager of the New York City Railway, testifying before the State Public Service Commission concerning the number of cars run on important surface lines in the city, complained of as being insufficient, says it is impossible to get competent motormen. The company is paying higher wages than any other in the East, and yet cannot run all the cars that it desires to. The men are paid overtime and work as long hours as they can. Mr. Root said that he had advertised in the New York and Philadelphia papers for men, with meager results.

An officer of the New York Central, referring to the inquiry now being made by the New York State Public Service Commission concerning freight car service, says that at the New York City Terminals of the New York Central, beginning next month, an increased charge is to be made for the use of cars occupied by produce dealers, who use the cars as distributing depots. Some dealers in vegetables go so far as to live in their cars day and night for a number of days after arrival in New York, peddling out their wares to hucksters who take a small wagon load at a time to sell on the streets of the city. The Central proposes on the fifth and sixth days to charge $3 per car per day; on the seventh and eighth days $4, and thereafter $5.

It developed at the first day of the extended hearing which the Interstate Commerce Commission has begun on the proposed uniform bill of lading that whatever action the Commission may take, the bankers of the country will make a united demand on Congress at its next session to legislate "order" bills of lading into the same class as bills and notes and give them the same legal protection as all negotiable instruments. The long-standing complaint of the banking interests was voiced at the hearing by R. E. L. Marshall and Samuel Williston. They explained with precision to the Commission that the crops of the country are moved each year on loans from the banks on bills of lading which the banks but not the courts regarded as negotiable. The legal uncertainty of such a custom, which has become a commercial necessity, is an evil demanding relief, hence the resolution of the bankers to go to Congress.

Cleveland, Chicago, St. Paul and North Platte, Neb., report serious congestion of freight; and the usual fall rush, in less pronounced form, is reported from many other places. At Cleveland coal dealers and manufacturers are severely hampered in their business because coal cars are so scarce. From Chicago eastward the grain movement is reported so heavy as to greatly interfere with the movement of other commodities. The Union Pacific main line throughout Nebraska is crowded with trains and North Platte merchants had not received a carload of freight for a week. At St.

Paul the congestion is hurting the jobbing interests. The situation is becoming worse than it was a year ago. The building of several hundred miles of branch lines in North Dakota this season, without a corresponding increase in rolling stock, is said to be largely responsible for the present condition. The lines appear to have cars enough, but are deficient in motive power. And to this difficulty is added the strike of machinists from St. Paul to the Pacific coast.

United States Express Company Dividend.

The United States Express Company has declared a semi-annual dividend of 3 per cent. on its $10,000,000 stock, putting it on a 6 per cent. basis. It has heretofore been paying 4 per cent. annually.

Brooklyn Ferry Service to be Abandoned.

The Brooklyn Ferry Company of New York, which went into the hands of a receiver on October 16, 1906, is about to abandon service on its seven lines of ferries across the East river. The property has not yet been sold. The sale under foreclosure was ordered last December and it was then offered to the city for $13,000,000, but the city refused. The company owns five lines, running from the foot of Broadway, Brooklyn, to Roosevelt, 23d, 42d and Grand streets, Manhattan, and from Grand street, Brooklyn, to Grand street, Manhattan. It leases the two lines from Greenpoint avenue, Brooklyn to 10th and 23d streets, Manhattan.

The ferry company at the time of its failure operated 18 boats of its own and leased five, but the competition of the new Williamsburg bridge proved too much for the old ferry service. The company has outstanding $8,500,000 capital stock and $6,500,000 bonds. On August 1, 1906, the company defaulted the interest on the bonds and also certain ferry rentals. A committee of reorganization was formed then, but it now seems that the receiver is convinced that the successful reorganization of the company is impracticable.

Disastrous Derailment at Shrewsbury, England.

A press despatch of Tuesday last reports the derailment of a passenger train while passing over a curve at high speed on the London & North Western, at Shrewsbury, early on the morning of that day, killing ten passengers and six trainmen and mail clerks and injuring a large number of persons. The derailment occurred at a point where the speed limit rule is 10 miles an hour. The engine and all of the cars but one were wrecked.

New Hudson River Steamboat Line.

The New York & Albany Transportation Company has been incorporated to operate a line of freight and passenger steamboats between New York and Albany. The company has bought two boats, one of which is the Saratoga, formerly on the Troy Line. Wharfs have been secured in Albany, and the New York terminal is to be arranged for soon. Both a day and a night service may be started by next April, and perhaps the company will ultimately run lines to Long Island Sound and points on the Atlantic coast.

Short on Theory; Long on Practice.

As a supplement to our report of the convention of railroad commissioners at Washington we copy the following from the *New York Commercial*: "Commissioner Stanton, Montana's representative, sketched the history of Montana, told two or three stories, related thrilling experiences of the early pioneers and toward the conclusion of his speech said a thing or two about railroad regulation. He told the convention frankly that he was a novice at the railroad game.

"'Our board was established seven months ago,' he said. 'We're new at the business out in Montana, but we are doing things; we're short on theory, but long on practice. There was a road out there that refused to run a train. We ordered them to do it. They did. That road,' he continued with a smile, 'won't make any money for years to come.' This statement brought down the house.

"'The pioneers went into Montana in order that their descendants might wear patent leather shoes and ride in automobiles. We intend to see to it that everybody is afforded an opportunity to ride on the steam cars. * * *'"

INTERSTATE COMMERCE COMMISSION RULINGS.

Coal Rates on Burlington Upheld.

The Interstate Commerce Commission, in an opinion by Chairman Knapp, has announced decision in the case of the Albany Produce Co. v. the Chicago, Burlington & Quincy. In their petition complainants alleged that the rate exacted by defendant for transporting coal in carloads from shipping points in the Centerville district, in Iowa, to Albany, Mo., is unreasonable, and is greater than the rate charged for carrying coal in carloads from said shipping points through Albany to St. Joseph, Mo., and that this adjustment of rates subjects complainants and the city of Albany to undue prejudice and gives to the locality of St. Joseph, and coal dealers therein, undue preference.

At the time their complaint was heard defendant's rate on coal from the Centerville district to Albany was $1.25 per net ton, and to St. Joseph 70 cents per net ton, but after the case was submitted defendant voluntarily reduced its rate from the Centerville district to Albany to $1 per ton. The Commission found that so far as shown by the evidence there is no competition between Albany and St. Joseph. St. Joseph ships no coal to Albany, Albany ships no coal to St. Joseph, and neither competes with the other in common territory for the sale of coal. Albany is not in reality interested in the rates to St. Joseph except as they afford a basis of comparison. The Commission declared that there is practically nothing in the record to warrant a finding that the $1.25 rate was unreasonable in itself, or that the present rate of $1 is excessive. It also held that it is equally evident that the charge of unjust discrimination has not been established. The case presented by the record did not indicate the violation of any provision of the law and the complaint was therefore dismissed.

An Unsupported Complaint from Dallas.

The Commission, in an opinion rendered by Commissioner Harlan, has announced its decision in the case of the Dallas Freight Bureau against the Missouri, Kansas & Texas and others. The complaint involved rates on agricultural implements, axes, pig iron, whisky and other commodities from St. Louis to Dallas. Complaint was also made of the rates on sugar, molasses and glucose from New Orleans to Dallas. The Commission held that the record disclosed no sufficient basis for an order, and the complaint was dismissed without prejudice; and it was further decided that: the Commission is authorized under the act to order a reduction in rates only when upon complaint made it is of the opinion that such rates are unjust, or unreasonable, or unjustly discriminatory, or unduly preferential; complainants must therefore prove the issues that they raise or make out a prima facie case sufficiently clear and strong to require the Commission in the public interest to enter upon an investigation of its own motion. Neither of these requirements is satisfied by a comparison, without any other showing, of the rates complained of, from St. Louis to Dallas, with rates between points in other and distant localities where different physical, competitive and traffic conditions exist. Shippers have ample opportunity for personally laying their troubles before the Commission and thus showing the actual results of the rates complained of upon their business. In this case no person interested in such rates appeared as a witness, and the only testimony offered was that of the secretary of a freight bureau having no personal knowledge of the effect of the rates upon the merchants dealing in the commodities involved and whose testimony is limited to a comparison of the rates attacked with rates on the same commodities for equal distances in other parts of the country, where the traffic is much more dense.

Commissioner Clements did not concur in the conclusions of the Commission.

MANUFACTURING AND BUSINESS.

The Fort Pitt Bridge Works, Pittsburgh, Pa., has opened an office in Chicago with A. R. Young, C.E., in charge. He is located in the Fisher building.

The Duff Manufacturing Company, Pittsburgh, Pa., has an order from the South Manchurian Railroad for 450 Duff ball-bearing screw jacks of 35-lbs. capacity.

The Washington Terminal Co. has ordered, for use in its new shops just built in Washington, a large number of double and single swivel vises from The Pittsburgh Automatic Vise & Tool Co., Pittsburgh, Pa.

The Central Inspection Bureau, New York, is inspecting a number of electric double-truck passenger and express cars for the Buffalo, Lockport & Rochester at the works of the Niles Car & Manufacturing Co., Niles, Ohio.

The Cutler-Hammer Manufacturing Co., Milwaukee, Wis., which some months ago bought the Wirt Electric Co. of Philadelphia, has consolidated that business with its New York plant at Park avenue and 130th street, where the manufacture of Wirt apparatus will be continued.

The Central Inspection Bureau, New York, has just finished inspecting a large number of flat bottom gondola cars for the Newburg & South Shore at the works of the Pressed Steel Car Co. The bureau has a contract with the Emlenton Refining Company for inspecting a number of tank cars at this same plant.

The Marion Steam Shovel Company, Marion, Ohio, is now turn-

ing out about 30 shovels a month. A few months ago the company made its first contract with the Isthmian Canal Commission, and it has now submitted to the commission bids for some 100-ton shovels for which contracts have not as yet been awarded.

G. L. L. Davis has resigned as General Sales Agent of the General Castings Co., Verona, Pa., to become General Sales Agent of the U. S. Metal & Manufacturing Co., 25 Broad street, New York City. Mr. Davis has been identified with the railroad supply business for a number of years.

Charles Hansel & Co., 43 Wall street, New York, have been engaged by the North Platte & Encampment Canal Co. to make the surveys, plans and estimates and to take charge of the building of a canal for irrigating 93,000 acres of land extending from Saratoga, Wyo., south to the Colorado state line. The canal is to have a capacity of 1,000 cu. ft. per second. A hydro-electric plant will also be built.

Dr. E. Rosenberg, whose book "Electrical Engineering" was reviewed in the *Railroad Gazette* of September 27, is no longer Chief Electrical Engineer for Körting Bros., Hanover, Germany. He is now an Electrical Consulting Engineer, with an office at Kirchstrasse 5, Berlin, N. W. Dr. Rosenberg has had long experience in large electrical manufacturing works and is particularly well-known for the Rosenberg direct current and train lighting generators, several hundred of which are in operation in Europe and Asiatic Turkey.

S. J. Bowling, Manager of the railroad and steamship department of The Philip Carey Manufacturing Co., Lockland, Cincinnati, Ohio, has moved into new offices at 1327 Majestic building, Detroit, Mich. The company is carrying out its contract for pipe covering at the new Washington Union Station, where it will apply about $75,000 worth of 85 per cent. magnesia covering. It has just finished a contract for the St. Louis & San Francisco for flexible cement roofing and is now applying about 20 carloads of roofing at the National Tube Company's plant at McKeesport, Pa.

The Pilling Air Engine Co., Detroit, Mich., maker of pneumatic hoists, locomotive turntable motors and compressed air hoisting machinery, will change its name to the Detroit Hoist & Machine Co., a new corporation with $50,000 paid up capital stock. The old company will still exist with a nominal capital to protect the name and good will. Both companies will be controlled by the same management. The new plant is in operation. Other improvements will be added in the near future, provision for same having been made by buying three acres of ground on the Grand Trunk at Milwaukee Junction, one of the best shipping points in Detroit.

The More-Jones Brass & Metal Co., St. Louis, Mo., has patented a new process for making bronze and brass bearings. No sand is used in this method, so the danger of grit is avoided. The bearings are cast in composition metallic molds, so made as to avoid cold shot and keep the metal thoroughly mixed. Part of the floating top is drawn off to take away impurities that might be in the metal and to leave the bearing of uniform heat, thus avoiding shrinkage and producing a uniform material. Comparative tests show the material when cast by this process to be 30 to 50 per cent. stronger in both cross-breaking and compression strength, varying with the difference in composition. The specific gravity of the metal is 5 per cent. greater. It is claimed that the bearings cast in the patented process show 40 to 50 per cent. less wear on the metal and the shaft. The cost of manufacture is not larger than formerly.

Iron and Steel.

The Wisconsin & Northern has given an order for 5,000 tons of rails.

The Terminal Railroad Association of St. Louis has ordered 2,500 tons of rails.

The American Bridge Company has an order for 1,000 tons of steel from an electric line for a bridge over the Youghiogeny river.

The Atchison, Topeka & Santa Fe, it is reported, has ordered a large quantity of rails from the Colorado Fuel & Iron Company; also 6,000 tons from the Illinois Steel Company.

OBITUARY NOTICES.

Colonel F. St. J. Lockwood, President of the Danbury & Norwalk, which owns the road operated as the Danbury branch of the New York, New Haven & Hartford, died on October 12 at the age of 82.

Alexander M. Fox, a Director of the Pennsylvania, died at Philadelphia last week. Mr. Fox was 83 years old. He was the oldest Director of the company and was first elected to that office to represent the city of Philadelphia's interest in the road.

Albert C. Murdock, Division Engineer on the Pacific extension of the Chicago, Milwaukee & St. Paul at Ellensburg, Wash., died suddenly on October 6. Mr. Murdock was 37 years old. Before going to the St. Paul a year ago, he was locating engineer on the Northern Pacific at Tacoma, Wash.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad conventions and engineering societies, etc., see advertising page 24.)

American Society of Civil Engineers.

At the meeting of this society, October 16, a paper was presented on the Bracing of Trenches and Tunnels, with Formulas for Earth Pressures, illustrated with lantern slides, by J. C. Meem. This paper was printed in the *Proceedings* for August, 1907.

American Society of Mechanical Engineers.

At the meeting of this society November 12, the principal address will be made by Charles R. Pratt on the Gearless Traction Electric Elevator, which is being installed in the Singer and Metropolitan Life, New York's two highest buildings. The paper will be discussed by engineers and architects from New York, Philadelphia and Chicago, and members of all professions are invited to attend.

American Railway Association.

A special meeting of this Association will be held at the Waldorf-Astoria Hotel, New York City, October 30, to take the place of the regular session appointed to be held at Norfolk October 23. All business intended to be taken up at the regular fall session will be considered at New York. Reports will be presented by the Executive Committee and the Committees on Train Rules, on Car Service, on Safety Appliances, on Signals, on Statistical Inquiry, on Standard Cipher Code, on Transportation of Explosives, on Standard Rail and Wheel Sections, on Standard Location for Third Rail Working Conductors, and on Car Efficiency. A First Vice-President will be elected.

General Passenger Agents.

The American Association of General Passenger and Ticket Agents held its 52d annual convention at Washington beginning on Tuesday of this week. The feature of the first session was an address by President W. W. Finley, of the Southern Railway. Mr. Finley characterized the demand for increased passenger service at decreased prices as a "hysterical wave of political agitation." The absence of complaints of high passenger rates in specific cases, especially when the public had been provided with federal and state commissions to receive such complaints, Mr. Finley regarded as significant. The convention began its business with a lively discussion of what was universally denounced as the inferior quality of ticket paper now in general use.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Albany & Susquehanna.—Henry E. Cooper has been elected a Director, succeeding J. H. Rhoades, deceased.

Arkansas, Louisiana & Gulf.—Officers of this company, which is building from Monroe, La., to Hamburg, Ark., 57 miles, are as follows: Chief Engineer, E. T. Bond, with office at Bastrop, La.; Superintendent, W. J. Hillyer, with office at Monroe; Auditor, L. E. Smart, with office at Monroe, and Assistant Auditor, V. G. Savage.

Atlanta, Birmingham & Atlantic.—H. M. Atkinson, President, has been appointed also General Manager, succeeding to some of the duties of G. D. Wadley, who remains Second Vice-President in charge of construction.

Boston & Maine.—Henry M. Whitney has resigned from the Board of Directors.

W. T. Roden has been appointed Auditor of Disbursements.

Central of Georgia.—C. E. James, Chattanooga, Tenn., and R. E. Steiner, Montgomery, Ala., have been elected Directors.

Chicago, Indianapolis & Louisville.—The authority of the general officers has been extended over the Indianapolis & Louisville, which is an extension recently opened for traffic from Wallace Junction, Ind., to Shirley Hill, 55 miles.

Delaware & Eastern.—J. L. Greatsinger and J. W. Griggs have been elected Directors, the Board being increased from 12 to 14 members.

Delaware & Hudson.—L. H. Stewart, Comptroller, has resigned on account of ill health. Mr. Stewart has been with the Delaware & Hudson for 33 years. W. H. Davies, Assistant Comptroller, is in charge of Mr. Stewart's duties for the present.

Grand Trunk Western.—W. G. Brownlee, General Transportation Manager of the Grand Trunk, has been elected a Director of the Grand Trunk Western.

Indianapolis & Louisville.—See Chicago, Indianapolis & Louisville.

Panama Railroad.—H. J. Slifer, formerly General Superintendent of the Central district of the Chicago, Rock Island & Pacific, and more recently Consulting Engineer in New York, has been appointed Assistant to the President of the Panama Railroad, with office at Colon.

Union Pacific.—William Mahl, Comptroller, has been elected a Director, succeeding David Willcox, deceased.

Western Maryland.—Edwin Gould has been elected a Director, succeeding James H. Hyde.

Operating Officers.

Arkansas, Louisiana & Gulf.—See this company under Executive, Financial and Legal Officers.

Chicago & North-Western.—L. W. Easterly, Trainmaster at Boone, Iowa, has been appointed Trainmaster at Council Bluffs, Iowa. P. W. Alshton, Trainmaster at Eagle Grove, Iowa, succeeds Mr. Easterly. S. A. Morrison, Trainmaster at Chicago, has been appointed to the new office of Trainmaster at Clinton, Iowa. J. G. Cowan, Trainmaster of the Peoria division, succeeds Mr. Morrison. A. L. Crabbs, chief despatcher of the Galena division, succeeds Mr. Cowan, with office at Chicago.

Cincinnati, New Orleans & Texas Pacific.—Warren S. Andrews, who was recently appointed General Superintendent of Transportation, was born at Salem, Ill., in 1865. After leaving high school in 1882 he began railroad work as a messenger boy on the Illinois Central. The next year he went to the Ohio & Mississippi, now part of the Baltimore & Ohio Southwestern, as an operator, and was later made train despatcher. In 1886 he was made a train despatcher on the Great Northern, and in 1893 returned to the Illinois Central as train despatcher. Six years later he was made Trainmaster on this road at Champaign, Ill., and was then later transferred to Carbondale. In 1902 he went to the Southern, where he served as Trainmaster at Charlotte, N. C., and later as Assistant Superintendent at Alexandria, Va., and at Greensboro, N. C. He was appointed Superintendent of the Washington division of this road in the fall of 1903, and in 1905 was transferred to the Danville division. Last winter he was appointed Assistant to the General Manager of the Cincinnati, New Orleans & Texas Pacific, where he remained until his recent promotion.

W. S. Andrews.

Grand Trunk.—David Crombie, who was recently appointed assistant to the general transportation manager, was born at Hamilton, Ont., in 1864. After a high school education he began railroad work in 1882 as a telegraph operator on the Grand Trunk. He later became train despatcher and in 1890 went to the Flint & Pere Marquette, now part of the Pere Marquette, as train despatcher and car distributor. Four years later he was appointed car service agent and then Superintendent of Car Service on this road. In 1900 he was appointed Superintendent of Transportation of the Pere Marquette and three years later went into private business at Chatham, Ont. In 1907 he returned to railroad work as Master of Transportation of the Grand Trunk at London, Ont., which position he held until his recent promotion.

H. E. Whittenberger, who was recently appointed Superintendent of the Grand Trunk at Montreal, Que., was born in 1864 at Peru, Ind. He began railroad work in 1885 on the Wabash. In 1897 he was made Trainmaster of the Middle division of the Grand Trunk, and in 1902 went to the Denver & Rio Grande as Superintendent. In 1904 he was appointed Superintendent of the Cincinnati, Hamilton & Dayton, and in 1906 went to the Kansas City Southern as Superintendent, where he remained until his recent appointment.

Missouri, Oklahoma & Gulf.—E. B. Fisher has been appointed General Superintendent, with office at Muskogee, Ind. T., succeeding A. N. Leitnaker.

Mobile, Jackson & Kansas City.—A. F. Church has been appointed Superintendent at Laurel, Miss., succeeding J. D. Patterson, resigned to go to the Southern.

New York, New Haven & Hartford.—O. M. Shepard, who was recently appointed Assistant to Vice-President John F. Stevens, was born at Cleveland, Ohio, in 1842. His first railroad work was in the United States government military telegraph and railroad service, which he entered in 1863. After becoming Superintendent of Telegraph he was, in 1870, appointed Master of Transportation and later Assistant Superintendent of the Gilman, Clinton & Springfield, now part of the Illinois Central. In 1874 he was made Assistant General Superintendent of the St. Louis & Southeastern, now part of the Louisville & Nashville, and six years later was made Superintendent of the New York & New England, now part of the New York, New Haven & Hartford. In 1882 he was made Division Superintendent on the New York, New Haven & Hartford, and was later made Assistant to the President. In 1886 he was appointed General Superintendent, and in 1890, the mileage of the system being much greater, was made Superintendent of the New York division and his former office was abolished. In 1903 he was again appointed General Superintendent, where he remained until his recent appointment.

O. M. Shepard.

Philadelphia & Reading.—B. H. Bowman, Assistant Trainmaster at Harrisburg, Pa., has been appointed Assistant Trainmaster at Rutherford, Pa., succeeding G. O. Sarvis, resigned.

Texas & Pacific.—W. G. Mason, Superintendent of the Avoyelles division, has been appointed Superintendent of the Louisiana division, with office at Bunkie, La., having charge also of the line from Eunice to Bunkie, built by the Louisiana, East and West, and which was to be part of the Avoyelles division.

Traffic Officers.

Chicago & North-Western.—H. G. Graves has been appointed General Baggage Agent, succeeding F. D. Taylor, assigned to other duties.

Wheeling & Lake Erie.—S. P. Woodside has been appointed to the new office of Assistant General Freight Agent at Pittsburg, Pa.

Engineering and Rolling Stock Officers.

Arkansas, Louisiana & Gulf.—See this company under Executive, Financial and Legal Officers.

Bangor & Aroostook.—Orlando Stewart, who recently retired as Superintendent of Motive Power and Equipment, is 74 years old. He was born at St. Albans, Me., and after a common school education began railroad work in 1847 as an apprentice on the Boston & Maine. After three years he went to the Erie as a gang boss. In 1853 he went to the Bellefontaine & Indiana, now part of the Cleveland, Cincinnati, Chicago & St. Louis, as shop foreman, and in 1856 returned to the East as a locomotive engineer on the Boston & Lowell, now operated by the Boston & Maine. In 1863 he was appointed general foreman of the United States government shops at Chattanooga, Tenn. He returned to his former position on the Boston & Lowell in 1866. In 1882 he went to the New York, Providence

Orlando Stewart.

& Boston, now a part of the New York, New Haven & Hartford, as Assistant Master Mechanic, and two years later was appointed Superintendent of Motive Power of the Fitchburg. He has been Superintendent of Motive Power and Equipment of the Bangor & Aroostook since 1894. Mr. Stewart is now living at 75 Wallingford Road, Brighton, Mass.

Boston & Albany.—E. E. Stone, Assistant Chief Engineer, has been appointed to the new office of Engineer of Maintenance of Way.

Buffalo, Rochester & Pittsburg.—J. M. Floesch, Chief Engineer, has resigned to go to a construction company at work on the Grand Trunk Pacific.

Union Pacific.—E. F. Fay, general foreman at Omaha, Neb., has been appointed Master Mechanic at Denver, Colo.

LOCOMOTIVE BUILDING.

The Chicago, Milwaukee & St. Paul is said to be figuring on 50 Mikado (4-8-4) locomotives to be built at its West Milwaukee shops.

The Due West Railway, Due West, S. C., which was reported in our advance sheet of October 2 as being in the market for locomotives, has bought second-hand locomotives from Joseph E. Bowen, Norfolk, Va.

The New York Central Lines, as reported in the *Railroad Gazette* of September 27, have ordered 20 ten-wheel locomotives, 99 consolidation locomotives, 60 Pacific locomotives, one 10-wheel switching and 10 six-wheel switching locomotives from the American Locomotive Company. The specifications are as follows:

General Dimensions.

Type of locomotive	10-Wheel.	Consolidation.	Pacific.	10 wheel Switching.	6-wheel Switching.
Weight, total, lbs.	202,000	234,000	261,000	270,000	157,000
On drivers, lbs.	156,000	208,000	171,000	270,000	157,000
Cylinders	22 x 26 in.	23 x 32 in.	22 x 28 in.	24 x 28 in.	21 x 28 in.
Diam. of drivers, in.	69	63	79	52	57
Boiler, type	Rad. stay; Ex. w.-top.	Rad. stay; Strght top	Rad. stay; Ex. w.-top.	Rad. stay; Ex. w.-top.	Rad. stay; Strght top
Workg stm pres	200 lbs.	200 lbs.	200 lbs.	210 lbs.	180 lbs.
Tubes, No.	400	444	379	447	308
Tubes, diameter	2 in.	2 in.	2 in.	2 in.	2 in.
Tubes, length	14 ft. 11 in.	15 ft. ½ in.	20 ft.	19 ft.	11 ft. 6 in.
Firebox, length	105⅛ in.	108$^1/_{16}$ in.	108⅝ in.	109 in.	72⅛ in.
Firebox width	75¼ in.	75¼ in.	75¼ in.	74 in.	65¼ in.
Grate area, sq. ft.	54.93	56.47	56.4	55.4	32.7
Htg. sur., total, sq. ft.	3,327.0	....	4,194.0	4,645.3	2,696.0
Water capacity, gals.	7,000	7,500	8,000	8,000	5,100
Coal capacity	12 tons.	12 tons.	14 tons.	12 tons.	7½ tons.

The San Antonio & Aransas Pass, which was reported as in the market in the *Railroad Gazette* of July 26, has ordered eight simple Pacific oil burning locomotives from the Baldwin Locomotive Works for January, 1908, delivery.

General Dimensions.

Type of locomotive	Pacific
Weight, total	127,000 lbs.
Weight on drivers	96,000 "
Diameter of drivers	62 in.
Cylinders	19 in. x 24 "
Boiler, type	Wagon top
" working steam pressure	180 lbs.
" number of tubes	230
" material of tubes	Charcoal iron
" diameter of tubes	2 in.
" length of tubes	13 ft. 1¾ in.
Firebox, length	71⅝ "
" width	34¼ "
" material	Otis steel
" grate area	17 sq. ft.
Heating surface, total	1,715 "
Tank capacity, for water	5,000 gals.
Oil capacity	1,800 gals.

Special Equipment.

Air brakes	Westinghouse
Axles	Baldwin specifications
Boiler lagging	Keasbey & Mattison
Brake-beams	Carnegie
Couplers	Janney
Headlights	Pyle National electric
Injector	Nathan
Journal bearings	Ajax bronze
Piston rod packings	Jerome metallic
Valve rod packings	Jerome metallic
Safety valve	Crosby
Sanding devices	Leach
Sight-feed lubricators	Nathan
Springs	Standard Steel Works
Tires, driving wheels	Midvale

The Delaware & Hudson has ordered 30 simple consolidation locomotives from the American Locomotive Company.

General Dimensions.

Weight on drivers	220,800 lbs.
Weight, total	250,000 "
Cylinders	23 in. x 30 in.
Diameter of drivers	57 "
Boiler, type	Wooten, wide firebox
" working steam pressure	210 lbs.
" heating surface, total	3,968 sq. ft.
" tubes, number	493
" tubes, material	Spellerized steel
" tubes outside diameter	2 in.
" tubes length	14 ft. 6 "
Firebox, length	126¼ "
" width	114 "
" maker	Worth Bros.
Grate area	99.85 sq. ft.
Tank capacity	7,800 gals.
Coal capacity	14 tons

Special Equipment.

Air brakes	Westinghouse
Axles	Cunningham treated
Bell ringer	Sansom
Boiler lagging	Keasbey & Mattison
Brake beams	Simplex
Brake shoes	Engine, Perfecto
Brake shoes	Tender, Diamond "S"
Couplers	Climax
Headlights	Dressel
Injector	Hancock
Piston rod packings	Trojan
Valve rod packings	Trojan
Safety valve	Consolidated
Sanding devices	Hanlon pneumatic
Sight feed lubricators	Nathan and Ohio triple sight feed
Springs	Railway Steel Spring
Steam gages	Ashcroft
Tires, driving wheels	Midvale
Valve gear	Walschaert
Fire door flange	O'Connor
Draft gear	For 5 engines, tandem radial, Commonwealth Steel Co. For 25 engines, Miner
Side bearings	Miner gravity
Bumper beam front	Commonwealth Steel Co.
End sills, tenders	For 5 engines, Commonwealth Steel Co.
Centering device	For 25 engines, U. S. Metal & Mfg. Co.

CAR BUILDING.

The Tehuantepec National is in the market for cars.

The Harriman Lines have ordered 25 or more passenger cars.

The Pennsylvania is said to be figuring on additional steel cars.

The Manistee & Northeastern will build 20 flat cars at its own shops.

The Wabash, it is said, is contemplating the purchase of new equipment.

The Erie is said to be building 50 cabooses at its Buffalo and Kent shops.

The South & Western, it is said, has ordered 100 cars from the Pressed Steel Car Co.

The Idaho & Washington Northern has ordered four cabooses from the Pullman Co.

The Central of New Jersey has ordered 25 passenger cars from Harlan & Hollingsworth.

The Long Island has ordered 50 passenger cars from the American Car & Foundry Company.

The Wabash denies that it is considering buying new equipment, as reported in our advance sheet of October 9.

The Mexican Central denies that it intends to buy any all-steel passenger coaches, as reported in the *Railroad Gazette* of October 4.

J. S. Clarke, Chairman of the Public Works Committee, Calgary, Alb., is asking bids until November 1 on six semi-convertible street cars.

The Producers Tank Line Company, Louisville, Ky., has ordered 20 tank cars of 80,000 lbs. capacity from the McGuire-Cummings Company.

The Goodwin Manufacturing Company, St. Louis, has ordered 20 tank cars of 80,000 lbs. capacity from the McGuire-Cummings Company.

The Atchison, Topeka & Santa Fe has ordered one hundred 40-ft. refrigerator cars of 60,000 lbs. capacity from the American Car & Foundry Company.

The Due West Railway, Due West, S. C., which was reported in our advance sheet of October 2 as being in the market for cars, has bought second-hand cars from Joseph E. Bowen, Norfolk, Va.

The Louisville & Nashville, as reported in our advance sheet of October 9, will build one hundred 40-ft. refrigerator cars of 50,000 lbs. capacity at its New Decatur, Ala., shops during the first six months of 1908.

The Union Pacific has ordered 250 Hart convertible steel cars of 100,000 lbs. capacity from the Rodger Ballast Car Co. to be built by the American Car & Foundry Co. Delivery to begin December 15. These cars will weigh 43,000 lbs. and will measure 41 ft. 6 in. long, over all. The special equipment includes:

Bolsters	Truck, Simplex; Body, Commonwealth
Brake beams	Damascus
Brake shoes	American Brake-Shoe & Foundry Co.
Brasses	Hewitt
Couplers	Climax
Draft rigging	Miner
Journal boxes	McCord
Springs	Railway Steel-Spring
Trucks	Andrews side truck frames
Wheels	American Car & Foundry Co.

The Sterling Coal Company, Philadelphia, Pa., has ordered 250 steel coal cars of 100,000 lbs. capacity from the Cambria Steel Company. These cars will measure 32 ft. 3 in. long, over end sills; 10 ft.

1⅜ in. wide, over all, and 10 ft. high, over all; 30 ft. 5 in. long, 9 ft. 6 in. wide and 6 ft. 3⅞ in. high, inside measurements. These measurements are in accordance with Pennsylvania Railroad specifications for standard, class "G1a" gondolas, and the special equipment will also be in accordance with these specifications.

The San Antonio & Aransas Pass, as reported in the *Railroad Gazette* of September 20, has ordered six passenger coaches from the Pullman Company for January, 1908, delivery. These coaches will measure 60 ft. long, 9 ft. 8 in. wide and 14 ft. 1½ in. high, inside measurements. The special equipment includes:

Bolsters	Commonwealth
Brake-beams	Carnegie
Brake-shoes	Lappin
Brakes	Westinghouse
Couplers	Janney
Curtain fixtures	Forsyth
Curtain material	Pantasote
Door fastenings	Pullman standard
Journal boxes	Symington
Light	Pintsch
Paint	Murphy Varnish Co.
Platforms	Standard Steel
Roofs	S. A. & A. P. standard
Springs	Standard Steel Works
Trucks	S. A. & A. P. standard

The New York, Ontario & Western, as reported in our advance sheet of October 5, is in the market for 10 passenger cars. These cars will measure 64 ft. long, over end sills; 10 ft. wide, over side sills, and 14 ft. 3½ in. from rail to top of upper deck. Bodies and underframes will be of wood. The special equipment includes:

Bolsters	New York, Ontario & Western standard
Brake-beams	National Hollow or Simplex
Brake-shoes	American Brake Shoe & Foundry Co.
Brakes	Westinghouse
Brasses	Brady
Couplers	Gould
Curtain fixtures	National
Curtain material	Texoderm
Draft rigging	Gould
Heating system	Not yet decided
Light	Safety Car Heating & Lighting, vapor system
Paint	Sherwin-Williams
Platforms	Gould, with Fillon traps
Springs	Railway Steel-Spring
Trucks	New York, Ontario & Western standard
Vestibules	Gould
Wheels	McKee-Fuller

RAILROAD STRUCTURES.

Altoona, Pa.—The Pennsylvania, it is said, has bought 250 acres of land for new shops and for extending its yards in the vicinity of Altoona. Reports say that officials of the company admit that extensions to the shops at Altoona, and at points on the Pitsburgh division are planned, but deny that definite action has been taken.

Amarillo, Tex.—Land, it is said, has been bought by the Pecos Valley & Northeastern as a site for shops, also for a roundhouse.

Chicago, Ill.—The Baltimore & Ohio is said to be buying land as a site for a new freight terminal at Van Buren and Jefferson streets.

Cincinnati, Ohio.—Action will soon be taken by the City Council on the proposition to issue $298,000 of bonds as its share of the cost of a viaduct to be built over the Baltimore & Ohio Southwestern tracks. The railroad to pay $158,000.

Girsland, La.—The Louisiana & North West is planning to put up a two-story freighthouse on the present site of its shops, and to put up a new foundry and machine shop in another location.

Jersey City, N. J.—Contracts are reported let by the Erie to Mullen & McDermott for the sub-structure and to the American Bridge Company for the superstructure of a bridge to be built over the Hackensack river. The work will involve the construction of about four miles of new double-track on the Newark and Greenwood Lake lines, and is expected to be finished by July of next year.

Long Island City, N. Y.—Plans are reported made for the main terminal building of the Belmont tunnel (New York & Long Island). The proposed building is to be six stories high and 150 ft. x 175 ft.

Milwaukee, Wis.—A resolution has been introduced providing for the elimination of 12 grade crossings on the Northern division of the Chicago, Milwaukee & St. Paul. The cost of the work will be between $750,000 and $1,000,000.

New York, N. Y.—The East 14th street car barns were recently damaged by fire; loss about $400,000.

Renfrew, Ont.—Surveyors are at work locating a site for a new freight shed and sidings for the Canadian Pacific here.

Rockport, Ind.—Surveys are being made to locate the site of the proposed bridge to be built over the Ohio river here.

Rossiter Junction, Pa.—Contracts are reported let to James K Long & Son for putting up a passenger station here, and to Adams & Neal for the masonry work. The building is to be used jointly by the Pennsylvania and the New York Central.

Valley Grove, W. Va.—The Baltimore & Ohio has engineers at work on plans to put in concrete walls at various points to protect the tracks from high water. The first part of this work to be carried out will be at Valley Grove, where a wall 600 ft. long is to be built. After completion of this section the work will be continued at other points.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

Annapolis, Washington & Baltimore.—See Washington, Baltimore & Annapolis.

Atlanta, Birmingham & Atlantic.—President H. M. Atkinson, of this company, is quoted as saying that the Alabama division will be in operation this month west to Talladega. The Atlanta branch is to be finished about December 1, when trains will be run from Atlanta to Brunswick. By July of next year it is expected to have all the extensions finished and the entire line in operation from Brunswick, Ga., to Birmingham, Ala.

Bartlesville Interurban.—Contracts are reported let for building this proposed line from Bartlesville, Okla., north to Dewey, four miles. J. J. Carl, President, Bartlesville, Ind. T.

Beaumont & Great Northern.—This road, which operates a line from Trinity, Tex., east to Livingston, 30 miles, is said to be planning to build an extension from Livingston southeast to Beaumont, 60 miles.

Boston & Albany.—Assistant General Manager Hustis in a newspaper statement says that about 26 miles of new third main track will be ready for use this winter, and that nine miles more has been authorized. The four-track section will be extended from Lake Crossing, Mass., westward to South Framingham. The sections of the new third track are between East Chatham and Richmond Furnace; Pittsfield and Dalton, and South Spencer and Charlton. Contractors are being engaged for the construction of a section from Rensselaer to Van Hoesen.

Calgary (Alb.) Street Railway.—Bids are wanted November 1 by S. J. Clarke, Chairman of Public Works committee, for building 12 miles of line, also the overhead line work, and a steel bridge with concrete abutments over the Elbow river.

California Northeastern.—See Southern Pacific.

Canadian Pacific.—Application, it is said, will be made by this company to Parliament at its next meeting for authority to build a branch from Killam, Alb., in township 44, ranges 13 and 14, west of the fourth meridian, northwest to Strathcona, about 80 miles.

Carolina & Tennessee Southern.—See Southern.

Colorado Roads.—Funds, it is said, have been secured by H. Larson and associates, of Rawlins, Wyo., to build a line from Steamboat Springs, Colo., north via Rawlins, on the Union Pacific, thence northwest to Lander, on the Chicago & North-Western, 225 miles.

Denver & Rio Grande.—Local reports say that surveys are under way for a line from Chama, N. Mex., southeast to a junction with the present Santa Fe-Antonito line at Servilleta, 60 miles.

Ensley Southern.—See Southern.

Fairmont & Southern.—Bids, it is said, will soon be asked for building this line, projected from Bellington, W. Va., north to Pittsburgh, Pa., 125 miles. (Sept. 20, p. 339.)

Grand Trunk Pacific.—Considerable progress is being made by this company on the main line west of Winnipeg. Treat & Johnston, who have the contract between Winnipeg and Portage la Prairie, 56 miles, will have the greater part of this work under way before winter, and expect to finish the grading about a month after the commencement of work next spring. McDonald & McMillan, who have the contract from Portage la Prairie west to Touchwood Hills, expect to have the work finished this month. Track has been laid from Portage la Prairie west for about 200 miles. It is said that the line will not be finished to Saskatoon this fall as the Canadian White Company will not finish the grading on its contract between Touchwood Hills and Saskatoon, 140 miles, for at least two months after the commencement of work next spring. Foley, Larsen & Co., who have the work from Saskatoon to Edmonton, 350 miles, have grading finished from Saskatoon west for 200 miles, and expect to have all the work finished next fall in time to move the 1908 grain crop from that section. The National-Transcontinental Railway Commission is said to expect that the contractors building the sections from Winnipeg east to Moncton, N. B., 660 miles, will carry on work all winter. It is estimated that 18,000 men are now at work on these contracts, and on the western section between Winnipeg and the Pacific coast and other railroad construction in this section about 20,000 men are at work.

Contracts, it is said, will shortly be let by this company for building 200 miles of main line from Edmonton, Alb., west.

Gulf, Beaumont & Great Northern.—See Gulf, Colorado & Santa Fe.

Gulf, Beaumont & Kansas City.—See Gulf, Colorado & Santa Fe.

Gulf, Colorado & Santa Fe.—This company has filed an amendment to its charter in accordance with the law passed by the last Legislature authorizing it to absorb and operate the Gulf, Beaumont & Kansas City, the Gulf, Beaumont & Great Northern, and the Texas & Gulf railroads, and to build an extension of the Gulf, Beaumont & Kansas City from Center, Tex., its present northern terminus northwest to Timpson, where connection is to be made with the Texas & Gulf. The latter is also to be extended north from Longview to a point on the Red river, about 125 miles. (April 19, p. 565.)

Gulf Short Line.—Incorporated in Oklahoma with $36,000,000 capital to build a line from Kansas City, Mo., southwest via Olathe, Ottawa, Emporia, Marion, McPherson and Hutchinson, Kan., thence through Oklahoma and Texas to Port Lavaca, Tex., on Matagorda bay, 1,500 miles, including branches in Kansas. The incorporators include: C. F. Bridge and T. Ragsdale, of Topeka, Kan.; L. E. Potts and J. P. Byrne, of Oklahoma City, and F. A. Jerran, of La Junta.

Jasper-French Lick Extension.—See Southern.

Memphis & Chattanooga.—See Southern.

Missouri, Kansas & Texas.—Reports are again being revived that this company will extend its Trinity-Colmesnell line from Colmesnell northeast to Shreveport, La., 125 miles.

New York & Long Island.—The south tube of the tunnel under the East river has been finished by the Degnon Construction Company and turned over to the railroad, which will equip it for operation. The north tube was turned over by the builders some time ago.

New York Subways.—The New York State Public Service Commission has approved the project to build the "Fourth avenue subway" in the Borough of Brooklyn, and bids for the work will be asked for shortly. The estimated cost is $25,000,000. (June 7, p. 819.)

North & South Texas.—This company, which is building from Lufkin, Tex., southwest to Groveton, 31 miles, it is said, has plans made for its proposed line south to Houston, about 90 miles. (July 5, p. 27.)

Oklahoma City (Electric).—This company, operating 30 miles of electric lines in Oklahoma City and suburbs, and which is building an extension to connect with the lines it owns at Guthrie, has changed its name to the Oklahoma Railway Company. The capital stock has been increased from $1,000,000 to $3,000,000 and the revised charter provides for operating lines to include Guthrie, Norman, Yukon, Oklahoma and Spencer or Choctaw City. The directors are: A. H. Classen, J. W. Shartel, H. M. Brauer, E. W. Cooke, G. H. Brauer, G. W. Ford and J. M. Owen, all of Oklahoma City.

Oklahoma Railway.—See Oklahoma City.

Okolona-Big Creek.—See Southern.

Opelousas, Gulf & Northeastern.—See Texas & Pacific.

Philadelphia Subway Terminal.—Incorporated in Pennsylvania to build a six-track subway under North Broad street from the city hall to the northern limit of the city near Clearfield street, about four miles. The plans include an extension north for a four-track subway to Olney avenue. George W. Goddard, President; M. Harris and C. Willing are also interested in the project.

St. Louis Southwestern.—Announcement is made that this company has plans ready for freight terminal improvements at Fort Worth, Tex., to cost about $500,000. A new main track is to be laid between Fort Worth and North Fort Worth; yard facilities are to be enlarged and a new steel and concrete bridge built across the Trinity river at that place.

Southern.—The report of this company for the year ended June 30, 1907, shows that double-track work and revision of grades and curvature was finished during the year on 206.81 miles. On the completion of about 85 miles more second-track will be laid from Orange, Va., to Charlotte, N. C.; between Clinton, Tenn., and Knoxville, and between Asheville, N. C., and Morristown, Tenn. During the year second-track has been laid between Pomona and Highpoint, 11.9 miles; between Highpoint and Spencer, 32.3 miles. This provides double-track between Goldsboro, N. C., and Spencer. Work is under way between Winesap, Va., and Sycamore, and grading is about finished between Durmid, Va., and Sycamore, 30 miles. This part of the line is expected to be put in operation about the first of the year. Between Winesap and Durmid, including a line through the city of Lynchburg, 6.9 miles, the work is heavy and includes a tunnel 1,300 ft. long. Grading has been finished on 2.26 miles near Galveston, Va. Second track work between Peyton, Ga., and Austell, 21.6 miles, has been finished with the exception of a bridge over the Chattahoochee river.

On the Knoxville division during the year double track has been laid from Knoxville, Tenn., to Mascot, 12.25 miles, and from Jefferson City, Tenn., to New Line, 10.32 miles. Work is nearing completion on the section between Mascot and Jefferson City, 14.3 miles, this included a new double-track bridge over the Holston river, and it is expected to have the entire line between Knoxville and New Line in operation this year. Grading work is almost finished for a second track between Asheville, N. C., and Craggy, 4.4 miles. A new concrete viaduct has been built over the French Broad river on this section. At the close of the year about half the double-track work between Ooltewah Junction, Tenn., and Cleveland, 13.75 miles, was finished. In addition the company is building under the name of the Carolina & Tennessee Southern, a line from Bushnell, N. C., west along the northern bank of the Little Tennessee river to the North Carolina-Tennessee state line, 26 miles. On this grading is finished from Bushnell for 15.4 miles. From the state line the company is further extending this line under the name of the Tennessee & Carolina Southern to Maryville, Tenn., 38.8 miles, on the latter grading has been finished for 37.4 miles. On the completion of this work, the company will have a continuous line from Bushnell, N. C., west to Maryville, Tenn., 64.8 miles, with maximum grades of half of 1 per cent.

The Ensley Southern is being extended from its present terminus at Short Creek, Ala., northwest to Coal Creek, 3.39 miles; about half of the track has been laid. A spur is also being built to Coal Creek, 1.47 miles.

During the year work has been continued on the Memphis & Chattanooga from Chattanooga, Tenn., crossing the Tennessee river at the Narrows, thence through the valley of the Tennessee to a connection with the Memphis division at Stevenson, Ala., 42 miles. Grading and masonry work on the line from a point on the belt line near Chattanooga to the east portal of Lookout mountain tunnel is about 90 per cent. finished. The double-track tunnel through Lookout mountain, 3,500 ft. long, is about finished, only the arching near the portals remaining to be done. Both approaches for the Raccoon mountain tunnel are finished and tunnel excavation is under way. About 25 per cent. of the grading from Raccoon mountain to the Tennessee river crossing is finished. From this point to the state line all the grading and masonry, including the crossing at Battle creek, Sequatchi river and Tennessee river, are finished and 1.3 miles of track have been laid from South Pittsburgh, Tenn. The bridge over Valley creek is in place and the other structures for Sequatchi river and Tennessee river crossing are on the ground ready for erection.

Construction of the Jasper-French Lick Extension from Jasper, Ind., northeast to French Lick, 24.7 miles, including a tunnel 2,000 ft. long, is nearing completion, and it is expected to put the line in operation next month.

The extension of the Okolona-Big Creek in Mississippi from Vardaman, Miss., to Calhoun, 8.2 miles, was put in operation last December.

Southern Pacific.—It is said that a line will be built from Lake Arthur, La., to Gueydam, 10 miles, which will give the road a shorter line to New Orleans than its present route. A bridge will be built over Nementou river. The shortening of the line is decided on because of the early opening of the Colorado Southern, New Orleans & Pacific's line from Houston, Tex., to New Orleans, which will compete with the Southern Pacific.

The California Northeastern, under construction from Weed, Cal., north to Klamath Falls, is now in operation from Weed north for 40 miles, and about the first of next month will be finished to Dorris, 63 miles. Beyond this point a tunnel which is now being bored will delay the completion of the line to Klamath Falls until next spring.

Tennessee & Carolina Southern.—See Southern.

Texas & Gulf.—See Gulf, Colorado & Santa Fe.

Texas & Pacific.—The Opelousas, Gulf & Northeastern began running passenger trains over its line October 2 from Melville, La., southwest to Crowley, 60 miles. (Sept. 13, p. 368.)

Twin City & Lake Superior (Electric).—This company, which is building a third rail protected line from St. Paul, Minn., to Superior Wis., 125 miles, air line, has graded over 30 miles, and will finish the first section of 49 miles about the first of November. It is expected that the whole line will be in operation by July 1, 1909.

Washington, Baltimore & Annapolis (Electric).—This company, building a high-speed electric line from Washington, D. C., northeast to Baltimore, 33 miles, has grading about finished and track laid for 75 per cent. of the way. The line is double-tracked throughout and has easy grades. The work includes a steel viaduct about half a mile long over the Patapsco river entering Baltimore.

When this work is finished on the main line, the company proposes to electrify the Annapolis, Washington & Baltimore, which it owns, from a junction with its main line at Academy Junction east to Annapolis, 14 miles, and will operate this line as its Annapolis branch. The line extends also west from Academy Junction to Annapolis Junction, on the Baltimore & Ohio, six miles. The Washington, Berwyn & Laurel (Electric), in operation from Washington via Hyattsville to Laurel, Md., 16 miles, also owned by this company, is to be reached by building a connecting line from Annapolis Junction to Laurel, about four miles.

Washington, Berwyn & Laurel (Electric).—See Washington, Baltimore & Annapolis.

Yankton, Wichita & Houston.—Surveys are reported being made by this company from Maple City, Kan., south through Oklahoma for 300 miles. The company proposes to build a line from Yankton, S. Dak., south to the gulf of Mexico. Fremont Hill, President, Cincinnati, Ohio.

RAILROAD CORPORATION NEWS.

Baltimore & Ohio.—See Chicago Terminal Transfer.

Boston & Maine.—See Maine Central.

Chicago & Milwaukee Electric.—A. C. Frost & Co., Chicago, are offering a block of the authorized Wisconsin division first mortgage, 5 per cent. bonds. The division runs from Lake Bluff to Milwaukee, 110 miles, and is to be opened for traffic by November 15.

Chicago, Burlington & Quincy.—See Chicago Terminal Transfer.

Chicago, Milwaukee & St. Paul.—Judge Smith McPherson in the federal court sitting at Kansas City, Mo., has granted a temporary injunction restraining the Secretary of State of Missouri from trying to forfeit the St. Paul's charter, which step was threatened under a recent Missouri law forbidding railroads from transferring to federal courts damage suits filed against them in state courts.

Chicago Terminal Transfer.—The annual meeting has been postponed until January 15. It is understood that the Baltimore & Ohio interests have reached an understanding with the Burlington interests according to which the latter will abandon suits attacking the Baltimore & Ohio ownership of the property, and the Baltimore & Ohio will buy the preferred stock held by minority holders and admit the Burlington as a tenant.

Cincinnati, Hamilton & Dayton.—Gross earnings for the year ended June 30, 1907, were $8,946,000, an increase of $548,000; net earnings, $1,885,000, an increase of $398,000. The deficit after charges was $861,000, which compares with a deficit of $1,148,000 at the end of the previous year.

Coal & Coke.—This company, which has $10,000,000 common stock, has created an issue of $10,000,000 preferred stock. The road runs from Leiter, W. Va., to Charlestown, 198 miles, with branches, and the company also owns 100,000 acres of coal lands. There are $9,268,000 5 per cent. first mortgage bonds of 1919 outstanding, and the increase in capital stock is understood to be in connection with a proposed reduction of the bonded debt to $5,000,000.

Council City & Solomon River.—J. B. Godney has been appointed Receiver of this road, which has built 35 miles of road from Penelope Creek, Alaska, to Dickson, and is projected to Candle, Seward Peninsula, 65 miles farther. There is outstanding $895,460 capital stock and $347,000 6 per cent. bonds due May 1, 1908. The receivership proceedings were brought by officers of the company. It is said that the road can only be operated from the first of June to the middle of October because of heavy snow the rest of the year.

Detroit United Railway.—This company has passed its quarterly dividend of 1¼ per cent. on the $12,500,000 capital stock. A large part of the surplus was used for new equipment and improvements, because in the present money market securities to pay for these could not be advantageously issued. The annual rate has been 5 per cent. since August, 1905, and for four years before that it was 4 per cent.

Great Northern.—Estimated gross earnings of the lines directly operated, for the fiscal year ended June 30, 1907, were $50,018,000, an increase of $3,788,000; net earnings, after taxes, $18,563,000, a decrease of $2,958,000. Other income was $3,415,000, an increase of $1,213,000. Charges decreased slightly and the appropriations for improvements and equipment amounted to $4,935,000, a decrease of $196,000. The balance available for dividends was $12,963,000, equal to 8.6 per cent. on the capital stock. This balance is $1,522,000 less than in the previous year. The balance before the above deduction for improvements, etc., amounts to 11.9 per cent. on the capital stock. The surplus for the year was $2,156,000, a decrease of $3,029,000.

Gulf Line Railway.—This company, which operates a road from Hawkinsville, Ga., to Bridgeboro, 77 miles, of which 14 miles are leased with option of purchase, has asked permission to issue $325,000 5 per cent. first mortgage bonds. (May 31, p. 760.)

Illinois Central.—The annual meeting began on October 17, but it was expected that no business would be transacted for some time, because of the time needed for counting proxies. A committee consisting of L. C. Fritch, Assistant to the President; C. E. Wenman, formerly Assistant Secretary, and E. S. Conway, was appointed to sort the proxies. Stuyvesant Fish has secured an injunction restraining the Harriman interests from voting 286,731 shares owned by the Union Pacific, the Railroad Securities Company and the Mutual Life Insurance Company, on the ground that it is against the law of Illinois to have its roads managed by outside corporations. The injunction only restrains the voting of these shares in case the Harriman interests have not got a majority without them. If they prove necessary to Harriman control, the meeting is to be adjourned to December to give these interests time to show cause for removing the injunction.

Maine Central.—A quarterly dividend of 2 per cent. was paid on October 1 on the $4,918,000 stock. The annual rate has been 7 per cent. for the last four years and before that it was 6 per cent. Over half of the stock is owned by the Boston & Maine.

Mexican Central.—President Diaz of Mexico, in his recent message to Congress, announced that the proposed merger of the Mexican Central with the National Railroad of Mexico is being held up pending an improvement in the money market.

National Railroad of Mexico.—See Mexican Central.

Pacific Traction Company.—This company, which was recently incorporated in Maine and has acquired franchises and street railroads in Tacoma, Wash., has made a first mortgage to the Bankers' Trust Company of New York as trustee, securing an issue of $2,000,000 5 per cent. 20-year bonds of July 1, 1907. It intends to acquire other franchises and to build street railways in Tacoma and Olympia, as well as a connecting line between those cities.

Pennsylvania Company.—Kuhn, Loeb & Co., New York, announce that they will buy at once at par and interest all or any part of $10,000,000 of the $50,000,000 Pennsylvania Company's 4½ per cent. collateral trust improvement notes, due November 1, 1907.

St. Louis & San Francisco.—Francis, Bro. & Co., St. Louis, are offering at a price to yield 6 per cent. $340,000 of an authorized issue of $359,000 5 per cent. equipment notes, dated March 1, 1907, and maturing as follows: $19,000 on March 1, 1908, semi-annual instalment of $18,000 each from September 1, 1908, to September 1, 1915, inclusive, and semi-annual instalments of $17,000 each from that date to and including March 1, 1917. One instalment of $19,000 was paid on September 1, 1907. The notes are secured on 250 gondola cars and 150 Hart convertible cars bought from the American Car & Foundry Company, which endorses the notes.

Southern.—The average mileage operated in the fiscal year ended June 30, 1907, was 7,547 miles, an increase of 173 miles. Gross earnings were $56,657,994, an increase of $3,016,556; net earnings $11,958,712, a decrease of $1,909,587. Interest and rentals increased from $9,853,358 to $11,265,616. Only $1,500,000 out of earnings for the year was paid in dividends on preferred stock, the usual semi-annual dividend due October 1, 1907, having been passed. There was appropriated for improvements, betterments and charges not to be capitalized, $536,334, which is $463,493 less than in the preceding year. The surplus for the year was $253,987, a decrease of $975,252. Out of accumulated surplus a dividend of 1½ per cent., or $900,000, on the preferred stock was declared, payable October 17, 1907.

Stephenville North & South Texas.—This company has registered with the Secretary of State of Texas $322,000 first mortgage, 5 per cent. 40-year bonds secured on 20 miles of completed road in operation from Hamilton, Tex., north. The road is under construction to Stephenville, 24 miles farther.

Toledo Railways & Light.—The President has sent a circular letter to stockholders announcing that the directors favor passing the semi-annual dividend of 1 per cent. on the $12,000,000 capital stock due November 1. The surplus was more than enough to meet this payment, but much has been spent for improvements chargeable to capital account because of the unfavorable market for issuing securities for this purpose.

THE CHICAGO, ROCK ISLAND AND PACIFIC RAILWAY COMPANY—TWENTY-SEVENTH ANNUAL REPORT.

To the Stockholders

The Board of Directors herewith submit their report of the operations and affairs of the Rock Island Lines for the fiscal year ended June 30, 1907.

The results of the operations for the year were as follows:

Gross earnings (increase $9,000,561.86, or 17.6 per cent.)	$60,238,419.01	
Operating expenses (increase $5,977,083.47, or 17.0 per cent.)	41,044,142.00	
Net earnings (increase $3,023,478.39, or 18.7 per cent.)		$19,194,277.01
Other income		745,181.71
Total income		$19,939,459.62
Taxes	$1,676,038.31	
Interest	8,279,300.02	
Rentals	1,233,604.22	11,188,942.55
Net income, after providing for all charges, being 11.6 per cent. on capital stock ($75,000,000.00)		$8,750,517.07
Dividends paid (5½ per cent. on capital stock)		4,116,728.00
Surplus for the year (increase $2,525,509.53)		$4,633,789.07

The increase in gross earnings was disposed of as follows:

Increase in expenditures for maintenance of the property (road and equipment)	$1,974,568.87
Increase in cost of movement and administration	4,002,514.60
Leaving in net earnings (33.5 per cent. of gross increase)	3,023,478.39
Total increase in gross earnings	$9,000,561.86

The property of the St. Louis, Kansas City & Colorado Railroad Company was taken over for operation on October 1, 1906. The greater portion of the cost thereof was carried last year in the general balance sheet as advances for construction and equipment.

The capital stock of the Chicago, Rock Island & Pacific Railway Company outstanding at the close of the previous fiscal year was $74,847,600, and has since been increased by the issue of $6,500 in exchange for a like amount of capital stock of the Burlington, Cedar Rapids & Northern Railway Company.

The amount of capital stock shown on general balance sheet as outstanding June 30, 1907, represents:

Capital stock of the Chicago, Rock Island & Pacific Railway Company, issued and outstanding	$74,854,100.00
Capital stock of the Burlington, Cedar Rapids & Northern Railway Company and Rock Island & Peoria Railway Company outstanding, for the purpose of taking up which there is reserved a like amount of the capital stock of the Chicago, Rock Island & Pacific Railway Company	145,900.00
Total authorized capital stock of the Chicago, Rock Island & Pacific Railway Company	$75,000,000.00

Of the outstanding capital stock of the Burlington, Cedar Rapids & Northern Railway Company, $5,000 is in the treasury of your company.

During the year the funded debt increased $15,880,000.

The cost of property and franchises increased $18,180,162.06. There were also expended $4,375,221.38 for additions and improvements.

The line Fordyce to Crossett, Ark., 56.85 miles, was put in operation February 1, 1907, and the line Tinsman to Eldorado, Ark., 35.81 miles, on June 23, 1907. These two lines compose what was reported a year ago as the uncompleted portion of the Little Rock & Southern Railroad, now a part of the Rock Island, Arkansas & Louisiana Railroad. That road is laid with 60-lb. steel rail and is ballasted with gravel. Standard Rock Island buildings and bridges, including a first-class brick depot at Fordyce, Ark., have been erected.

Trackage rights have been obtained over the rails of the Louisiana & Arkansas Railway Company and the Louisiana Railway & Navigation Company, to carry the line to Alexandria, La., and it is expected that the line from Alexandria to Eunice, La., will be operated in October, 1907. At this latter point connection will be made with the Colorado Southern, New Orleans & Pacific Railroad (Frisco), from Houston, Tex., to New Orleans, La., establishing a new through route of importance to the Rock Island Lines.

The earnings, operating expenses, taxes, interest, etc., of the operated portion of the Rock Island, Arkansas & Louisiana lines were included in the accounts of your company.

GENERAL.

The records of the industrial department show that there have been located along the Rock Island Lines during the year 327 new enterprises, at an estimated cost of about $8,500,000. These new enterprises are scheduled to employ over 8,000 persons.

During the past year your company built or made additions to 58 tracks to private industries, and four side tracks to coal mines.

During the fiscal year 109 locomotives, 95 passenger train cars (including one passenger motor car), 6,847 freight train cars, one derrick car and two other road service cars were received and placed in service.

The work of installing automatic block signals has been pushed, as will be attested by the expenditure of $220,509.58, for new and additional signal and interlocking plants. The greater portion of this amount was for the installation of automatic block signal apparatus.

To meet the growing demands of increased traffic, $4,089,934.18 have been expended for additional and improved terminals at various points.

The new freight depots and yards constructed in St. Louis by the Rock Island-Frisco Terminal Railway Company, were put in operation March 1, 1907. The money was provided jointly by this company and the St. Louis & San Francisco Railroad Company, each company receiving securities of the terminal company in reimbursement of its advances.

$3,000,000 of 5 per cent bonds have been issued by the terminal company and guaranteed jointly by this company and the St. Louis & San Francisco Railroad Company, the unexpended balance of which is reserved for further additions and improvements.

Joint use of these terminals has been granted to the Chicago & Eastern Illinois Railroad Company.

The transfer yard of the Iowa Transfer Railway Company at Des Moines, Ia., referred to in the last annual report, has been completed and is being operated. The total amount advanced by your company as its portion of the cost of this transfer yard was $6,200, for which was received 62 shares, par value $6,200, being one fifth of the capital stock of the Iowa Transfer Railway Company.

The Peoria Railway Terminal Company, a new corporation, with a capital stock of $1,000,000 par value, has acquired all of the property of the Peoria & Pekin Terminal Railway Company, one half of whose capital stock was owned by your company at the date of rendering the last annual report. In exchange for such capital stock your company has received one half of the capital stock of the Peoria Railway Terminal Company, and the latter company is now operating the property.

Trackage rights were acquired and trains of the Chicago, Rock Island & Gulf Railway Company have been operated since July 1, 1906, over the Ft. Worth & Denver City Railway Company from Amarillo, Tex., to Dalhart, Tex., 82.06 miles. Your company has acquired similar rights and has operated its trains since November 25, 1906, over the line of the St. Louis & San Francisco Railroad Company from Wichita, Kan., to Medora, Kan., 48.07 miles.

During the year your company has advanced on account of the Trinity & Brazos Valley Railway Company, for construction and equipment of that line, $97,415.50, and on account of construction of important terminals at Galveston, Tex., $98,016.66.

Legislation by the various states which your lines serve, respecting rates and operating methods of railroads, has been excessive in quantity and severe in character. The legislatures of five such states have passed laws establishing two cents a mile as the maximum rate of passenger fare, and other laws have been passed by the several states calling for serious reductions in freight rates. Doubtless a large part of this legislation has been due to misconception of the actual conditions. At every opportunity it is the policy of the officers of your company to endeavor to establish better relations with the people of the various states, and to impress upon them the fact that the progress of the section of the country traversed by your road, and the continued prosperity thereof, require candid co-operation between the railroads and the other business interests. The aim of all must be to promote the welfare of the country, and it is to be hoped that when the situation is thoroughly understood, a spirit of mutual co-operation will be the result.

A complete inventory of material, fuel and supplies was taken April 30, 1907, and the necessary adjustment of the accounts made.

The accounts of your company at the close of the fiscal year were examined by Mr. Stephen Little.

It is a pleasure to acknowledge the hearty and necessary co-operation of officers and employees.

By order of the Board of Directors,

B. L. WINCHELL,
President.

ROCK ISLAND LINES.

Income Account; Year Ended June 30, 1907, Compared with Previous Year.

	1906-7.	1905-6.	Increase.	Per ct.
Average mileage operated	7,780.26	7,218.07	562.19	7.8
Earnings:				
Freight	$40,663,972.36	$34,695,823.88	$5,968,148.48	17.2
Passenger	16,449,765.44	13,917,030.64	2,532,734.80	18.2
Mail	1,356,868.48	1,138,631.15	218,237.33	19.2
Express	1,373,765.79	1,165,718.12	208,047.67	17.8
Miscellaneous	394,047.84	320,654.26	73,393.58	22.9
Total	$60,238,419.01	$51,237,858.05	$9,000,561.86	17.6
Operating expenses:				
Maint. of way and structures	$8,754,396.55	$7,302,489.58	$1,451,906.97	19.9
Maint. of equipment	7,184,128.08	6,661,466.18	522,661.90	7.8
Conduct'g transportation	23,420,948.42	19,630,076.17	3,790,872.25	19.3
General expenses	1,684,668.95	1,473,026.60	211,642.35	14.4
Total	$41,044,142.00	$35,067,058.53	$5,977,083.47	17.0
Net earnings	$19,194,277.01	$16,170,799.52	$3,023,478.39	18.7
Other income	745,181.71	1,015,837.26	270,655.55*	26.6
Total income	$19,939,459.62	$17,186,636.78	$2,752,822.84	16.0
Taxes	$1,676,038.31	$1,631,890.21	$44,148.10	2.7
Interest	8,279,300.02	7,748,169.72	531,130.30	6.9
Rentals	1,195,927.71	998,847.67	197,080.04	19.7
Improvements on leased lines	37,676.51	21,897.14	15,779.37	72.1
Total charges	$11,188,942.55	$10,400,804.74	$788,137.81	7.6
Available for dividends	$8,750,517.07	$6,785,832.04	$1,964,685.03	29.0
Dividends	4,116,728.00	4,677,552.50	560,824.50*	12.0
Surplus	$4,633,789.07	$2,108,279.54	$2,525,509.53	119.8
Appropriated for special improvement and equipment fund	.....	2,108,279.54	*2,108,279.54	100.0
Balance of surplus carried to credit of profit and loss	$4,633,789.07	.....	$4,633,789.07	....

Dividends Declared During Year Ended June 30, 1907.

Dividend No. 105, 2 per cent. paid October, 1906	$1,496,908.00
Dividend No. 106, 1 per cent. paid January, 1907	748,520.00
Dividend No. 107, 1½ per cent. paid April, 1907	1,122,780.00
Dividend No. 108, 1 per cent. paid July, 1907	748,520.00
Total	$4,116,728.00

Profit and Loss.

Balance as of June 30, 1906			$17,202,469.38
Surplus for the year ended June 30, 1907, as per income account above		$4,633,789.07	
Interest prior to October 1, 1906, on advances by the Chicago, Rock Island & Pacific Railway Company to the St. Louis, Kansas City & Colorado Railroad Company	$829,587.75		
Interest prior to July 1, 1906, on advances for St. Louis, Mo., freight terminals	67,395.43	$896,983.18	
Net profit from operation of mines for two years ended June 30, 1907		38,944.61	
Sundry liabilities written off		29,005.98	
		$5,598,722.84	
Less:			
Discount and expenses in connection with first and refunding mortgage gold bonds issued	$2,261,849.71		
Depreciation on tracks, structures and equipment, removed, sold, or destroyed:			
Tracks $13,752.55			
Structures 42,854.74			
Equipment 1,356,522.79	1,413,130.08		
Sundry uncollectible accounts written off	3,088.32	3,678,068.11	1,920,654.73
Profit and loss, as of June 30, 1907			$19,123,124.11

* Decrease; not included in total.

Statement of Securities Owned June 30, 1907.

IN CAPITAL ASSETS.	Face Value.	Book Value.
Included in advances for construction and equipment:		
Stocks:		
Gulf Construction Company	$25,000.00	$25,000.00
Included in investment account—stocks representing ownership of Rock Island Lines in sundry properties:		
Stocks—Railroads:		
Calumet Western Railway Co.	104,300.00	
Kankakee & Seneca Ry. Co.	5,000.00	
Keok. & Des. M. Ry. Co., preferred	575,100.00	
Keok. & Des. M. Ry. Co., common	1,487,900.00	
Peoria & Bureau Valley R. R. Co.	10,000.00	
Stocks—Union depot, terminal, stock yards and coal companies:		
Atchison Union Depot & R. R. Co.	9,000.00	
Chicago Transfer & Clearing Co.—judgment note trust certificate	98,000.00	
Chicago Union Transfer Ry. Co., pref.	40,000.00	
Chicago Union Transfer Ry. Co., com.	40,000.00	
Coal Valley Mining Co.	50,000.00	
Consolidated Indiana Coal Co.	2,400,000.00	
Dering Coal Co.	1,700,000.00	
Gasconade Ry. Construction Co.	50,000.00	
Iowa Transfer Ry. Co.	6,200.00	
Kansas City Terminal Ry. Co.	99,900.00	
Keokuk Union Depot Co.	20,000.00	
Leavenworth Depot & R. R. Co.	25,000.00	
Memphis Union Station loan-participation certificate	120,000.00	
Minnesota Transfer Ry. Co.	7,000.00	
Missouri and Illinois Bridge & Belt Railroad Co.	17,000.00	
Morris Terminal Ry. Co.	25,000.00	
Peoria Ry. Terminal Co.	500,000.00	
Pueblo Union Depot & R. R. Co.	8,000.00	
St. Joseph Union Depot Co.	2,000.00	
St. Joseph Stk. Yds. & Terminal Co.	12,500.00	
St. Paul Union Depot Co.	103,600.00	
Terminal R. R. Assn. of St. Louis	205,800.00	
The Union Depot Co. of Kan. City, Mo.	45,000.00	
Union Stk. Yds. Co., Topeka, Kan.	13,100.00	
Total	$7,779,400.00	1,365,168.00
Included in stock of the Chicago & Alton Railroad Company:		
The Chicago & Alton R. R. Co.—pref.	$4,880,000.00	
The Chicago & Alton R. R. Co.—com.	14,420,000.00	
Total	$19,300,000.00	9,605,970.49
Total in capital assets	$27,104,400.00	$10,996,138.49

ROCK ISLAND LINES.

Condensed General Balance Sheet, June 30, 1907, and Comparison with Previous Year.

ASSETS.	1907.	1906.	Increase.
Capital Assets:			
Property and franchises	$243,498,382.20	$221,825,639.16	$21,672,743.04
St. Louis, Kansas City & Colorado Railroad Co.	.....	16,804,457.58	16,804,457.58*
Additions and improvem'ts current year	4,375,221.38	3,492,580.98	882,640.40
Advances for construction and equipment	4,385,825.57	3,354,913.05	1,030,912.52
Real estate	639,949.98	431,230.19	208,719.79
Investment account—stocks representing ownership of Rock Island Lines in sundry properties	1,365,168.00	1,136,583.54	228,584.46
Stock of the Chic. & Alton Railroad Company	9,605,970.49	9,581,542.87	24,427.62
Deposit with trustee for purchase of equipment under indenture of February 1, 1907	7,533,550.00	.....	7,533,550.00
Total	$271,404,067.62	$256,626,947.37	$14,777,120.25
First and refunding mortgage gold bonds held in the treasury (see contra)	$11,250,000.00	$11,250,000.00	.....
Current Assets.			
Cash	$9,917,499.05	$9,646,668.76	$270,830.29
Station agents and conductors: Debit $2,594,072.96; Credit 243,612.69	2,350,460.27	2,047,194.32	303,265.95
Companies and individuals: Debit $2,906,185.72; Credit 51,504.07	2,854,681.65	1,767,937.73	1,086,743.92
Traffic balances: Debit $961,472.93; Credit 869,487.74	91,985.19	†9,208.43	101,193.62
Express companies	303,125.21	177,614.51	125,510.70
U. S. postoffice department	411,369.35	291,245.12	120,124.23
Advances for construction, equipment, etc., fundable	854,693.62	.....	854,693.62
Loans and bills receivable	2,217,133.19	999,184.71	1,217,948.48
Bonds, etc., in treasury unpledged	10,087,795.80	6,687,548.86	3,400,246.94
Stocks in treasury—unpledged	910,069.01	1,191,511.45	281,442.44*
Accrued income from inv'stm'ts	155,406.49	148,228.83	7,177.66
Prepaid insurance	156,123.30	85,973.07	70,149.63
Material and supplies	4,356,074.74	3,968,069.18	388,005.56
Total	$31,666,416.87	$27,001,968.71	$7,664,448.16
Deferred Assets.			
Open carrying accounts in process of adjustment: Debit $770,956.26; Credit 117,599.10	$653,357.16	†$187,438.02	$840,795.18
East St. Louis & Suburban Railway Company bonds	.....	49,725.00	49,725.00*
Total	$653,357.16	†$137,713.02	$791,070.18
Total	$317,973,841.65	$294,741,203.06	$23,232,638.59

LIABILITIES.	1907.	1906.	Increase.
Capital Liabilities:			
Capital stock	$75,000,000.00	$75,000,000.00	.....
Funded debt	174,332,000.00	164,587,000.00	$9,745,000.00
Three-year notes due July 1, 1907	‡7,500,000.00	7,500,000.00	.....
Collateral trust gold notes due April 1, 1908	6,000,000.00	6,000,000.00	.....
Equipment trust notes	7,385,000.00	1,250,000.00	6,135,000.00
Total	$270,217,000.00	$254,337,000.00	$15,880,000.00
First and refunding mortgage gold bonds issued and held in the treasury (see contra)	$11,250,000.00	$11,250,000.00	.....
Current liabilities:			
Purchase money note for Dering Coal Co. stock	.....	$540,000.00	$540,000.00*
Unpaid vouchers and drafts	$2,845,601.08	1,433,603.27	1,411,997.81
Unpaid wages	2,556,021.30	2,047,550.92	508,470.38
Interest, rentals and dividends due July 1	2,788,589.00	2,789,767.37	1,178.37*
Taxes accrued (not due)	1,075,398.00	1,039,372.52	36,025.48
Interest and rentals accrued (not due)	1,342,077.14	1,073,047.63	269,029.51
Interest coupons due and not presented	212,065.00	.....	212,065.00
Dividends due, not cal'd for	7,007.07	3,135.25	3,871.82
Bonds matur'd, not pres'nt'd	26,500.00	.....	26,500.00
Notes payable	150,000.00	.....	150,000.00
Interim certificates for first and refunding mortgage gold bonds	$3,000,000.00	.....	3,000,000.00
Total	$14,003,258.59	$8,926,476.96	$5,076,781.63
Deferred Liabilities:			
Keok. & D. M. Ry. Co. account equipment	$197,562.25	$197,562.25	.....
White & Black River Val. Ry. Co.—acct. equipmt.	25,170.00	25,170.00	.....
C. H. Henderson, trustee	.....	50,000.00	$50,000.00*
Hospital fund (employees')	40,338.61	35,050.30	5,288.31
Total	$263,070.86	$307,782.55	$44,711.69*
Total liabilities	$295,733,329.45	$274,821,259.51	$20,912,069.94
Provisional Accounts:			
Equipm't replacement funds	$561,438.27	$213,415.92	$348,022.35
Insurance fund	417,670.28	395,778.71	51,891.57
Special improvement and equipment fund	2,108,279.54	2,108,279.54	.....
Total	$3,117,388.09	$2,717,474.17	$399,913.92
Grand total liabilities (including provisional accounts)	$298,850,717.54	$277,538,733.68	$21,311,983.86
Profit and loss	$19,123,124.11	$17,202,469.38	$1,920,654.73
Total	$317,973,841.65	$294,741,203.06	$23,232,638.59

NOTE.—In stating the assets and liabilities of the companies forming the Rock Island Lines, the holding of the Chicago, Rock Island & Pacific Railway Company in the bonds and capital stock of the auxiliary lines, together with loans between the various companies, have been eliminated from the liabilities and a like reduction made in the book value of the assets; the figures shown, therefore, represent the book value of the assets and the liabilities without duplication.

The classification of some of the items in the general balance sheet has been changed during the past year. To preserve comparisons the figures for last year have been restated to agree with the classification of the 1907 figures, hence, the 1906 figures do not agree in every detail with those published in the annual report for the previous year.

* Increase.
† Credits.
‡ Paid July 1, 1907.
§ Exchanged July 1, 1907, for first and refunding mortgage gold bonds.

IN CURRENT ASSETS.

Included in advances for construction, equipment, etc. (fundable):		
Stocks:		
Rock Island Frisco Terminal Ry. Co.	$299,700.00	
St. Louis Rock Island Terminal Ry. Co.	11,[illegible].00	
Total	$311,[illegible].00	
Bonds:		
Rock Island Frisco Terminal Ry. Co.	$437,000.00	
Total stocks and bonds	$748,[illegible].00	
Included in bonds, etc., in treasury unpledged:		
Atchison Union Depot & R. R. Co.	$1,500.00	
Chic. Rock Isl. & Pac. R. R. Co. (of Iowa)	180,847.50	
Consolidated Indiana Coal Co.	273,000.00	
Dawson Railway & Coal Co.	250,000.00	
Dering Coal Co.	150,000.00	
Kankakee & Seneca Ry. Co.	325,000.00	
Kansas City & Northwestern Ry. Co.	8,000.00	
Minnesota Transfer Ry. Co.	28,000.00	
*Peoria Ry. Terminal Co.	1,500.00	
Rock Isl. Imp. Co. equipment series "A"	3,600,000.00	
Rock Isl. Imp. Co. equipment series "B"	4,760,000.00	
The Chicago, Rock Island & Pacific Ry. Co. first and refunding mortgage gold	21,000.00	
Total	$10,201,847.50	
Included in stocks in treasury unpledged:		
Burlington, Ced. Rap. & Northern Ry. Co.	$5,000.00	
Cedar Rapids Auditorium Co.	1,000.00	
Central City Elevator Co.	4,000.00	
Des M., Iowa Falls & Northern Ry. Co.	1,000.00	
Kansas City Times News Co.	6,400.00	
Memphis Railroad Terminal Co.	9,900.00	
Nebraska Central Ry. Co.	99,700.00	
Nebraska Construction Co.	270,000.00	
St. Joseph Auditorium Co.	5,000.00	
The Chicago, Rock Island & Pac. Ry. Co.	275.00	
The Rock Island Co., preferred	987,330.00	
The Rock Island Co., common	52,000.00	
Town and land companies in Kansas	207,150.00	
Western Coal & Mining Co.	36,000.00	
Total	$1,684,755.00	
Total bonds and stocks in current assets	$12,634,592.50	$11,398,770.17
RECAPITULATION.		
Included in capital assets	$27,104,400.00	$10,996,138.49
Included in current assets	12,634,592.50	11,398,770.17
Total securities owned	$39,738,992.50	$22,394,908.66

*3,000.00 owned jointly with the Chicago & Alton Railroad Company.

ST. LOUIS AND SAN FRANCISCO RAILROAD COMPANY—ELEVENTH ANNUAL REPORT.

To the Stockholders:

The Board of Directors herewith submit their report of the operations and affairs of the St. Louis & San Francisco Railroad Company's Lines (exclusive of the Chicago & Eastern Illinois Railroad) for the fiscal year ended June 30, 1907.

The results of operation for the fiscal year were as follows:

Gross earnings	$38,621,067.51	
(Increase, $6,574,410.95, or 20.5 per cent.)		
Operating expenses	24,872,579.36	
(Increase, $4,327,046.24, or 21.1 per cent.)		
Net earnings (Inc. $2,247,364.71, or 19.5 per cent.)		$13,748,488.15
Other income		1,540,866.55
Total income		$15,289,354.70
Taxes	$896,958.13	
Interest, rentals and other fixed charges	10,233,813.28	
		11,130,771.41
Net income after providing for all charges*		$4,158,583.29
Dividends paid: 1 per cent. on first preferred stock		199,742.12
Balance of surplus carried to profit and loss		$3,958,841.17
(Increase, $2,169,447.66.)		

*Being equal to 4 per cent. on the first and second preferred stock ($21,000,000) and 11.41 per cent. on the common stock ($29,000,000).

There was a slight decrease in the mileage operated during the fiscal year, as compared with the previous year, caused by a remeasurement of line and the taking up of small sections of useless track.

The average mileage operated during the year was 5,061.72 miles, as compared with 5,068.92 for the preceding year, being a decrease of 7.20 miles.

The total main track mileage operated at June 30, 1907, was 5,064.16 miles.

The capital stock of the company outstanding at the end of the fiscal year was $50,000,000, being the same as in the preceding year, and is composed of:

$5,000,000 first preferred.
16,000,000 second preferred.
29,000,000 common.

The total funded debt at June 30, 1906, including that of leased and auxiliary lines was		$167,440,148.59
The net increase during the fiscal year was		10,080,153.61
Making the total funded debt at June 30, 1907		$177,520,302.20
The total amount of equipment bonds and notes outstanding at June 30, 1906, was		$8,078,629.97
The net increase during the fiscal year was		4,371,859.82
Making the total amount of equipment bonds and notes outstanding at June 30, 1907		$12,450,489.79

A comparison of the assets and liabilities of the company, and its leased and auxiliary lines, at June 30, 1907, with the figures of the preceding year, is shown on the comparative condensed balance sheet on pages 16 and 17.

The increase in the franchises and property accounts, including those of the leased and auxiliary lines, for the fiscal year was $8,214,792.31.

[illegible] expenditures were made during the fiscal year for additions and improvements to the property and to the equipment.

The various classes of rolling stock acquired are shown on statement, pages 41 and 42, and in addition thereto contracts were placed for 70 freight, 10 passenger and 10 switch locomotives, 87 passenger train cars and 5,255 freight cars, but deliveries of same could not be obtained until the last half of the calendar year 1907.

Contract has been let for the construction of new car and engine shops at Springfield, Mo., to be completed by February 1, 1908, at a cost of approximately $1,[illegible].

A new union passenger station at Birmingham, Ala., was constructed during the year jointly by the lines centering at that point, and this company in conjunction with all the other lines interested has guaranteed the bonds issued covering the cost thereof. The interest charge is to be apportioned between the lines using the terminals on the basis of cars handled.

The station, though not quite completed, was put in operation at July 1, 1907, and 4 per cent. bonds to the amount of $1,190,000 had then been issued in payment of the property, one-sixth thereof, or $198,333.33 being the amount guaranteed by this company.

The new freight depots and yards constructed in North St. Louis by the Rock Island-Frisco Terminal Railway Company were put in operation March 1, 1907. The money was provided jointly by this company and the Chicago, Rock Island & Pacific Railway Company, each company receiving securities of the terminal company in reimbursement of its advances.

$3,000,000 of 5 per cent. bonds have been issued by the terminal company and guaranteed jointly by this company and the Chicago, Rock Island & Pacific Railway Company, the unexpended balance of which is reserved for further additions and improvements.

Joint use of these terminals has been granted to the Chicago & Eastern Illinois Railroad Company.

The company has acquired, through the proceeds of its $7,500,000 five-year, 5 per cent. collateral trust gold notes, dated January 1, 1906, all the capital stock (except Directors' shares), and all the bonds of Colorado Southern, New Orleans & Pacific Railroad Company. The property of the last named company has been leased to this company for the period of 999 years from April 30, 1907. Through the ownership by Colorado Southern, New Orleans & Pacific Railroad Company of all the stock (except Directors' shares), of the Orange & Northwestern Railroad Company and of the Beaumont, Sour Lake & Western Railway Company, a through line will be in operation from Houston to Baton Rouge upon the completion of construction work now in progress (see page 74). From Baton Rouge to New Orleans the trains of your company will be operated into New Orleans under a trackage agreement with the Illinois Central Railroad Company and Yazoo & Mississippi Valley Railroad Company.

The increase in the tonnage carried during the fiscal year was 2,305,162 tons, or 16.64 per cent., and the increase in number of passengers carried was 1,194,353, of 19 per cent.

The earnings from operation per mile of road for the fiscal year were $7,630.03, an increase over the preceding year of $1,307.84, or 17 per cent., and is the largest revenue per mile of road earned by the company in any year.

The percentage of all fixed charges and taxes to net income for the fiscal year was 72.8 per cent., as compared with 82.4 per cent. for the preceding year, and 93.3 per cent. for the year 1905. This shows a healthy growth in the financial strength of the company.

The industrial department has reported that 338 new industrial plants, employing over 12,000 men, and costing approximately $9,000,000, have been located on the tracks of the Frisco lines during the fiscal year.

It is encouraging to note this expansion of industrial development going on in the territory tributary to the company's lines, as it insures, to a large extent, a continued increase in both freight and passenger traffic.

The crops for the current year in the territory tributary to the company's lines are about normal.

The net receipts from land sales and royalties for the fiscal year were:

St. Louis & San Francisco R. R.	$371.46	
Kansas City, Fort Scott & Memphis Ry.	24,929.97	
		$25,301.43

This amount was credited to other income in the income account for the year.

The usual statements showing the income and profit and loss accounts, condensed balance sheet and statistical exhibits, are appended to this report and show the results of the operation of both properties and their financial condition at the end of the fiscal year.

The books and accounts of the company at the close of the fiscal year were examined by Mr. Stephen Little.

Acknowledgment of the faithful and efficient services rendered by officers and employees during the year is here made.

By order of the Board of Directors. A. J. DAVIDSON, *President.*

ST. LOUIS & SAN FRANCISCO RAILROAD LINES.

Income Account; Fiscal Year Ended June 30th, 1907, Compared with Previous Years.

	1906-7.	1905-6.	Increase.	Per ct.
Average mileage operated	5,061.72	5,068.92	7.20*	0.11
Earnings:				
Freight	$26,848,664.91	$21,955,975.42	$4,892,689.49	22.3
Passenger	9,169,400.43	7,908,644.11	1,260,756.32	15.9
Mail	885,662.71	704,415.22	181,247.49	25.7
Express	998,864.97	882,232.39	116,632.58	13.2
Miscellaneous	718,474.49	595,389.42	123,085.07	20.7
Total	$38,621,067.51	$32,046,656.56	$6,574,410.95	20.5
Operating expenses:				
Maint. way & structures.	$5,406,107.20	$4,049,093.65	$1,357,013.55	33.5
Maint. of equipment	4,699,674.36	3,803,210.75	896,463.61	23.6
Conducting transportation	13,610,703.47	11,742,742.07	1,867,961.40	15.9
General expenses	1,156,094.33	950,486.65	205,607.68	21.6
Total	$24,872,579.36	$20,545,533.12	$4,327,046.24	21.1

Net earnings	$13,748,488.15	$11,501,123.44	$2,247,364.71	19.5
Other income	1,540,866.55	1,632,659.89	91,793.34*	5.6
Total income	$15,289,354.70	$13,133,783.33	$2,155,571.37	16.4
Taxes	$806,958.13	$943,559.23	$46,601.10*	4.9
Interest	5,419,637.54	5,178,866.90	240,770.64	4.6
Rentals and sinking fund	3,179,293.74	3,067,339.57	111,954.17	3.6
Div. on trust certificates:				
K. City, Ft. S. & M. Ry.	540,400.00	540,400.00	.....	...
Chic. & E. Ill. R.R.	1,094,482.00	1,094,482.00	.....	...
Total charges	$11,130,771.41	$10,824,647.70	306,123.71	2.8
Available for dividends	$4,158,583.29	$2,309,135.63	$1,849,447.66	80.1
Dividends:				
4 per cent. on first preferred stock in 1907; 4 per cent. on first preferred, and 2 per cent. on second preferred stock in 1906.	$199,742.12	$519,742.12	$320,000.00*	61.6
Surplus, carried to credit of profit and loss	$3,958,841.17	$1,789,393.51	$2,169,447.66	121.2

*Decrease; not included in totals.

ST. LOUIS & SAN FRANCISCO RAILROAD LINES.

Statement of Securities Owned, as of June 30th, 1907.

(In Property Account.)

	Face value.	Book value.
Stocks:		
Arkansas Coal & Mining Co.	$11,250.00	
Crescent Hotel Co., Eureka Springs, Ark.	15,198.00	
Kansas Southwestern Ry. Co.	181,000.00	
St. Louis & San Francisco R.R. Co.:		
First preferred stock	6,535.10	
Second preferred stock	53.00	
Common stock	149.60	
St. Louis & North Arkansas R. R. Co.	20,000.00	
Fort Smith & Van Buren Bridge Co.	175.00	
Fort Smith & Southern Ry. Co.	1,100.00	
Fayetteville & Little Rock R. R. Co.	4,500.00	
The Joplin Railway Company	900.00	
Little Rock & Texas Ry. Co.	3,500.00	
Oklahoma City Terminal R. R. Co.	100,000.00	
Paris & Great Northern R. R. Co.	4,500.00	
Peirce City Real Estate Co.	54,800.00	
Pittsburg & Columbus Ry. Co.	2,500.00	
St. Louis, Wichita & Western Ry. Co.	500.00	
St. Louis, Arkansas & Texas Ry. Co.	1,100.00	
Springfield & Northern Ry. Co.	1,500.00	
Springfield & Southern Ry. Co.	900.00	
Springfield Connecting Ry. Co.	3,500.00	
St. Louis & Oklahoma City R. R. Co.	900.00	
Terminal Railroad Association of St. Louis.	205,800.00	
New Orleans Terminal Ry. Co.	1,000,000.00	
Ozark & Cherokee Central Ry. Co.	2,880,000.00	
Winchell Townsite Co.	2,000.00	
Total securities in property account	$4,502,360.70	$203,845.69

(In Current Assets.)

Stocks:		
Mobile, Jackson & Kansas City R.R. Co.	$280,000.00	
Gulf & Chicago Ry. Co.	280,000.00	
Colonial Hotel Company	5,000.00	
Jasper Land Company	8,666.67	
Hotel Realty Company	5,000.00	
Kirby Lumber Company	1,942,500.00	
Kansas City Belt Ry. Co.	120,000.00	
Taylor City Belt Ry. Co.	30,000.00	
Star Publishing Co. (Fort Worth)	200.00	
Birmingham Terminal Co.	25,000.00	
Total stocks	$2,696,366.67	
Bonds:		
K. C., Ft. S. & G. R.R. Co., 1st Mort. 7%	$1,000.00	
St.L., M. & S. E. R.R. Co. 1st Mort. 4% scrip	750.00	
5-year 4½ per cent. gold bonds	71,475.07	
St. L. & S. F. R.R. Co., Con. Mort. 4% scrip	159.00	
2½-year 5 per cent. gold notes	*6,500,000.00	
5-year 4½ per cent. gold notes	113,068.02	
(St. L., S. F. & N. O. R.R.)		
Rock Island-Frisco Terminal Ry. Co. 1st Mort. 5 per cent. bonds	396,622.45	
Memphis Union Depot Co., 5 per cent. note	120,000.00	
Total bonds	$7,203,074.54	
Total securities in current assets	$9,899,441.21	$8,858,016.63
Total securities owned	$14,401,801.91	$9,061,862.32

*$4,751,000 of these notes are deposited as collateral to notes payable.

ST. LOUIS & SAN FRANCISCO RAILROAD LINES.

Condensed General Balance Sheet, June 30th, 1907, and Comparison with Previous Years.

ASSETS.

	1907.	1906.	Increase.
Capital Assets:			
Franchises and property	$170,544,848.03	$163,670,111.19	$6,874,736.84
Stocks and bonds owned	203,845.69	203,845.69	.....
Total franchises & property	$170,748,693.72	$163,873,956.88	$6,874,736.84
Leasehold estate (K. C., Ft. S. & Mem. Ry.)	$51,729,525.06	$50,591,075.97	$1,138,449.09
Leasehold estate (K. C., M. & Birm. R. R.)	9,175,875.76	9,175,875.76	.....
Franchises and property, auxiliary companies	7,451,879.52	7,250,273.14	201,606.38
Chic. & E. Ill. R. R. Co.:			
Preferred stock, cost of	9,321,550.00	9,321,550.00	.....
Common stock, cost of	18,239,237.13	18,239,237.13	.....
New equipment, under equipment trusts	11,731,234.01	7,261,925.55	4,469,308.46
Securities under coll. trust notes of 1908, cost of	1,225,325.00	.....	1,225,325.00
Total	$279,623,320.20	$265,713,894.43	$13,909,425.77
Current Assets.			
Cash in treasury	$880,833.16	$1,091,051.11	$210,217.95*
Cash in hands of fiscal agents	2,373,751.91	2,550,486.10	176,734.19*
Due from agents & conductors: Debit $1,339,109.10, Credit 25,545.79	1,313,563.31	941,664.84	371,898.47
Due from R.R. Co., acc't traffic: Debit $1,263,372.39, Credit 964,304.07	299,068.32	193,152.65	105,916.27
Due from companies & individuals: Debit $2,388,444.82, Credit 3,295.81	2,385,149.01	1,990,486.57	394,662.44
Due from U. S. government	236,328.35	181,160.43	55,167.92
Securities in treasury unpledged (cost of)	4,107,016.63	1,849,778.19	2,257,238.44
Pledged as coll. under notes payable (cost of)	4,751,000.00	.....	4,751,000.00
Supplies on hand	2,870,411.61	2,185,324.93	685,116.68
Advances account construction (fundable)	864,853.65	954,295.76	$9,412.11*
Total	$20,082,005.95	$11,937,399.98	$8,144,605.97
Deferred Assets.			
Open carrying acc'ts in process of adjustment: Debit $844,894.25, Credit 357,954.53	$506,939.72	$125,938.72	$81,001.00
Trustees sinking fund accounts	352,456.93	229,520.38	122,927.55
Sinking funds	87,541.25	95,346.88	7,805.63*
Total	$439,998.18	$324,876.26	$115,121.92
Total Assets	$300,652,261.05	$278,402,109.39	$22,250,151.66

LIABILITIES

Capital Liabilities.	1907.	1906.	Increase.
Capital stock: First preferred	$5,000,000.00	$5,000,000.00	.....
" " Second pref'd.	16,000,000.00	16,000,000.00	.....
" " Common	29,000,000.00	29,000,000.00	.....
Funded debt	123,054,582.20	113,846,428.59	$9,208,153.61
Total capital and bonds	$173,054,582.20	$163,846,428.59	$9,208,153.61
Outstanding securities:			
Leasehold estate (K. C., Ft. S. & M. Ry.)—Stock:			
Preferred certificates	$13,510,000.00	$13,510,000.00	.....
Funded debt	38,295,300.00	37,423,300.00	$872,000.00
Equipment bonds & notes	2,885,202.00	3,286,304.00†	401,102.00*
Total (K.C., Ft. S. & M.	$54,690,502.00	$54,219,604.00	$470,898.00
Leasehold estate (K. C., M. & Birm. R. R.):			
Funded debt	$9,247,420.00	$9,247,420.00	.....
Funded debt, aux. companies	6,923,000.00	6,923,000.00	.....
Stock trust certificates:			
Preferred (C. & E. Ill.)	9,317,550.00	9,317,550.00	.....
Common (C. & E. Ill.)	18,044,500.00	18,044,500.00	.....
Equipment notes outstanding	9,565,287.79	4,792,325.97	$4,772,961.82
Total	$280,842,841.99	$266,390,828.56	$14,452,013.43
Current Liabilities.			
Notes payable	$5,577,250.00	$748,449.79	$4,828,800.21
Audited vouchers and pay rolls	4,110,884.18	3,813,130.68	297,753.50
Interest and dividend matured	2,695,243.10	2,434,351.00	260,892.10
Interest accrued (not due)	1,000,417.62	1,007,483.98	$7,066.36*
Taxes accrued (not due)	240,978.81	224,092.39	16,886.42
Total	$13,624,773.71	$8,227,507.84	$5,397,265.87
Provisional Accounts.			
Sinking fund accrued	$295,042.53	$302,681.97	$7,639.44*
Improvement fund (K. C. & M. Ry. & Bridge Co.)	7,563.47	10,112.77	2,549.30*
Total	$302,606.00	$312,794.74	$10,188.74*
Grand total liabilities	$294,770,221.70	$274,931,131.14	$19,839,090.56
Profit and loss	5,882,042.35	3,470,978.25	2,411,064.10
Total	$300,652,264.05	$278,402,109.39	$22,250,154.66

NOTE.—In stating the assets and liabilities of the companies covered by this report, for the current fiscal year, the holdings of the St. Louis & San Francisco R.R. Co., in the bonds and capital stocks of leased and auxiliary lines have been eliminated, and for the purpose of comparison similar changes have been made in the 1906 figures.

*Decrease.

†$566,304 of this amount was included in "Funded debt" of the K. C., Ft. S. & M. Ry. Co., in the June 30, 1906, report and the remainder, or $2,720,000, in "Equipment notes outstanding."

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS.

THE BRITISH AND EASTERN CONTINENTS edition of the Railroad Gazette is published each Friday at Queen Anne's Chambers, Westminster, London. It contains selected reading pages from the Railroad Gazette, together with additional British and foreign matter, and is issued under the name Railway Gazette.

CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.

ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

CONTENTS

VOL. XLIII., No. 17. FRIDAY, OCTOBER 25, 1907.

The annual report of the Treasurer of Yale University just published repeats the story of the bed-rock value of non-speculative railroad securities in the face of and in contrast with any shrinkage of prices in Wall street. The report is very instructive as showing the nature and results of railroad investments very conservative in nature and, at the same time, very varied as to railroad properties and their location. Out of some 200 separate Yale investments in bonds of all classes 138 are in railroads and street railways; and out of 69 stock investments 38 are in railroads. Of the 174 railroad and street railway investments of the two classes, bonds and stocks, practically none are in default as to either interest or dividends. Other features of the report supply evidence in the same line. Out of 269 stock and bond investments of all kinds 174, or nearly 65 per cent., are in railroad and railway stocks and bonds. The subgroups are not given separately, but the whole group returns 4.82 per cent. income on book value, the bonds, of which 69 per cent. are railroad and railway bonds returning 4.77 per cent. Again the Yale Treasurer refers to his present investment policy as specifically including "railroad bonds and short time notes" and the railroad bonds held rise from $2,118,384 in the fiscal year 1905-6 to $2,658,723 at the end of the past fiscal year, or an increase of more than 25 per cent. Yet again, the shrinkage for the fiscal year ending June 30, 1907, is returned by the Yale Treasurer at about 4½ per cent. on the whole group of 269 investments so largely composed of railroad stocks and bonds. There has, of course, been an added contraction since last June, but it can be reckoned at more than equalling the previous contraction and still leave a good relative showing for the conservative railroad investments of a great educational institution in such a period of great market value shrinkage as the present one. The non-default of interest and dividend payments on the 269 Yale investments certifies another familiar fact in terms of high magnitude. It is anomalous that vast shrinkage of capital nowadays should leave incomes unimpaired just as it is anomalous that so few failures should follow in its wake. But both anomalies are cheering and they can hardly persist much longer without bridging the gap completely between the low ebb of railroad values and the upward turn of the fiscal tide.

The paper on Failures of Steel Tires, by George L. Norris, chemist of the Standard Steel Works, read at the October meeting of the Western Railway Club, which is reprinted with illustrations in this issue, is an interesting and exhaustive study of the causes of failures of steel tires in service. Failures due to inherent defects in the steel from which the tires are made are comparatively few at the present time because of the great advance in the art of special steel making in recent years. Mr. Norris gives in his paper only passing mention of the method of making the blooms from which the tires are rolled, as practiced at the works with which he is connected. As a supplement to the information and photographs contained in his paper as presented, we have incorporated in the article as Figs. 5, 6 and 7, three photographs showing typical fractures obtained in cutting the blooms from the long octagonal ingots into which the molten steel is cast. In order to produce such perfect ingots, the greatest care is exercised in every stage of the process, starting with the melting of the metal in the furnace. Round-end octagonal ingot moulds are used and the ingots are cast from the bottom with the large end up. This allows free escape of the gases. The shape of the ingots and the bottom pouring prevent the formation of fins at the bottom and shrinkage cracks through the body of the metal. These cracks if present would open up during the process of upsetting the bloom under the press preparatory to rolling the tires. In addition to these precautions the ingot moulds are thoroughly heated before pouring to prevent sudden chilling of the molten metal. This assists greatly in getting rid of the usual honey-combing around the edges of the ingot. The ingots, when cold, are made into blooms by cutting partially through with a tool in a lathe and then breaking the remaining metal by driving a wedge in the tool groove. The top is discarded and the remaining portion of the ingot is cut up into from four to six blooms, depending on the size of tire. The three photographs show the uniformly perfect fractures obtained. The metal is free from honey-combing around the edge or blow holes scattered through the interior of the metal. The central pipe shown in the two left-hand sections of Fig. 6 and any excessive segregation is usually entirely cut off with the top discard. Where a small pipe extends into the center of the second piece it is got rid of by punching out the center during the process of manufacture of the tires.

The annual meeting of the Railway Signal Association, reported last week, marks real progress, though the discussions at the convention brought out very little that was new. The principal feature of the meeting, "Exhibit No. 1," of the report made by the special committee, is itself anything but new in its substance; but it is important in what it represents. In deciding to reduce the

number of essential signal indications to sixteen (Numbers 1—3; 5—16, and "C") the committee has done a valuable service; and this service has been done by such competent men, by means of such a thorough discussion in committee, that the report will stand as a permanent landmark. Opposers may succeed in delaying the adoption of the improved practice called for by the report, but the reasonableness of the committee's scheme cannot be controverted. Railroad signaling in America has suffered greatly from a diversity in appliances (and, to a lesser degree, in practice), which probably is inevitable in so large a country; and it is the existence of this diversity, with the need of reducing it, that gives importance to this report. Without resolute action, by a united association, in support of this committee, the notion that there ought to be 30 or 40 signal indications is likely to spread, and to receive support. We do not discuss Exhibit No. 1, for to do so would require several columns of space. The adoption of each item was the result of the most thorough sifting of all possible considerations, and all this will be explained in the circular accompanying the letter ballot. Indeed, the success of the committee's action will depend in large measure on the letter ballot; for to secure the triumph which the report deserves there should be a large, intelligent and enthusiastic vote in both the Railway Signal Association and the American Railway Association; and this will not be possible without a full, detailed and clear explanation of the committee's action, so well prepared that no lukewarm or ill-informed member can miss the point. This point is the necessity of simplifying and making uniform American railroad signaling, and of abolishing all its bad practices. The present report tells definitely what service the railroads want (or should want) their signals to perform. If all or a good majority will promptly agree on this matter, the committee will then proceed to tell how to arrange the signals so as best to fill the want. This was tentatively done in the report made a year ago, but the railroad public was not then educated to the point either of accepting the report or intelligently rejecting it. Now, with the present report, the subject can be taken up again, with more promise of progress.

In its statement of the "Basis of System," on the first page of the report, this committee has distinctly cleared the air. Every signal engineer should study every line of these half dozen paragraphs, if not for the correction of errors in his own mind, for the strengthening of his power to denounce error in others. For the reason given above, we do not here discuss the whole of the report; but this point, and the recognition of the single switch light, under "Explanation of Action," deserve special mention. Having set out to prescribe a perfectly consistent system, the members of the committee were under strong temptation, no doubt, to contrive something new, or at least, different, for the indication at an isolated switch; but they dared to be (superficially) inconsistent, thus promoting simplicity and economy. It is to be hoped that next year, in their recommendations, they will go further and prescribe for such switches a simple and rational target—say one of the simplest and most old-fashioned of those described in the *Railroad Gazette*, January 12, 1906—and also a limit for the height of both target and light. Switch lights can be sufficiently differentiated from semaphore lights by height alone.—The action of the Milwaukee meeting in spending a whole day on a code of specifications has once more shown how profitless it is to try to do committee work in such a large meeting. If a committee makes a poor report on such a subject—detailed specifications—the only remedy is to get a better committee, and wait another year. But in this case it was not a poor report. Many items were unacceptable to some of the members, and very likely justly so; but it is not the function of a new set of specifications to prescribe exactly what a certain engineer will desire to say in a certain place or on a certain branch of his subject. The most that a committee can do is to prescribe a form, taking care to mention every point that any user is liable to desire to insert in a contract, and in disputed or doubtful matters to draft such a paragraph as a majority will want. If the committee cannot make a satisfactory guess concerning the wishes of the majority it can give alternative readings, or it can leave blanks. To use blank spaces would be the only way to satisfy some of the critics who spoke at Milwaukee; and probably that is the method that the committee will adopt in making some of its corrections; but it is to be borne in mind that a blank but poorly fulfils its function unless the committee tells very fully just what it believes ought to be put into the blank space. A main object in this work is uniformity, and every blank space offers a chance for unnecessary (as well as necessary) diversity. The true course with new specifications which are accused of being crude is that which has been taken by this Association with the insulated wire code—use temporarily the best that can be had, and keep a committee on the watch to introduce improvements when practicable.

RAIL CORRUGATIONS.

For a number of years a great deal of trouble has been experienced by street railway companies, from the corrugating of the upper face of the rail head. Innumerable theories have been advanced to account for this peculiarity, but very little in the way of real investigation has been done. Corrugating is not a peculiarity of street roads, for it is to be found on some steam lines, and has been particularly troublesome in India, but it is upon these street roads that it occurs to the greatest extent and has attracted the most attention. In fact, it has become, in some cases, a very serious item of expense. Much of the trouble has been attributed to the condition of the metal forming the rail, but there does not seem to be one atom of evidence to prove that the metal of the rail itself, or the method of its manipulation at the mill, has anything whatever to do with it. At the recent meeting of the American Street & Interurban Railway Engineering Association, held at Atlantic City, a report was rendered by a committee appointed to look into the subject of rail corrugations, in which the trouble is attributed to a vibration set up by the loading of the rail, and remedies are suggested which are claimed to have been effective. The report gives, in detail, the answers to the questions that were issued as a circular, and then the conclusions are drawn on the basis that the primary cause of corrugations is vibration, either in the rails or in the entire track structure. So that they may arise from any one of four causes: the vibration or lateral bending of the web of the rail itself; the rails being loose on their supports; the ties being loose on their foundations and the vibration or movement of the foundations immediately under the track structure. Which one of these defects or conditions caused the corrugations, can be ascertained by an inspection of the head of the rail. Each condition produces corrugations of a different character, not only in length and form, but also with certain other peculiarities difficult of explanation without referring to a case in point.

The reason given why these corrugations do not appear on steam roads, if they are due to vibrations, is that the comparatively loose rail is forced ahead by the great weight of the locomotive in the well-known long wave, and that there is very little slipping of the wheels of the trailer cars. In cases where trouble has been experienced on foreign roads, it has been found that, in almost every case, the rails have been held in chairs or were provided with some form of a cushion, and the probability is that there is a slight movement between the rail and its supports.

In the cases of street rails that were reported to be free from corrugations and yet were very loose, it has been found that the corrugations really existed, but the distances between crowns, or the pitch was so great that they were not perceptible under the conditions of ordinary inspection.

By measuring the amount of bending or buckling in the web of the rail it has been found, in some cases, to be as much as $^3/_{32}$ in.

It has been noted by some roads that corrugations were appearing on rails laid on a concrete base, but in every case that has come to notice the rails had been temporarily supported by wooden ties, concrete being tamped under the base of the rail between the ties with no provision made for taking up the shrinkage, which always takes place during the settling and drying of the concrete.

In many cases where track is constructed in this manner the rails seldom have a continuous or uniform support, by reason of their not having anchorages or holding-down devices other than spikes in the ties, spaced at long intervals. This results in a slight movement of the rail on its foundation, and soon causes corrugations to appear, although quite frequently where light rail is used the trouble comes from the bending or buckling of the web of the rail, as noted above.

In concrete road-bed construction, it seems absolutely necessary to provide some means of drawing the rail down on its bed, thereby taking up the shrinkage and preventing any liability of the rail moving on its foundation. In this class of construction, vibration can be prevented only by providing a rail of the proper design and an absolutely uniform and continuous support.

When the trouble in tie construction is found to have been

caused by loose rails or ties, the only remedy is to grind or file the head of the rails, and to immediately follow this work by firmly securing the rails to the ties and by tamping, using a coarse gravel wherever the foundation is found to consist of soft or spongy material.

Corrugations in light rails, due to the bending of the thin web, are difficult to remedy without considerable expense, but after the heads have been filed to a comparatively smooth surface, it has been found that setting the track to a slightly wide gage will sometimes prevent a recurrence of the defect.

That there is something in this bending of the web of the rail to account for this corrugation is shown by the fact that about two years ago steps were taken to obviate the trouble by increasing the thickness of the web of the rails on one road to $\frac{9}{16}$ in. By this means the corrugation has been reduced on a system of 600 miles to a very small percentage. It is added in conclusion, that the price of this immunity is eternal vigilance, and the expenditure of considerable sums of money when any form of wooden support is used.

STILL BETTER BRAKES

A third terrible fatal derailment within a recent period, and caused by failure to check the speed of the train on a curving approach to a dangerous curve, has happened in England under circumstances which suggest some general lessons, both there and here, in the value of the quickest acting brakes.

In July, 1906, at Salisbury, a train at high speed was derailed on a sharp curve where the speed limit was 15 miles per hour, killing 28 persons. In September, 1906, at Grantham, a train at high speed was derailed on a sharp curve where the speed limit was 15 miles per hour, killing 14 persons. On October 15, 1907, at Shrewsbury, a train at high speed was derailed on a sharp curve where the speed limit was 10 miles per hour, killing 16 persons. In each case, either the vacuum brake failed to work at the critical time, or three persons, the driver, fireman and guard, failed to do their duty. One physical condition is alike in the three cases, namely: In nearing each of these three dangerous curves the driver normally begins to check from high speed while the train is passing through a curve.

It has been demonstrated and published that the older forms of vacuum brake ball-valve, still largely in use, are liable to erratic action. This is, in brief, the discovery that the ball can, under certain circumstances, be so displaced as to allow the air to be slowly admitted to the vacuum chamber above the piston, and thereby impair or lose the efficiency of the brake. The governing circumstances are that the train needs to be moving at high speed, and that the brakes be applied, and released, to slightly check speed while on a curve with sufficiently short radius so that centrifugal force prevents the return of the ball to its valve seat, and causes the brake to be temporarily inoperative. At Salisbury and Grantham the drivers and firemen were instantly killed and, lacking their evidence, we can only incline to the belief that these accidents were due to a dangerous form of brake valve. If no other explanation is found for the similar derailment at Shrewsbury it will be cumulative evidence of mechanical defect.

It seems to be clear that the original failure of the British companies, in the seventies, to adopt a standard, either compressed air or vacuum, for braking trains has so divided the business that there has been a lack of incentive to invention and application of improved brakes. In the vacuum brake, with the exception of an automatic feature, the improvements have been comparatively slight.

The history of the air brake in this country has been marked by four epochs, and we are now apparently entering on a fifth stage. There has been a successive adoption for passenger service of four distinct forms, each better than the other, and made standard as rapidly as the efficiency of the later form over that of its predecessor was adequately demonstrated. The fifth and the latest improvement gives an increased emergency efficiency of from 15 to 20 per cent. In connection with a supplemental air supply and a graduated release feature, it reduces to a minimum the existing small chance of brake failure due to incompetent handling. While this is not yet in the "adequately demonstrated" group to the extent that demands its wholesale adoption, nevertheless it has been applied to the electric equipment of the New York Central, Pennsylvania, Long Island and other roads and made standard on the Atchison. Judging by the past, it is sure to receive such consideration as its merits warrant, and this ready attitude is fully justified by a study of the results of accidents. In all the 159 principal accidents reported on by the Interstate Commerce Commission for the last year, brake efficiency was a marked factor, and in so far as the percentage of that efficiency can be increased there will be a lessening of the serious results.

Train Accidents in September.[1]

Our record of train accidents occurring on the railroads of the United States in September includes 18 collisions, 24 derailments and two boiler explosions, 44 accidents in all. This record is not published in full except in the cases of the few accidents which are especially prominent in the present instance six collisions and four derailments. The record of "ordinary" accidents—which term includes, for our present purpose, only those which result in fatal injury to a passenger or an employee or which are of special interest to operating officers—is given at the end in the shape of a one-line item for each accident, showing date, location, class, and number of deaths and injuries. In this tabular statement the italics indicate items which are explained in detail. This record is based on accounts published in local daily newspapers, except in the cases of accidents of such magnitude that it seems proper to send a letter of inquiry to the railroad manager.

The month of September had four train accidents which may be called of first magnitude: the collision at West Canaan, N. H., on the 16th; the derailment at Norris, Iowa, on the 6th; the collision near Bellaire, Ohio, on the 28th, and one at Tehachapi, Cal., on the 26th. The New Hampshire collision, due to an error in the train number in a despatcher's order, was reported in the *Railroad Gazette* of the 20th. The railroad commissioners of the state have investigated the case and they think that the weight of evidence is against the despatcher who, it is believed, put the cipher into the order, in place of the figure 4, which should have been put there, because a previous order relating to train No. 30 was before him when he was carrying out this operation. It does not appear that the commissioners unequivocally condemn the despatcher, though they exonerate Greeley, the station operator, from all blame. The only recommendation in the report is that the despatcher at Concord should not be required to go downstairs to deliver train orders, as he is liable to have to do during a few hours on Sunday morning.

The derailment at Norris, Iowa, on the 6th occurred nearly opposite the station. It caused the death of 13 passengers and the injury of six; one employee was killed and five injured. The passengers killed and injured were all in the smoker, which is said to have been a strong car, in first class condition. The passenger train was running at regular speed. A freight train was standing on the side track, and the trucks of the tender of the passenger engine, supposedly derailed several hundred feet west of the switch, when they struck the switch caused the passenger engine to turn over against the freight engine, badly damaging both. The mail car, baggage car and smoker were demolished. No defect was discovered in cars, engine or track, which would have caused the derailment.

In the collision near Bellaire, Ohio, on the 28th, six passengers, three employees and one other person were killed and 20 passengers and two employees were injured. In this collision, occurring at 2.40 p.m., an eastbound express train ran over a misplaced switch and collided with a freight train which was moving on the westbound main track. The engines of both trains were wrecked, and the smoking car was telescoped by the baggage car so that every seat was demolished. Every person in this car was either killed or injured. The collision is charged to the forgetfulness of a telegraph operator who had neglected to change the switch.

The collision near Tehachapi, Cal., on the 26th, caused the death of eight Greek laborers and the injury of 20, a work train being run into by a freight near the entrance to a tunnel. It is said that the comrades of the victims attacked the trainmen after the collision, so that a force of armed men was sent to protect the trainmen.

The collision at Dillard, Ore., on the night of the 12th was a case of a freight train entering a side track not under proper control. It collided with and damaged five work train cars occupied

[1] Abbreviations and marks used in Accident List:

rc.....Rear collision.
bc.....Butting collision.
xc.....Other collisions; as at crossings or in yards. Where only one train is mentioned, it is usually a case of a train running into a standing car or cars, or a collision due to a train breaking in two on a descending grade.
b.....Broken.
d.....Defective.
dr.....Defect of roadway.
eq.....Defect in car or engine.
n.....Negligence.
unf.....Unforeseen obstruction.
unx.....Unexplained.
derail.....Open derailing switch (negligence of engineman or signalman).
ms.....Misplaced switch.
acc. obst..Accidental obstruction.
malice....Malicious obstruction of track or misplacement of switch.
boiler.....Explosion of boiler of locomotive on road.
fire.....Cars burned while running.
Pass.....Passenger train.
Ft.....Freight train (includes empty, engines, work trains, etc.).
*Wreck wholly or partly destroyed by fire.
†One or more passengers killed.

by laborers, standing on the side track. Five laborers were killed and five seriously injured. Of the killed, three were burned to death, the wreck having taken fire immediately from stoves in the outfit cars upset by the collision.

The collision at Allington, Conn., on the 15th, resembles that which occurred at Pittsford, N. Y., in June, in that the engineman is said to have forgotten a regular train which runs only once a week. In this case it was a Sunday train; in the Pittsford case it was a train scheduled to run only two days in the week.

The collision at Devore, Cal., on the 21st, was due to a long freight train becoming uncontrollable while on a steep descending grade. It collided with an empty engine at the foot of the grade and the wreck was mostly destroyed by a fire which broke out immediately.

The derailment near Kanawha Falls, W. Va., on the 2d, causing five deaths, was due to a broken rail. Three cars were overturned and fell down a bank. The rail was one weighing 100 lbs. per yard, made in 1898, but it had an interior defect which could not have been discovered by a surface inspection.

The derailments near New Florence, Pa., on the 15th, which were on the West Penn division of the Pennsylvania, are remarkable only because they were both caused by the same wheel failure; that of the flange of a wheel in one of the trains. The two trains were running in the same direction on parallel tracks, and the second derailment, which is classed as due to accidental obstruction, was caused by parts of the wreck of the first train which fell under the cars of the second.

In three derailments in this month the first vehicle to jump the track was the tender, and in two of these cases the engine was running backward. These three are in addition to those mentioned above, but in one of the above (Norris) it is thought that the tender was the first to leave the track.

Train Accidents in the United States in September, 1907.

Collisions.

Date.	Road.	Place.	Kind of Accident.	Kind of Train.	No. persons reported Kil'd.	Inj'd.
1.	Grand Trunk	Royal Oak.	rc.	P. & Ft.	0	2
*3.	Southern	Concord.	xc.	P. & P.	0	5
3.	Southern	Chattanooga.	rc.	P. & Ft.	0	5
3.	Texas & Pacific	Annetta.	bc.	P. & P.	0	2
6.	N. Y., N. H. & H.	Botsford.	xc.	P. & Ft.	1	0
7.	St. L. & San Fran.	Denison.	bc.	P. & P.	0	5
8.	L. S. & M. S.	Cleveland.	bc.	Ft. & Ft.	1	0
*12.	*Southern Pacific*	Dillard, Ore.	rc.	Ft. & Ft.	5	5
13.	D.L. & W.,N.Y.,S. & W.	Hoboken.	xc.	P. & P.	0	4
14.	H., E. & W. Tex.	Houston.	bc.	Ft. & P.	1	2
15.	*N. Y., N. H. & H.*	Allingtown.	bc.	P. & P.	1	12
16.	*Boston & Maine*	W. Canaan.	bc.	P. & Ft.	25	26
*21.	*Atch., Top. & S. Fe*	Dwight.	xc.	Ft. & Ft.	6	0
23.	Mo., Kan. & Texas	Evansville.	bc.	Ft. & Ft.	4	0
26.	*Southern Pacific*	Tehachapi.	xc.	Ft. & Ft.	8	20
†28.	*Balt. & Ohio*	Bellaire	xc.	P. & Ft.	10	22
29.	Seaboard.	Alamo.	xc.	Ft. & Ft.	4	0
29.	St. L. & San Fran.	Stanton.	bc.	P. & Ft.	3	20

Derailments.

Date.	Road.	Place.	Kind of train.	Cause of derlmt.	No. persons reported Kil'd.	Inj'd.
1.	Iowa Central	New Sharon.	Pass.	ms.	1	2
†2.	*Ches. & Ohio.*	Kanawha Flls.	Pass.	b. rail.	5	9
3.	San An. & A. Pass.	Shavano.	Ft.	unx.	1	1
3.	Southern	Concord.	Pass.	unx.	0	4
4.	Mo., Kan. & Texas	Myra.	Ft.	loose rail.	1	1
4.	Balt. & Ohio	Sutervllle.	Ft.	mal.	0	0
4.	F. W. & D.	Tolbert.	Pass.	loose rail.	0	18
†6.	*Chic., R. I. & Pac.*	Norris.	Pass.	unx.	14	11
6.	Seaboard Air Line	McRae.	Pass.	unx.	0	7
7.	Chic., R. I. & Pac.	Caldwell.	Pass.	neg.	2	0
8.	Pennsylvania	Church Hill.	Pass.	unx.	0	1
8.	El Paso & S. W.	Escondida.	Pass.	beam.	0	0
9.	Texas & Pacific	Arlington.	Ft.	unx.	1	4
11.	C. N. E.	Lloyds.	Ft.	unx.	1	0
15.	*Pennsylvania*	New Florence.	Ft.	flange.	1	3
15.	*Pennsylvania.*	New Florence.	Ft.	acc. obst.		
17.	Denver & Rio Grande.	Pando.	Ft.	runaway.	3	0
17.	Lehigh Valley	Pattenburg.	Pass.	b. rail.	0	2
*19.	Great Northern	Wenatchee.	Pass.	unx.	0	1
21.	Illinois Central	Fulton.	Pass.	unx.	3	0
*22.	Southern	Ryan.	Pass.	b. rail.	0	32
22.	Pennsylvania	Burton City.	Ft.	boiler.	4	0
27.	Pennsylvania	Duncannon.	Ft.	hose.	0	12
*30.	St. L. & San Fran.	Dixon.	Pass.	unx.	2	1

Other Accidents.

17.	Chic., R. I. & Pac.	Ramah.	Pass.	boiler.	2	0
16.	Balt. & Ohio	Lorain.	Ft.	boiler.	1	2

Of the 12 serious electric car accidents reported in the newspapers in September, five resulted in one or more fatalities, namely, Schenectady, Chicago (South Side Elevated), Nazareth, Pa.; Toledo, Ohio; Elmore, Ohio.

The Interstate Commerce Commission has issued an interesting decision concerning the collection of demurrage for the detention of freight cars while on private side tracks. The opinion, by Commissioner Prouty, is in the case of the Cudahy Packing Company against the Chicago & North-Western. The complainant owns a warehouse at Deadwood, S. Dak., situated on a spur track built and maintained at the expense of the railroad. Demurrage at one dollar a day is charged if cars are not unloaded within 48 hours. The complainant desires to retain its cars upon this spur track both before and after they are unloaded for an indefinite time without payment of demurrage charges. The Commission holds that the fact that the defendant had constructed and maintained entirely at its own expense the spur track for the exclusive use of the complainant, would be no reason why the complainant should be relieved from the payment of these charges which are imposed upon the rest of the public. The construction and maintenance of this track is rather in the nature of a gift to the complainant and certainly could not be made the basis of any exception in its favor; and the question is in no way affected by the fact that the cars are owned by the complainant. This is as it should be, of course. The Commission, indeed, might justly have gone farther and have declared that the same rule would apply even if Cudahy had owned the track. The North-Western has the usual rule that if the consignee owns both car and track no demurrage shall be charged; but that rule is justified rather by expediency than by economy and justice. In this case the packer evidently desired to treat the side track as though he owned it. And well he might; for the company had about the same as given it to him. The owner of private cars may take them out of service whenever he pleases, unless he has agreed to keep them in service; but it is not a strained construction of the arrangement between the owner and the railroad to hold that such cars shall share with other similar cars the burden of keeping the general traffic moving; even perhaps to the extent of being used for some other shipper's goods if the owner has no immediate need of the cars. More important than this consideration, however, is the convenient use of the track. Demurrage is not charged solely as rent on cars, nor for rent and track room combined; but also for the purpose of facilitating switching and the promotion of prompt movement of freight generally. If a packing company desires to hold its cars out of service it should at least provide for them a track where they would not inconvenience the railroad switching crews in their handling of other cars. Demurrage collections must be managed under rather loose rules, at best; but this decision ought to suggest to the railroads that they abandon, so far as abandonment may be in the interest of economy, their rule exempting owners' cars on owners' tracks. If a railroad hires a car and pays for its use it should have the right to use it as its own car.

Erie Railroad.

The Erie is a railroad company on which the depression in the security market has fallen with particular severity. A year ago plans were authorized and work begun on making over the property into an efficient trunk line railroad. A new through line was to take the place of 70 of the first 89 miles westward out of Jersey City and new cut-offs were to be built further west. As a result of these improvements and others by which they were to be followed, grades and curvature, now severe, were to be greatly reduced all the way between New York and Chicago, with the intention of eventually getting a maximum grade of 0.3 of 1 per cent. both east- and westbound between Chicago and Port Jervis, and with the exception of one pusher grade, a ruling gradient of 0.2 of 1 per cent. east- and 0.6 of 1 per cent. westbound between Port Jervis and Jersey City. The Jersey City terminals were to be rearranged, enlarged and electrified, this improvement including an open cut four tracks wide through Bergen Hill, the narrow throat which lies just west of the passenger and fast freight terminal, whose double-track tunnel had for some time been insufficient. Work had been actively begun on several of these projects and it looked as though the time was within measurable distance when the Erie, freed from the handicaps of the mistakes of the past as reflected in the physical needs of the property, would be able, through greatly increased earnings, to overcome even the great financial mistakes of its past history—a result which was almost absolutely certain to come about if a thorough improvement policy could be carried out.

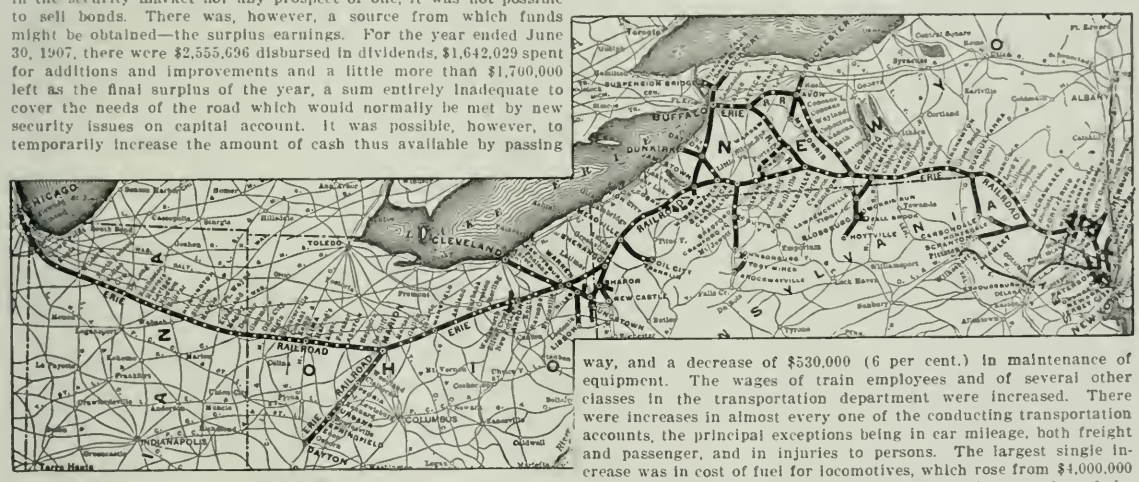
The Erie has had to depend on issues of bonds convertible into common stock, to finance the cost of its improvements. Up to June 30, 1906, $22,000,000 of these bonds were sold, while Erie common stock was selling around 45. With Erie common selling at below 20, as it does to-day, the convertible feature of such bonds is of small value and there is no market for them. Even before the stock market crash of last March the company, in the fall of 1906, with work actively under way on at least three of the new construction projects, found itself in need of ready money. Short term notes were issued. The report gives no facts about the note issues of the year and the information made public at the time was not always definite or final, so that it is not possible to give with certainty the exact amounts put out. According to the *Railroad Gazette's* record, however, between October 1, 1906, and January 3, 1907, $7,000,000 six-months 6 per cent. notes were sold at prices near par.

Then came the great decline in security prices. There fell due on April 8 $3,000,000 notes, and the Erie was for the moment in a tight place. These were refunded by $5,500,000 one-year credit notes which instead of being interest-bearing were discounted by the bankers like commercial paper. This is a more expensive process for the seller. At the price of about 90, at which the notes were reported to have been sold, the cost of the money to the Erie was 10 or 11 per cent., a prohibitive rate for railroad borrowings. The funds

thus obtained were all needed to meet notes which were falling due. Improvement work had been stopped in March. The most important of this was what is known as the Guymard cut-off, from Highland Mills, N. Y., west via Campbell Hall to Guymard, which is the station east of Port Jervis. This new 40-mile line was to take the place of a stretch of road with heavy grades and curvature. There was also a cut-off between Hunts, on the Hornell-Buffalo line, and Cuba, on the main line west of Hornell, on which work was suspended. These were the two pieces of work on which most had been done.

Before many weeks the situation brightened. Late in May the Erie borrowed $5,000,000 more on one-year notes, but on better terms than received for the notes sold in April. The two new cut-offs on which work had been stopped had been incorporated as separate railroads, the Guymard cut-off being the Erie & Jersey Railroad and the cut-off from the Buffalo division to the main line being the Genesee River Railroad. The Erie & Jersey issued first mortgage bonds and in June the Erie sold $3,000,000 three-year 6 per cent. notes secured by $4,000,000 Erie & Jersey bonds. In the same month the Genesee River was authorized to issue $6,000,000 first mortgage bonds and the Erie negotiated a loan of $2,000,000 secured by part of these bonds. Thus funds were provided for the immediate needs of the Erie and for carrying on the most important of the construction work which had already been begun.

Then came the question, how, looking toward the future, to further finance the improvements? The short term notes had been issued at high cost to provide funds immediately and absolutely necessary. This form of financing was too expensive to be followed except under compulsion. As there was no general improvement in the security market nor any prospect of one, it was not possible to sell bonds. There was, however, a source from which funds might be obtained—the surplus earnings. For the year ended June 30, 1907, there were $2,555,696 disbursed in dividends, $1,642,029 spent for additions and improvements and a little more than $1,700,000 left as the final surplus of the year, a sum entirely inadequate to cover the needs of the road which would normally be met by new security issues on capital account. It was possible, however, to temporarily increase the amount of cash thus available by passing



Erie Railroad.

the dividend payments. This, however, was a more extreme step than the directors thought necessary to take.

The expedient was adopted, as announced last August, of paying the dividends in scrip payable in 10 years with interest meanwhile at 4 per cent. This operation has been described as a forced loan from stockholders at 4 per cent., at a time when the Erie was paying 6 per cent. and over for money borrowed from other sources. In a sense this is true but it does not tell the whole story. It was within the power of the directors to pass the dividends altogether; in which case the stockholders would have had nothing at all for their dividend payments. There is special justification of scrip dividends in the present situation of the Erie. The road has great quantities of traffic, is well managed and needs only a series of improvements to put it in a strong position financially. Once established as a cheaply operated through line between New York and Chicago it should be able to make returns on all of its very large capitalization. Even now, preferred dividends are being earned and the stockholders for that reason should get returns. On the other hand, money cannot be borrowed at reasonable rates and without funds work will have to be stopped on important improvements and part of the money already spent wasted. Therefore scrip dividends are a reasonable compromise between passing out money to stockholders which is greatly needed for the eventual betterment of their property, and paying nothing at all. Through the funds thus temporarily obtained it is probable that part at least of the note issues maturing in 1908 can be paid without going to the security market for new funds.

From the earnings' standpoint the past year was a prosperous one, particularly because operating expenses were kept in hand and did not increase as fast as might have been feared. Gross earnings from railroad and other operations, not including coal companies were $53,900,000 against $50,000,000 in 1906, an increase of $3,900,000, or 8 per cent. Railroad gross earnings increased $3,700,000, which is in the same proportion. Railroad operating expenses were $1,900,000, or 6 per cent. larger than in the previous year, while net railroad earnings were $16,171,357, an increase of 12 per cent. over the previous year. The expenses of "other operations" were larger than the earnings, so that the net earnings from all operations were $15,747,788, against $14,129,797 in 1906. The railroad operating ratio was 68.12 per cent., against 69.71 per cent. in 1906.

This reduction in the operating ratio is a fortunate and unusual result in a year when the expenses of operation generally greatly increased. It was brought about partly by a reduction of 6 per cent. in the cost of maintaining the equipment. This decrease came mostly in locomotive repairs, where such a showing was not unnatural following a year in which 173 new locomotives, of which 118 were additions, were added to the equipment. In 1907 with four new locomotives received there was a decrease of 26 in the number of locomotives. The retiring of these 30 old locomotives from the equipment also helps to explain the decrease in the cost of locomotive repairs. Repairs and renewals cost $2,291 per locomotive, against $2,954 in 1906; $612 per passenger car, against $618 in 1906, and $69 per freight car, against $60 in 1906. Maintenance of way cost $2,346 per mile of line operated, against $2,139 in 1906. It therefore appears that the reduction in the Erie's operating ratio was not gained at the expense of maintenance.

Conducting transportation increased $1,530,000, or 9 per cent., against an increase of $179,000, or 11 per cent., in maintenance of way, and a decrease of $530,000 (6 per cent.) in maintenance of equipment. The wages of train employees and of several other classes in the transportation department were increased. There were increases in almost every one of the conducting transportation accounts, the principal exceptions being in car mileage, both freight and passenger, and in injuries to persons. The largest single increase was in cost of fuel for locomotives, which rose from $4,000,000 to $4,330,000. The good results of the year in the operation of the road are shown in the cost per locomotive-mile which, in the final analysis, is probably the most accurate single unit by which to judge railroad operating expenses. In spite of the increase in cost of fuel, supplies and wages, the total cost per locomotive-mile was reduced from 36 to 34 cents. The principal decrease was in the cost of repairs and renewals—a concrete illustration of the saving due to acquisition of new and modern motive power. There was an increase of 6 per cent. in the number of ton-miles, against an increase of 2 per cent. in the freight-train and freight-car mileage. The trainload rose from 455 to 472 tons and the carload from 19 to 20 tons. Although the average haul was slightly shorter, the ton-mile rate was 0.614 cents, against 0.598 cents in 1906, so that the freight earnings increased nearly $3,000,000, or over 8 per cent.

Passenger earnings, with a small decrease in the passenger-mile rate, increased 5 per cent. Of the 24,200,000 passengers carried, 23,500,000 were local passengers and 683,000 through passengers. There was a larger increase in through passenger travel than in the previous year. The increase of 7 per cent. in passenger miles was handled with an increase of 4 per cent. in passenger-train mileage but of 8 per cent. in passenger-car mileage.

The Erie does what few other railroad companies do in showing its freight traffic by commodities. A table is given showing the tonnage of the year and of the preceding year with the percentage which each class was of the total traffic, and, in addition, the increase or decrease in each class of tonnage both in amount and per cent. Only by including all these figures can an accurate idea of the business of the road be quickly gained, yet many roads give merely the tonnage by classes during the year, sometimes without even giving the percentage which each class is of the total tonnage.

This table shows that anthracite coal is the largest single item of the Erie's tonnage; 22 per cent. of the total last year, against 20 per cent. in 1906, this with an increase of 16 per cent. in anthracite tonnage. Bituminous coal was 19 per cent. last year, against 20 per cent. in 1906. The principal proportionate increases in tonnage during the year were in grain, flour and other mill products, 18 per cent.; cotton, 55 per cent.; fruit and vegetables, 46 per cent.; dressed meats, 13 per cent.; petroleum and other oils, 17 per cent.; sugar, 24 per cent.; bar and sheet metal, 55 per cent.; forest products other than lumber, 27 per cent.; anthracite coal, 16 per cent.; iron and other ores, 28 per cent.; salt, 12 per cent. Live stock tonnage decreased 22 per cent.; "other packing house products," 37 per cent., and agricultural implements, 33 per cent.

President Underwood speaks of the present status of the construction work. The contemplated improvements to the line between Passaic Junction, N. J., and Highland Mills, N. Y., the eastern terminus of the Guymard cut-off, have been postponed. They will have to be carried out before the maximum benefits will be secured from the Guymard cut-off. As part of the plan for improvements east of Port Jervis, the Erie Terminals Railroad has been organized in New Jersey to build from a point on the New York and New Jersey state line, near Suffern, to the Hudson river; and the Suffern Railroad has been organized in New York to build from Suffern, on the present main line, to a connection with the line of the Erie Terminals company. These two companies will take care of the improvements south of Suffern.

Similarly in western New York, although the new cut-off from Hunts to Cuba is to be finished, its related line improvements between Hornell and Hunts and between Salamanca and Cuba have been postponed. The cut-off from Columbus, Pa., to Niobe, 13 miles, which is being built by the Columbus & Erie Railroad, has progressed satisfactorily during the year.

There are several interesting events not yet mentioned. The electrified line between Rochester, N. Y., and Mt. Morris, 35 miles, was put in operation in June and has already resulted in an increase of over 33⅓ per cent. in passenger earnings. This electrification was described in the *Railroad Gazette* of October 11 and October 18, 1907, with editorial comment in the earlier number. The American Locomotive Company in June delivered to the Erie the first of the three Mallet articulated compounds which are to be used as pushers over one of the worst summits on the road. These engines, which will push more than two consolidation locomotives of the heaviest type, represent the latest step in concentrated locomotive power. If they prove to be as successful in practice as there is reason to believe, they will probably eventually be adopted as a permanent type to strengthen the few points at which the regenerated Erie will have steep grades. A third feature of the year's operations which, though small proportionately, is of serious import to the company, is the increase of over 40 per cent. in taxes. This is almost entirely due to new laws in New Jersey whose legality is now being tested before the courts. During the year the contract with Wells, Fargo & Company for handling the express business on the Erie, which expired in 1916, was extended for a further period of 16 years.

One of the Erie's great problems has long been its suburban business. As will be seen even on the small scale of the map of the whole road, Erie lines are thickly clustered in the territory on the west side of the Hudson river between Newark, N. J., and Haverstraw, N. Y. The Erie has a tremendous commutation business which it is handicapped in serving. Betterment of the suburban service awaits the general terminal improvements at Jersey City, in particular the completion of the new four-track cut which is to be used entirely for passenger service. Eventually the ferry trip will be eliminated. A contract was made during the year with the Hudson & Manhattan, which is building two tunnels under the Hudson river, by which the Erie is granted the use of the tunnels now building, together with valuable terminal facilities in New York. This contract will become partially effective as soon as the first tunnel of the Hudson & Manhattan is put in operation, which will be within a few months. Once the Jersey City improvements are finished, the Hudson & Manhattan is to build additional facilities at that point and the contract can be carried out in full. Then the Erie should be able to offer a particularly attractive suburban service.

The last two years' operations, not including the New Jersey & New York Railroad, 37 miles, or the coal companies, are summarized below:

	1907.	1906.
Mileage worked	2,169	2,151
Passenger earnings	$9,158,282	$8,982,814
Coal freight earnings	13,135,409	12,649,493
Other freight earnings	25,114,683	23,506,444
Gross railroad earnings	51,194,113	47,161,102
Maint. way and structures	5,087,975	4,500,230
Maint. of equipment	8,117,536	8,677,901
Conducting transportation		
Traffic	907,923	901,771
Operation	18,107,485	16,641,723
Railroad operating expenses	33,579,959	32,059,130
Net railroad earnings	17,614,155	15,102,272
Net income	5,903,658	5,916,844
Additions and improvements	1,642,029	1,926,978
Year's surplus	1,705,933	933,975

St. Louis Southwestern.

The St. Louis Southwestern is one of the smaller Gould railroad properties. It lies directly in the territory of the St. Louis, Iron Mountain & Southern and probably on this account is managed quite independently of the other Gould railroads. It is not a great system, but a small compact railroad leading from various points in northeastern Texas, north through Arkansas and parallel to the Mississippi river to St. Louis. From the Mississippi river crossing at Illmo, Mo., to St. Louis, 138 miles, it runs over track used jointly with the St. Louis, Iron Mountain & Southern. The lines in Texas are owned by the St. Louis Southwestern Railway of Texas. The longest through line of the road, from Gatesville, Tex., to St. Louis, does not pass through the most important cities in the intervening territory, such as Fort Worth, Dallas and Sherman, Tex.; Shreveport, La.; Little Rock, Ark.; Memphis, Tenn., and Cairo, Ill., which are all reached by branches. The road is therefore largely dependent on the traffic which is produced along its own lines, a good deal of which gets the long haul from Texas to the Mississippi river gateways, as is shown by the average distance haul of the freight, which is 240 miles. The passenger travel is largely local, the average haul being 40 miles.

The St. Louis Southwestern is not and never has been a dividend paying road. The 1907 report is the sixteenth annual statement of the company's position. The railroad lines which were taken over in 1891 were of the lightest standard. The next few trying years gave no opportunity for making improvements, so that by the time that railroad prosperity returned in 1898 and 1899, the road was in need of almost everything. On June 30, 1897, there were only 24 miles of rail heavier than 56 lbs. to the yard in the whole mileage of 1,223 miles and all of this 24 miles of 75-lb. steel had been put in the track since June 30, 1894. There were only 94 miles of rock ballasted track and 347 miles of track ballasted with gravel and sand. Of the total of 1,223 miles, 736 miles were unballasted and 595 miles were unfenced. In the 1897 annual report the President urged the importance of continuing the work of fencing the track as the reduction in the amount paid for claims for stock killed and injured would make the expenditure a very profitable investment. These features of the condition of the property 11 years ago are suggestive in comparison with the road as it stands to-day.

On June 30, 1907, the total mileage of track with 85-, 75-, 70- or 60-lb. rails, mostly 75-lb., was 870 miles of the total of 1,310 miles owned. Of the same total, 859 miles were ballasted, leaving 451 miles of track, mostly in Texas, unballasted. At the same time all but about 300 miles of line were fenced. These figures deal with conditions on the lines owned and do not, as nearly as can be judged from the facts given in the report, include the lines over which the St. Louis Southwestern has trackage rights.

In the 1897 year gross earnings were $4,800,000, or $3,879 per mile of road and net earnings $888,000, or $726 per mile of road. Fixed charges and taxes, not including any payments on the second mortgage income bonds, were $954,000, leaving a deficit from the year's operations of $64,000. Last year gross earnings for the first time in the company's history were more than ten million dollars, or $7,267 per mile of road. Net earnings were $3,400,000, or $2,312 per mile of road; fixed charges and taxes, including $751,000 on the consolidated mortgage bonds which absorbed two-thirds of the second mortgage incomes, were $1,850,000, leaving, instead of a deficit as in 1897, a net income after charges of $1,700,000. This is a record of tremendous progress. It is due both to the growth and development of the Southwest and to the application of surplus earnings to the improvement of the property so that it has been in a position to handle the continually increasing traffic which has been offered to it.

Last year's record is the best in the history of the road. The increase in gross earnings was $1,600,000, or 17 per cent. Operating expenses increased $500,000, or 7 per cent., leaving net earnings of $3,360,000, against $2,290,000 in 1906, an increase of over $1,000,000, or 47 per cent. The operating ratio was reduced from 75 to 68 per cent. These are remarkable gains. No railroad outside of the Southwest can show any such favorable results for the past year. The St. Louis Southwestern shared the fortunate experience of the other Southwestern roads in not only getting a large increase in gross earnings, but in being able to save most of this increase for net, while most railroads in other sections of the country had to see their increased earnings being used up in operating expenses.

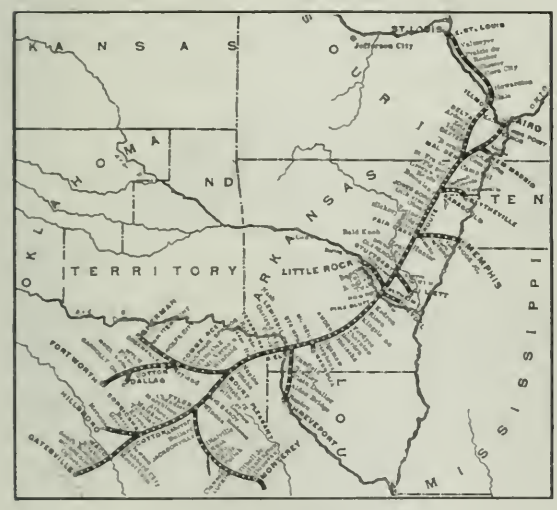
Whether this rate of progress or one anywhere nearly so large can be maintained during the present year is a question. Vice-President and General Manager Britton states, under date of September 16, that general business throughout the Southwest is in a healthy condition and an improved traffic movement may be expected. Indications point to a fair cotton crop in spite of the fact that its lateness makes it peculiarly liable to harm from early killing frosts. The demand for lumber and forest products continues good and the movement is limited only by the available equipment. Especially is there increased traffic in hard woods, oak, hickory,

gum and cypress. Many new hard wood lumber mills have been located along the line to use hard woods from lands from which the yellow pine has been cut off. Completion of this lumbering will leave the land ready for agriculture. A great deal of such land is constantly being cleared and put under cultivation, so that the acreage along the line devoted to agriculture is each year increasing. Besides this, immigration has continued and many new commercial enterprises have been located whose result will be reflected in the traffic of future years.

On the other hand, Mr. Britton has a less cheerful story to tell under the head of adverse state legislation. Of this much has been encountered during the past year, such as requiring additional train service, additional station buildings and viaducts where not needed, equipping locomotives with electric headlights, many reductions in freight rates and "harassments encountered through orders from the several state railroad commissions." In Texas, for instance, orders have been issued establishing accounting methods widely at variance with the Interstate Commerce Commission standard, resulting in duplication of records and accounts and a corresponding increase in expenses. A number of the laws and the orders of the commissions have been appealed to the courts.

In regard to the reduction of passenger fares by law, Mr. Britton speaks as follows:

During the past year, in obedience to public clamor, the legislatures of the states of Arkansas, Missouri and Illinois enacted 2-cent passenger fare laws which went in effect on April 10, June 19 and July 1, 1907, respectively, in the states named. While these laws apply only to intrastate business, their effect has been to compel this company and other railroad companies similarly situated to reduce their interstate passenger rates as well. Up



St. Louis Southwestern.

to the time the first of these laws became effective, the increase in the volume of passenger traffic and the revenues derived therefrom, in the states named, was about 15 per cent. over the corresponding period of the preceding year, attributable to the very satisfactory business and crop conditions prevailing and to the development and colonization of the territory tributary to this line. While this increase was most gratifying, the volume or density of the passenger traffic by no means warranted or justified the large decrease, nor in fact, any decrease whatever, in the passenger rates. Since these laws became effective, the passenger revenues of the company, in the territory affected thereby, have shown a decrease, instead of an increase, compared with the same period of the preceding year. While it is hoped that the volume of passenger traffic will continue to increase in proportion to the natural growth of the country and its population, the passenger business, which has always been more or less unprofitable in the Southwest on account of the sparsely settled condition of the country will continue to be so for some time to come, unless some relief from these confiscatory rates can be obtained through legal process. With this object in view, the Missouri law is now being tested in the Federal courts on constitutional grounds."

The trainload in 1897 was 160 tons and the carload 11 tons, both including company freight. Only six years ago, the trainload was 236 tons and the carload 15 tons. Last year the trainload was 323 tons and the carload 18 tons. These figures are for the entire system. The Texas lines for the first time had a trainload of over 200 tons, while the average trainload on the lines north of the Red river was 426 tons, a satisfactory figure for a Southwestern road even though most of its mileage is through line. One strong point in the operation of the road is the fact that there is almost an equal amount of tonnage in each direction. The northbound tonnage is 54 per cent., and the southbound tonnage 46 per cent. of the total. Last year the southbound tonnage increased more than the northbound. This is shown in the reduction of percentage of empty car mileage to total car mileage from 28 to 25 per cent.

The total freight revenue increased $1,2[illegible], or 18 per cent. This was due both to an increase of 8 per cent. in the number of revenue ton miles and of 9 per cent. in the ton mile rate. The number of passenger miles increased 16 per cent., and the total passenger revenue 18 per cent., while the average revenue per passenger mile increased 2½ per cent., which was possible because the passenger-rate deductions did not take effect until nearly the end of the fiscal year. There was a decrease of three miles, or 7 per cent., in the average passenger trip end, as a result, a decrease of 5 cents, or 5 per cent., in the average revenue per passenger.

There were some very large proportionate increases and decreases in the individual articles of tonnage. Wheat decreased 27 per cent., oats, 52 per cent.; corn, 44 per cent., and "other grain and mill products," 15 per cent., while the rice tonnage increased 122 per cent.; fruits and vegetables, 30 per cent.; cotton, 84 per cent., and cotton products, 110 per cent. In justification of its title, "Cotton Belt Route," these last two classifications made up over 11 per cent. of the total tonnage. This as against 6 per cent. in the previous year. As most of this is through traffic, it is easy to see that the fine cotton crop of last year, more than any other one thing, was responsible for the road's prosperity. Under the head of manufactures and miscellaneous there were decreases of 11 per cent. in tonnage of sugar and molasses, 27 per cent. in petroleum and other oils and 57 per cent. in rails. On the other hand, castings and machinery increased 30 per cent.; wines, liquors and beers, 41 per cent.; agricultural implements and carriages, 41 per cent., and general merchandise, 21 per cent. The total of this group was 19 per cent. of the total tonnage, an increase of 10 per cent. over the previous year. The tonnage, as a whole, increased 8 per cent. over 1906 and was slightly over 3,000,000 tons, of which a little more than 2,000,000 tons originated on the road.

Nearly $1,500,000 was spent on additions and betterments during the year. For these expenditures, however, the treasury was reimbursed by consolidated mortgage bonds which are being held subject to future sale. There was over $321,000 advanced from the treasury for the same purpose, against which no bonds have yet been issued. The principal items among the additions and improvements were: Roadway and track, $500,000; new side tracks, $150,000; new roundhouses and shops, $163,000; rails, $109,000, and new buildings, $104,000. At Pine Bluff, Ark., a modern steel and concrete car shop equipped with the latest machinery and a new power house have been built. The company now hopes not only to repair and replace all of its existing car equipment, but to build new cars from time to time. There were 115 miles of track laid with 75-lb. rails replacing 56-lb. rails. Work is now in progress ballasting the line between Mt. Pleasant, Tex., and Fort Worth, 154 miles. The bridges of the road have been improved, the two most important new bridges being one over the Brazos river at Waco, Tex., the other over the Red river at Shreveport, La., giving the St. Louis Southwestern its own line into Shreveport. At the same time the maintenance expenditures included in operating expenses were larger than in the previous year. Maintenance of way cost $1,308 per mile of line owned, against $1,257 in 1906. Repairs of equipment cost $2,071 per locomotive, against $2,040 in 1906; $706 per passenger car, against $636 in 1906, and $71 per freight and work car, against $53 in 1906—this last a noticeable increase to place the freight car maintenance on a proper level. There was a slight decrease in cost of repairs per locomotive mile, showing greater efficiency in power. There was an increase of 10 per cent. in number of locomotives and of 16 per cent. in total tractive power during the year. On the other hand, there was a decrease in the number of freight cars, a result which probably would not have come about if investment conditions had been more favorable. If its traffic continues to increase in the way it has during recent months, the St. Louis Southwestern will soon need to order new freight cars.

The St. Louis Southwestern has $20,000,000 preferred and $16,500,000 common stock outstanding. These are now selling at about 35 and 15 respectively. The surplus of $1,571,497 earned last year after interest on the still remaining income bonds and after miscellaneous deductions, is equal to 5 per cent. on the preferred stock and 3½ per cent. on the common. The stockholders have had a long time to wait for any return on their holdings, but at the present rate of progress a dividend on the preferred stock would seem to be inevitable within a year or two. However, if the business reaction which is freely predicted, affects the Southwest, dividend payments will probably have to be postponed for a number of years longer. The railroad lies in territory which has a most hopeful immediate future so far as natural conditions are concerned, but which may, by severity in railroad legislation, cripple

its own growth and the growth of its railroads for several years. The last two years' results are summarized below:

	1907.	1906.
Mileage worked	1,454	1,452
Passenger earnings	$2,028,881	$1,713,474
Freight earnings	7,899,937	6,698,723
Gross earnings	10,553,135	8,989,564
Maint. of way and struct.	1,713,653	1,650,466
Maint. of equipment	1,383,417	1,189,334
Conducting transportation	3,707,592	3,433,387
Operating expenses	7,196,103	6,699,444
Net earnings	3,357,032	2,290,120
Net income	1,712,542	697,055
Income bond interest	130,420	130,420
Year's surplus	1,571,497	586,778

Pere Marquette.

The Pere Marquette, with over 2,000 miles of line, is the largest railroad now or for some time past in the hands of a receiver. The only other large road in such case is the Cincinnati, Hamilton & Dayton. The two went into receivership together on December 4, 1905, but their operations are kept separate. The annual report of the Pere Marquette just issued covers the first full year during which the road has been managed by the receiver, Judson Harmon; a year of successful progress in restoring a wrecked railroad property to independence.

As almost inevitably happens when a railroad company is forced into financial default, the road itself had been allowed to run down and wear out physically. The following table of the amounts spent during the last four years on maintenance per mile of line and per unit of equipment proves this concisely:

	1907	1906	1905	1904
Maintenance of way, per mile	686	679	720	533
Repairs of locomotives, per locomotive	1,975	1,890	1,940	1,333
Repairs of passenger cars, per car	426	427	441	409
Repairs of freight cars, per car	41	39	25	21

With the exception of the locomotive item, none, even of the present charges, are sufficient to permanently preserve the line or the car equipment. The record of the earlier years shows how inefficient were the tools with which the receiver was to work out the salvation of the property.

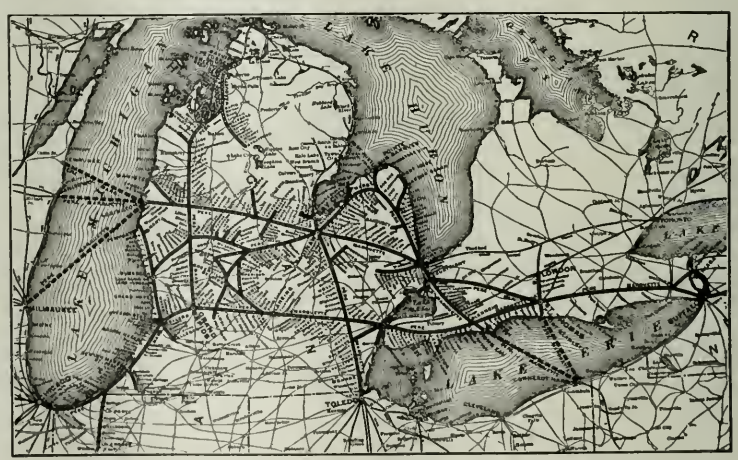
That, nevertheless, he has done this, is shown by the success, at a time when it was most difficult to raise railroad funds, of an offering of $5,000,000 five-year 6 per cent. notes. These were offered to the stockholders in June and the issue was considerably oversubscribed at par. Yet the preferred stock, instead of being a guaranteed 4 per cent. stock, as the Cincinnati, Hamilton & Dayton agreed to make it, is quoted at about 30, while Pere Marquette common, on which the C., H. & D. guaranteed 5 per cent., is quoted at 8. The proceeds of this issue are to be used to pay off the outstanding receiver's certificates and take the road out of the hands of the court and return it to the management of its stockholders.

At the same time the present preferred stock is to be exchanged at 115 for 4 per cent. first preferred stock, cumulative after 1910. Present preferred shareholders, however, who did not subscribe to the note issue are to receive new second preferred stock in exchange for their present holdings. Common stockholders are to exchange their holdings for an equal amount of new common stock, plus an additional amount of new common stock equal to the par value of any notes for which they may have subscribed.

This reorganization plan is to be voted on at a special meeting of the stockholders next Monday, October 28. It is likely to be carried and by the end of the year the Pere Marquette, entirely separated from the Cincinnati, Hamilton & Dayton, will probably begin a new period of its history as a solvent, independent railroad. That it will long remain independent, however, is doubtful, though the fact that it has parallel lines with both the Michigan Central and the Grand Rapids & Indiana may prevent it from falling, as it naturally would otherwise, to either the New York Central or the Pennsylvania. As it stands, it is a fairly compact group of lines in central Michigan, some of them of light traffic. Besides this central group of local lines, it has a through line with connections by trackage rights at each end with Buffalo and with Chicago, and car ferry connections across Lake Erie and Lake Michigan.

The property has fared well during the year just past. Gross earnings were $11,200,000, an increase of $784,000, or 6 per cent. over 1906. Operating expenses were kept down so that they required only $11,000 of this increase, and net earnings were $1,200,000, an increase of $710,000, or 21 per cent. There was a decrease, which amounted to almost as much as this gain in net earnings, in payments for taxes. Taxes rose from $414,663 in 1905 to $1,196,918 in 1906, owing to the final decision, against the railroads, in April, 1906, by the United States Supreme Court of the Michigan railroad tax case. The contested part of the taxes for 1902, 1903 and 1904, and the entire taxes under the new law for 1905, with a penalty of 1 per cent. a month on the deferred payments immediately fell due and were paid. Last year there were no such back payments and there was a corresponding reduction in taxes. Other fixed charges, however, increased by $143,000, leaving a net reduction in fixed charges of $576,000. The net income after charges was $432,000, against a deficit of $861,000 in 1906, an increase of $1,300,000 over the previous year's showing. This very favorable result is what makes it possible, fundamentally, to carry out a speedy termination of the receivership.

It will be observed that the satisfactory operating results were obtained not so much through increase in gross earnings as by keeping down operating expenses. As shown by the maintenance figures per mile of track and per unit of equipment, this was not done by spending less on the property. It was brought about by reducing the cost of the non-productive payments, conducting transportation and general expenses. In 1905, with 1,312,000,000 revenue ton-miles, conducting transportation cost $6,272,000. It was reduced $271,000 in 1906 and last year $31,000 more, so that in a year when there were 1,715,000,000 revenue ton-miles and when wages and supplies cost more than in the previous years, conducting transportation cost only $5,970,000. General expenses were $381,000 in 1905, $408,000 in 1906, and last year were reduced to $365,000, less than the 1905 figure. The largest decrease under this head was in law expenses, which were $26,000 against $48,000 in 1906. Salaries of general officers were $69,000, against $76,000 in 1906. The principal changes in the conducting transportation account were increases in wage payments, fuel, loss and damage and advertising; and decreases in cost of handling fuel, injuries to persons, operating marine equipment (this a decrease of 25 per cent.), and outside agencies. Such a saving as the one in the cost of handling fuel is noteworthy, because it is a saving which represents increased efficiency and nothing else. Another economy of the same kind is mentioned incidentally in connection with one of the smaller improvements made during the year. New freight platforms and transfer sheds were built at Michigan City and at Detroit at a cost of less than $5,000. Through them a saving of $10,000 a year will be made in cost of transferring and switching freight at Chicago, Detroit and Suspension Bridge. Incidents like these prove that the present operating officers are taking advantage of chances for real economies.



Pere Marquette.

The better operation of the road is shown in a decrease in the number of empty freight car miles. The empty mileage was reduced from 36,500,000 to 31,000,000. The revenue trainload was increased from 312 tons to 322 tons, and the average carload by half a ton. There were only six instead of seven empty freight cars in the average train, while the larger loading was carried in the same number of loaded cars as in the previous year. In spite, therefore, of a small reduction in the ton-mile rate, the average revenue per freight-train mile increased from $1.86 to $1.90.

The Pere Marquette's tonnage is made up 16 per cent. of agricultural products, 38 per cent. of mineral products, 20 per cent. of forest products, 12 per cent. of manufactures, and 12 per cent. of less than carload shipments and commodities not otherwise classified. There was an increase of 60 per cent. in the tonnage of fruits

and vegetables carried, which rose from 1.6 per cent to 2.5 per cent of the total tonnage. The tonnage of sugar beets increased 36 per cent and now furnishes 2 per cent., against 1.5 per cent. in 1906, of the total tonnage. There was an increase of 63 per cent. in anthracite tonnage, which rose from 3.6 to 5.7 of the total; but the amount of bituminous coal carried decreased. There were decreases in every classification of forest products, the total decrease being 12 per cent. In 1906 forest products made up 24 per cent. of the total tonnage, against 20.5 last year.

There are entries which hint at previous bad bookkeeping and insufficient maintenance. For instance, the receiver has charged over $1,000,000 during the year to profit and loss on account of depreciation of equipment. When the road was put in his charge there were on hand about 2,800 low-capacity, non-air freight cars and a number of old small locomotives. No provision had been made by previous managements for renewing this equipment, or for charging off the depreciation from year to year while in service. In order to preserve what value remained, it was decided to dispose of these cars and engines for their scrap value. All of them have been condemned and charged off, and nearly all of them have been scrapped or sold for scrap value. Their original cost has been credited to equipment renewal account, and their estimated depreciation, amounting as already mentioned to over $1,000,000, charged to profit and loss.

The equipment was increased during the year by 4,000 36-ft. box cars of 8,000 lbs. capacity bought from the Pullman Company, delivered between October and March. In payment, $4,346,753 receiver's equipment notes were issued, of which $3,661,200 was for the cost of the cars and $685,553 for accrued interest to maturity. These notes, issued in two series, are payable monthly, the final maturity of one series being 1913 and of the other 1914. To-day, according to the receiver, 70 per cent. of the freight cars have been bought within the last four years, while the rest are in good repair and will be available for heavy service for many years. The breaking up of the old cars and the purchase of a large number of new cars, puts the Pere Marquette equipment in position to compare favorably with that of any railroad in the United States.

The receiver was able to provide funds to put down heavier rails on over 80 miles of track. There were 35½ miles of 85-lb. rail laid on the main line, principally on the Toledo division. This released 75, 70, 67 and 60-lb. rail which, with 10 miles of 70-lb. rail released during 1906, was relaid at various points on 45½ miles of line of lighter traffic. This 45½ miles had been laid with 56, 40 and 35-lb. rails, most of which was scrapped and sold, the rest used for side tracks and repairs. New steel bridges on concrete abutments replacing wooden bridges and pile trestles were built at seven points up to the close of the fiscal year and work was then in progress on seven more bridges of the same sort. General repairs were made to 28 bridges. There were 25 concrete culverts built replacing wooden bridges, wooden culverts and pile trestles; five more are under construction. During the year there was a net charge of $134,000 to additions and improvements.

The suit brought early in 1906 to annul $3,500,000 Pere Marquette bonds issued in July, 1904, to pay for stock of the Chicago, Cincinnati & Louisville, which was then taken into the "Great Central System," was settled in April, 1907. In consideration of $400,000 receiver's certificates and the abandonment of all claims of the Pere Marquette for advances to the Chicago, Cincinnati & Louisville, or for ownership of its stock, the $3,500,000 Pere Marquette bonds were surrendered and canceled. This settlement was approved by the court in the receivership cause and the certificates forming part of the consideration were issued by its authority.

During the year the amount of receiver's certificates outstanding was increased $619,180, as shown in detail by the following statement:

Amount outstanding June 30, 1906		$1,619,180
Issued during the year on the dates and for the purposes shown below:		
July 2, 1906, to provide funds to pay interest due July 1, 1906, on the following bonds:		
Pere Marquette R. R. Co., collateral trust indenture 4 per cent. bonds	$57,400	
Pere Marquette R. R. Co., consolidated mortgage 4 per cent. bonds	167,640	
Pere Marquette R. R. Co., refunding mortgage 4 per cent. bonds	181,140	
Flint & Pere Marquette R. R., Toledo division, first mortgage 5 per cent. bonds	10,000	
	419,180	
March 1, 1907, issued as the consideration, among other things, for the surrender of certain bonds of the P. M. R. R. Co., amounting to $3,500,000, with the unpaid interest notes or coupons issued therewith, and in settlement of certain litigation between the P. M. R. R. Co. and Wm. A. Bradford, Jr., and others	100,000	819,180
		$2,438,360
Less tax certificates issued May 5, 1906, paid and canceled Feb. 1, 1907		200,000
Total receiver's certificates outstanding June 30, 1907		$2,238,360

On April 15, 1907, the South Haven branch from Lawton, Mich., to South Haven, on Lake Michigan, 34 miles, was leased to the Kalamazoo, Lake Shore & Chicago Railway for 25 years. Accordingly this branch is not shown on the map. Steamer No. 5 was sold to the Barry Steamship Company. The proceeds of the sale are to be used to buy 59 new stock cars.

Receiver Harmon mentions the creation in Michigan of a railroad commission of three members which took office in September, and also the 2-cent passenger fare law of that state which took effect September 28. It appears that the commissioner of railroads made inquiry as to whether any contest of this law would be made by the Pere Marquette or by the receiver. He was informed that no contest would be made. On this point the receiver speaks as follows:

> This course was determined upon after mature consideration, and is due to the desire of the receiver and of all concerned to accept as controlling the public sentiment in Michigan on that subject, a desire which outweighs the well-grounded belief that such a rate is unreasonably low in Michigan when applied without reference to passenger earnings per mile of road. It is hoped that increased patronage by the people of the state will make good the substantial loss inevitably resulting from such a large reduction of passenger rates. If a maximum rate of 2 cents per mile shall prove insufficient to meet the expenses of the passenger service and to allow a fair return on the value of the property used in the passenger service it is expected that the people of Michigan will, on being shown that fact, modify the law and allow a reasonable rate to be charged.

This is a tone which might well long ago have been adopted by most railroad officers.

The closing statement of the report before being signed by the receiver is a sincere acknowledgement of the co-operation of the officers and employees in helping him work out the salvation of the property. While he is the executive head, it must not be forgotten that he can be only indirectly responsible for the successful operating results, which must be due to General-Manager Cotter and his assistants. Mr. Harmon's acknowledgment of the help which he has received, though brief, has a different tone from the generally rather perfunctory acknowledgments of this sort in a railroad report. It is as follows:

> The excellent showing for the year which the receiver is able to make, notwithstanding many adverse conditions, has been mainly due to the spirit and intelligence which the officers and employees have shown in the discharge of their several duties. This report would be incomplete without this acknowledgment of their intelligent devotion to the property and business of the road.

The principal results of the last two years' operations for the years ended June 30 are summarized as follows:

	1907.	1906.
Mileage worked	2,390	2,398
Passenger earnings	$3,431,021	$3,239,447
Freight earnings	9,902,158	9,665,899
Gross earnings	14,214,195	13,430,170
Maint. of way and struct.	1,639,447	1,627,307
Maint. of equipment	1,975,221	1,873,321
Conducting transportation	5,640,323	5,563,684
Operating expenses	9,977,351	9,933,994
Net earnings	4,236,843	3,497,076
Taxes	477,817	1,196,918
Interest and rentals	3,465,792	3,322,455
Fixed charges	3,943,609	4,519,373
Net income	432,222	$60,947*

*Deficit.

Baltimore & Ohio.

The year 1907 might easily have been a very striking one in the history of the oldest railroad company in the United States. The eighty-first annual report might have recorded the transformation of the Baltimore & Ohio from being the Pennsylvania's second line of defence, to be, in fact, as well as in potentiality, the eastern end and principal trunk line outlet of the Harriman lines in the West. But Mr. Harriman has had his hands full since the Union Pacific acquired 18½ per cent. of its stock in the latter part of 1906, and plans for uniting the Baltimore & Ohio with the Pacific roads, whether or not seriously planned, have not been carried out. The only closer connection which has been made between the Baltimore & Ohio and the Harriman lines has been the establishment of a new steamship line by the Southern Pacific from Baltimore to New Orleans.

Although most briefly mentioned in the report, probably the most important special event of the year was the aggressive action of the Baltimore & Ohio in connection with the foreclosure of the Chicago Terminal Transfer Railroad. The Chicago Terminal Transfer owns the Grand Central Station in Chicago, the terminal tracks used in connection with it, and a belt line around the city. The Baltimore & Ohio, with the Pere Marquette and the Chicago Great Western, uses the Grand Central Station and terminals. Interest on the bonds of the Chicago Terminal Transfer was defaulted January 1, 1905, and on April 16, 1906, a receiver was appointed. A decree of foreclosure on February 20, 1907, advertised the sale of the property on May 3, 1907. In order to protect its lease of its passenger terminal in Chicago, which seemed likely to be bought by the Hill interests and turned over to the Burlington for its exclusive use, the Baltimore & Ohio, under its rights as lessee, came forward with an offer to redeem the Chicago Terminal Transfer bonds at par, which was generally accepted by the bondholders. By this

action it appears to have safeguarded its right to occupy the Chicago Terminal Transfer property, in spite of the fact that the Hill interests held control of a majority of the Terminal stock. After extended negotiations an agreement is reported to have been reached under which it is believed that the Burlington and the Baltimore & Ohio will use the Grand Central terminal jointly. What will happen to the other roads is not known. The effect of this somewhat unexpected event on the Baltimore & Ohio's finances for the year was that $17,000,000 of the $27,000,000 raised by the new stock issue of September, 1906, was tied up temporarily, yet apparently for some time. In consequence, the road at June 30, 1907, was left with very little surplus working capital. Aside from this, the year has been one of no special developments. The road has carried more business than in the record year 1906 and at a slightly higher average rate for freight, in spite of which its net earnings are smaller. There is no such extensive campaign of improvement under way as there was in the summer of 1906. In general, the year has been a comparatively uneventful one.

The Baltimore & Ohio is a heavy traffic road. Most of its tonnage is low-grade heavy freight. These are the items in their order which make up the largest proportion of the tonnage:

	Per Cent.
Bituminous coal	39.33
Coke	10.05
"Other castings and machinery"	7.51
Stone, sand and like articles	7.07
Miscellaneous	5.91
Ores	5.70
Lumber, bark, etc.	5.28
Cement, brick and lime	3.95
Grain	2.52
Iron, pig and bloom	2.45
Anthracite coal	1.85
Merchandise	1.13
	92.75

No other classification furnished as much as three-quarters of 1 per cent. of the total tonnage. Of the groups mentioned almost every one is made up of heavy or bulky articles. The traffic center of the road is in the West Virginia, Pittsburgh and Cleveland districts, from which it carries bituminous coal and iron and steel products both eastbound to Baltimore, Philadelphia and New York and westbound to Chicago, Cincinnati and St. Louis.

Gross earnings were $82,200,000, against $77,400,000 in 1906, but this increase of $1,800,000 was all and more spent in paying for the handling of the increased traffic. Operating expenses were $5,400,000 larger than in 1906, so that there was a decrease of over $500,000 in net earnings. At the same time the operating ratio rose from 64 to 67 per cent.

Maintenance of way and structures increased $1,200,000, maintenance of equipment $934,000 and conducting transportation $3,200,000. The payments for wages were about $1,154,000 larger than in 1906, fuel and other supplies cost more and, on account of the accidents at Woodville, Ind., on November 12, 1906, and at Terra Cotta, D. C., on December 30, 1906, the item of injuries to persons rose from $276,000 to $773,000, an increase of nearly 200 per cent.

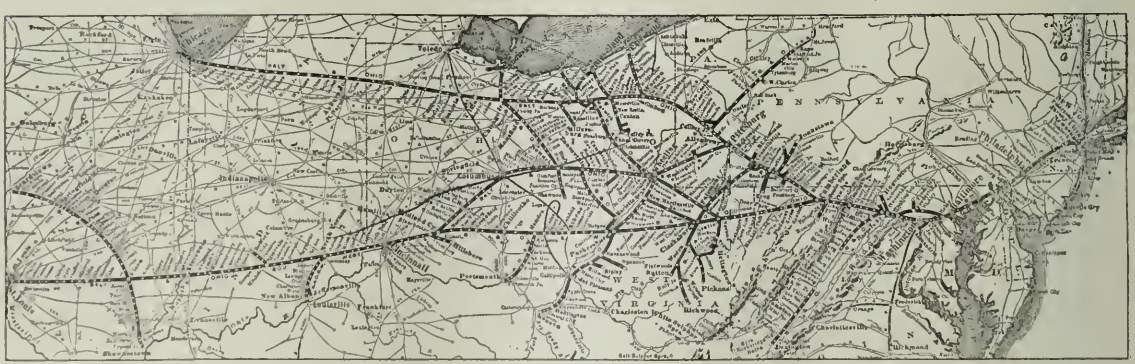
Maintenance of way cost $2,632 per mile, against $2,315 in 1906, this including no part of the more than $4,000,000 appropriated directly or indirectly for improvements, and $6,000,000 more charged to capital account. Equipment repairs cost $2,486 per locomotive, against $2,415 in 1906, $851 per passenger car, against $755 in 1906, and $84 per freight car, against $70 in 1906. The locomotive figures cover only the lines directly operated. The car figures are for the whole system, including nearly 500 miles of affiliated lines. Although the big increases in operating expenses were in the conducting transportation accounts, these figures make it evident that maintenance of both way and equipment was somewhat more liberal than in the previous year.

There is published an instructive table showing the principal facts of the freight and passenger movement for the last twenty years. In 1888, with 1,774 miles operated, there were 11,200,000 tons carried at an average rate of 0.656 cents per ton per mile. In 1899, with 2,042 miles of line and 25,000,000 tons carried, the average rate was 0.390 cents, the bottom figure. The next year the ton-mile rate rose to 0.455 cents, and in 1907 it was 0.570 cents. This is the highest figure since 1896, with the exception of 1904, when 0.582 cents was the average rate. Last year, with over 4,000 miles operated, there were 58,400,000 tons of freight carried. The average haul was 191 miles, against 195 miles in 1888. This table gives an idea of the steadiness of the road's traffic and the importance to the Baltimore & Ohio of the average rate received. With satisfactory rates it can make large profits; without them it has more to fear than most large railroads, for it must depend largely on its regular sources of heavy traffic.

In 1888 there were 7,100,000 passengers carried an average distance of 32 miles at an average rate of 1.861 cents per mile. This rate dropped to 1.540 cents in 1894. Last year it was 1.956 cents, against 2.006 cents in 1906. In 1907 there were 17,500,000 passengers carried an average distance of 41 miles.

The trainload was 433 tons, against 420 tons in 1906. The average carload was 23 tons last year. The average earnings per ton of all commodities, including soft coal, were 1.11 cents; the average earnings per ton of soft coal were 79 cents. The average distance haul of soft coal and of all commodities was almost exactly the same.

Among the principal improvements carried on during the year were the new passenger and freight terminals at Wheeling, W. Va., where a new line substitutes a 1.3 per cent. grade (the ruling grade between Wheeling and Pittsburgh) for a 3 per cent. uncompensated grade on a curve of 17 degrees, equivalent to a grade of 3.5 per cent.



Baltimore & Ohio.

This work, which is well advanced and should be completed by 1908, includes new masonry abutments, pier and retaining walls, excavation for street depression, changes of tracks and of street car tracks, steel work for elevated tracks, a new power plant and a new passenger station 90 ft. x 250 ft., with two umbrella sheds, each 620 ft. long.

At Washington, D. C., grading for the joint coach and engine yards north of New York avenue extended, between Florida avenue and Langdon, has been about 95 per cent. finished; about 70 per cent. of the tracks have been laid; two 25-stall engine houses, machine and blacksmith shop, oilhouse, storehouse, signal tower, battery charging station, boiler houses, two-story enginemen's building, car repair shop, locker and washroom building, sandhouse and steel coal tipple are about 98 per cent. finished. There are under construction a four-story storehouse, power plant, a brick chimney 150 ft. high, oilhouse and three sheds for airing bedding and cleaning carpets. The Rhode Island avenue bridge has been built and the New York avenue bridge is 90 per cent. finished. The operations of the Washington Terminal Company, controlled jointly by the Baltimore & Ohio and the Pennsylvania, which is building the Washington terminal station, had been $12,200,000 to June 30, 1907. The outside of the building, except cleaning down, pointing and putting on dome roof, is finished. The interior of the east wing is 96 per cent. advanced, the central section 90 per cent., the west wing 60 per cent., the concourse 96 per cent., the train sheds and platforms 90 per cent., the express building 95 per cent., the power house 98 per cent., the tracks 92 per cent., the interlocking and signal apparatus at K street 80 per cent. and at Massachusetts avenue 60 per cent. and the filling for the plaza 95 per cent. All masonry bridge work and filling, tunnel and girder work on both the north and south ap-

proaches has been finished. It is expected that train service will be begun next Sunday.

President Murray speaks as follows in regard to the state railroad legislation of the year:

There has been legislation on the part of a number of states which threatens most serious consequences to the carriers affected thereby. This action has been mainly confined to a reduction of the charge for the transportation of passengers to a maximum rate of 2 cents per passenger per mile. The state which action affects your lines, and the date such action became effective, are: Virginia, July 1, 1907, with an exception as to B. & O. lines fixing the maximum at 3 cents per passenger mile; West Virginia, May 21, 1907; Ohio, March 15, 1907; Pennsylvania, October 1, 1907; Indiana, April 10, 1907; Illinois, July 1, 1907. Compliance with the above legislation required a revision of passenger tariffs and rates, and it cannot be said at this time with any positiveness to what extent your passenger earnings will be affected; that the reduction will be considerable admits of no reasonable doubt. In some sections the incentive to travel may afford some possible compensation, but in others nothing of this character can be looked for, and the result as a whole is problematical.

The following table shows in brief form the operations of the last two years, rearranged where necessary, according to our usual practice. The figures cover the lines directly operated and do not include the results of the Valley Railroad of Virginia; the Ravenswood, Spencer & Glenville; the Ohio & Little Kanawha; the Cleveland Terminal & Valley, and the Cleveland, Loraln & Wheeling, which have a combined mileage of 456 miles and gross earnings of $4,151,936. The figures for the Baltimore & Ohio system excluding these controlled or affiliated lines, are as follows:

	1907	1906
Mileage worked	1,066	4,030
Passenger earnings	$14,117,117	$13,701,098
Freight earnings	64,625,946	60,002,204
Gross earnings	82,243,922	77,292,056
Maint. of way and struct.	10,542,499	9,330,859
Maint. of equipment	13,148,502	12,514,981
Conducting transportation	29,330,156	26,198,469
Operating expenses	51,880,091	49,515,221
Net earnings	27,363,831	27,870,835
Net income	18,561,302	19,142,275
Dividends	11,500,190	9,251,478
Improvement appropriation	1,115,672	4,077,973
Year's surplus	2,915,499	5,812,821

Nashville, Chattanooga & St. Louis.

The Nashville, Chattanooga & St. Louis is controlled by the Louisville & Nashville and forms the most direct connection between the Louisville & Nashville's line from St. Louis and Georgia railroads in which the L. & N. is interested—namely, the Georgia Railroad and the Atlanta & West Point. The territory in Tennessee served by the Nashville, Chattanooga & St. Louis embraces two of the three iron ore producing districts in the state, the bituminous coal fields on the Cumberland plateau northwest of Chattanooga and the phosphate beds southwest of Nashville. These beds are the largest known deposits in the world. Grain and lumber also contribute largely to the traffic of the road. A great variety of timber is native to Tennessee, and much of it is valuable hardwood. During the fiscal year ended June 30, 1907, the total tonnage carried amounted to 5,930,000 tons, of which 3,830,000 tons originated on the lines of the road. Of this total tonnage 16 per cent. was coal, 4 per cent. coke, 5 per cent. ores, 6 per cent. stone, sand and similar material and 2 per cent. phosphate rock. The bulk of the traffic in these classes originated on the lines of the road. Grain took up 16 per cent., flour 4 per cent., other mill products 3 per cent. and hay 3 per cent.; lumber amounted to 10 per cent. and logs, posts, wood, etc., to 3 per cent. Products of animals amounted to 2 per cent. Among manufactures the most important articles are brick, cement and lime, which aggregated 3 per cent. of the total tonnage, and bar and sheet metal, iron and rails, 4 per cent. Among the above products the more noticeable changes, as compared with the figures of the preceding year, were an increase of 13 per cent. in coal and coke, an increase of 29 per cent. in ores and an increase of 15 per cent. in phosphate rock. Lumber increased 59 per cent., while logs, etc., decreased 51 per cent. Grain increased 15 per cent. and flour 15 per cent., while other products of agriculture remained about the same. There was a falling off of 16 per cent. in live stock. Pig iron and bloom, bar and sheet metal decreased slightly. It is interesting to notice that although there were big increases in the amount of building materials, machinery, tools and household goods originating on the lines of the company, much of this seems to have been shipped to other territory. The amount of merchandise originating on its own lines decreased from 217,000 tons to 169,000 tons, while if the building materials, etc., had been for home consumption there would have been, presumably, a corresponding increase in the output of merchandise.

The history of the road dates back to 1854, when the Nashville & Chattanooga was built from Chattanooga to Nashville. The Nashville & Northwestern, from Nashville to Hickman, Ky., was built in 1869, and the two roads were consolidated under the name of the present operating company in 1877 and now form the main line, 229 miles long. There are about 300 miles of branches, which have been built or acquired from time to time from the early 'eighties up to 1890. Three of them run to the coal fields and others run to the phosphate fields and south to a connection with the Louisville & Nashville at Gadsden, Ala. The Western & Atlantic runs from Chattanooga to Atlanta, Ga., and was leased from the state of Georgia in 1890. The story of this state-owned road was published in the *Railroad Gazette* of August 2, 1907. In 1896 the Paducah & Memphis division of the Louisville & Nashville was leased, but its operations have been included in the accounts of the rest of the company only since 1900, when the lease was finally ratified. It runs from Paducah, Ky., south to a connection with the Nashville, Chattanooga & St. Louis at Hollow Rock, Tenn., about half way between Nashville and Hickman, and thence southwest to Memphis. The weights of rails on the Nashville, Chattanooga & St. Louis run all the way from 38 lbs. to 80 lbs., but, beginning with 1899, some 80-lb. steel has been laid each year, until now there are 278 miles thus equipped. Old trestles and bridges are being gradually replaced with steel girder and I-beam structures.

Gross earnings in 1907 were $12,240,000, an increase of $1,120,000; net earnings, $4,040,000, a decrease of $20,000. The operating ratio was 67.0 per cent. in 1907, 63.5 per cent. in 1906, 66.6 per cent. in 1905 and 63.5 per cent. in 1904. Large amounts for additions to property and equipment have been charged against income each year. The extent to which the company is turning earnings back into the road is still more noticeable in the maintenance charges during the last few years. Maintenance of way cost $1,413 per mile in 1907, as against $1,306 per mile in 1906, and $1,257 per mile in 1905. Maintenance of locomotives per locomotive cost $2,824 in 1907, $2,313 in 1906 and $2,470 in 1905. Maintenance of passenger cars per car cost $677 in 1907, $630 in 1906 and $552 in 1905. Maintenance of freight cars per car cost $74 in 1907, $63 in 1906 and $58 in 1905.

The company has $10,000,000 capital stock and $16,000,000 bonds, of which $6,300,000 are first mortgage bonds secured on the main line and maturing in 1913; $7,608,000 are first consolidated mortgage bonds of 1928, secured on the main line and branches; the rest are branch line bonds. The interest on these bonds amounted to $947,640 in 1907. Rentals were $626,460. These charges have been about the same for several years. The stock is now on a 6 per cent. basis, this being the annual rate of the last two semi-annual dividend distributions. In 1905 and 1906 5 per cent. annually was paid and in 1904, 4 per cent.

Nashville, Chattanooga & St. Louis.

The principal results of operation were as follows:

	1907.	1906.
Mileage worked	1,230	1,226
Passenger earnings	$2,407,401	$2,207,804
Freight earnings	8,967,426	8,104,876
Gross earnings	12,238,472	11,120,082
Maint. of way and struct.	1,737,619	1,601,666
Maint. of equipment	1,696,448	1,338,283
Conducting transportation	4,501,038	3,874,606
Operating expenses	8,203,003	7,035,492
Net earnings	4,035,469	4,055,490
Net income	2,233,528	2,243,413
Income appropriations	1,527,158	1,289,421
Year's surplus	106,380	453,992

NEW PUBLICATIONS.

*Railroad Operation in Italy.**

This is a lecture delivered at its request before a meeting of the engineers of Milan last June during the railroad exhibition held there—not a simple half-hour address, but a plump pamphlet of 166 octavo pages in its printed form. The subject was timely, for the first year of the operation of the railroads by the state had been distinguished by a confusion and blockade of traffic, perhaps greater than has ever existed elsewhere since the first days of railroads—a natural consequence of the transfer of a system by operating companies which had long known that they would no longer have to provide for the needs of traffic, to a government which had done very little to equip itself for the work until the railroads actually fell into its hands. And the selection of Signor Spera to discuss the subject was natural; for he had given a good part of his life to the study of it. As early as 1895 he published a volume on possible reforms and economies in the working of the Italian railroads, which had been chiefly in the hands of three great operating companies since 1885; followed it by a second volume on the same subject in 1897, and by a third in 1904, just before the state took over the railroads (mostly its own property before 1885) from the companies. These volumes had been interspersed with many other pamphlets and lectures on Italian transportation questions, and the author as delegate of the Minister of Public Works reported on the International Railroad Congress in Paris, to the Minister of Agriculture on the Chicago Labor Congress in 1893, and studied our railroads at the time of the International Railroad Congress in Washington. Thus we may assume that his opinions were mature and based on long observation and reflection and wide knowledge.

The circumstances affecting railroad transportation in Italy are peculiar. A long and narrow peninsula stretching out between two seas, cut off from the rest of Europe by the Alps, and divided longitudinally by the Appenines, it would have been difficult to plan an efficient railroad system to serve the whole country; and as when railroad construction begun it was divided among a number of independent governments, there can scarcely be said to have been any plan at that time. It is a country lacking the bulky freights which burden the railroads of such countries as Great Britain, Belgium, Prussia, Saxony and large parts of this country; lacking coal, and therefore the primary iron industries. The population per square mile is less than in several other European countries; but per square mile of cultivable land it is excessive. The great valley of the Po is one of the most fertile agricultural districts in the world, and one of the best cultivated; on the other hand the Appenines cover a wide belt where there is little cultivable land; and in South Italy, with few exceptions, farming is deplorably backward. The nearness of the sea to all parts of the country has had less effect on railroad transportation than might have been expected. There are comparatively few deep harbors; Geneva and Naples, on the main land, are really great ports, and Sicily is so well provided that it exports and imports chiefly by sea. On the other hand, the country is full of towns, especially small ones; and where these have industries the raw materials have to be brought in large part from the ports or from beyond the Alps.

No one unless intimately acquainted with the circumstances of a country and of its different parts is qualified to criticise its system of railroad operation. But it is certainly true, as Signor Spera says, that such system ought to be planned to suit the circumstances; and that while road and rolling stock should be specially designed for the peculiarities of the traffic, the best machinery for transportation will be effective only when a high degree of ability is engaged in working it; that the operating engineer is as indispensable as the constructing engineer. Here our author finds the weak point of Italian railroad management. Methods of operation developed in other and very different countries were imitated at first and have been adhered to after they had been proved inefficient. The country has many small cities or large towns, each of which is the traffic center of a limited district. Four-fifths of the journeys are for distances less than 62 miles; not one-eighth of the freight is carried as far as 186 miles, and 53 per cent. of it less than 62 miles. Now these short hauls in Italy are effected only by three classes of slow trains—omnibus, mixed and "accelerated," usually infrequent, and for many places leaving or arriving at inconvenient hours. The delays are such that local freight in a very large proportion of cases can be delivered more quickly when hauled by horses than when shipped by rail. The 7,200 miles of railroad in Italy had in a recent year 1,558 millions of ton-miles of freight traffic, or 209,000 ton-miles per mile of road. In this country in 1906 the freight movement was 970,900 ton-miles per mile of road, or nearly five times as great, though we had less than 400 inhabitants per mile, and Italy more than 1,000. Per inhabitant there were 47 ton-miles in Italy and 2,510 in the United States. The American railroad man evidently should be modest in applying his knowledge to Italian circumstances.

Without going into particulars of the reform proposed by Signor Spera, we may say that a chief feature of it is a strict separation of passenger and freight, light and frequent trains for the local traffic, running between local traffic centers 40 or 50 miles apart, the freight trains carrying a crew large enough to do all the loading and unloading at stations; and provision for the long distance and heavy traffic in the way of double-track, yards and stations, and some new lines, not so much unlike the work we are engaged in here.

The Chemistry of Commerce. By Robert K. Duncan, Professor of Industrial Chemistry at the University of Kansas. 263 pages; 5½ in. x 8½ in.; 59 illustrations. Published by Harper & Brothers.

Professor Duncan's theme is the applicability of science to modern industry. This does not seem to need proof, familiar as we are with the glowing articles in Sunday supplements hailing new discoveries and heralding revolutions in trade or transportation because of them. But it seems that manufacturers in this country do not read the Sunday papers; at least, there is a lack of what Professor Duncan calls the sympathy between learning and manufacture. The new processes described by him are almost entirely confined to Germany, although France and Italy are also ahead of us in using the investigations of chemists in improving their products, and, as the author says, "even in England there is abroad in the land the spirit of applied science." The function of the manufacturer is two-fold; it is to make as efficient an article as possible and to make money out of it. His success in the one should naturally depend on his success in the other, but in America, especially during the last few decades, he has been able through control of the market, to maintain or increase his earnings in spite of waste in production and comparative inferiority of his product. The problems of manufacture have been marked by the tariff, the abundance of raw material and the enormous demand that made competition mild. But now overproduction is in sight, the supply of raw material is to a great extent controlled by a few men and even the tariff is not eternal. In the last chapter of the book, the author describes a plan looking to the solution of these manufacturing problems whose solution is now becoming necessary. Industrial Fellowships may be established at the University of Kansas by manufacturing companies. The endowment, all of which goes to the holder of the fellowships, extends over a period during which the Fellow has the university's laboratory facilities in seeking to improve the manufacture of a specific product. His contract with the endower is broad and gives great advantages to both, while the university has the right, three years after the Fellow has finished his investigations, to publish a thesis embodying the results of his work, this, of course, having nothing to do with any patents that may be taken out. Professor Duncan's book is most readable; it is general, rather than specific, knowledge that he presents and so clearly that the reader absorbs it without conscious effort.

Explanation of Switch and Signal Circuits. By John T. Doran. New York: Doran & Kasner. Cloth, 137 pages. Price, $1.50.

This book describes the electric block and interlocking signal system installed in the Electric Zone of the New York Central. No statement is made to this effect although the language used assumes that the reader is well acquainted with the installation mentioned. The book is useful for the circuit plans contained, these being typical of an A. C. signal system applied to a road which is electrically operated. But the descriptions are incomplete and far from clear, and the reader gains no satisfactory idea of the signal system. The following announcement on the title page is unique: "A Handbook of Diagrams and Information for Electrical Signal Constructors and Maintainers at a Glance, all that ordinary Signal Men Need and Nothing They do Not Need." That a relay must be used with a track circuit, and that when more contacts are required than one relay will provide a second or repeater relay must be used are facts well known; but signal maintainers cannot be expected to realize this when told that "A track circuit governs the polyphase relay, which, when operated, completes the S. T." The author is much in need of the new signal dictionary, to learn that a signal having two or more home arms is not called a "root," as is stated on the circuit diagram shown, but is a route signal.

CONTRIBUTIONS

Seth Wilmarth and His Locomotives.

Yeadon, Pa., Oct. 5, 1907.

To the Editor of the Railroad Gazette:

Will you permit me to call your attention to two errors in my article on "Seth Wilmarth's Locomotives" in your issue of Sept. 27th? Beneath illustration of engine "Pioneer" your printers have named the date of building as 1871, and 1949 as the year in which the

*L'Esercizio Ferroviario in Italia, nei suoi rapporti con l'economia del paese e la scienza del transporti. Im l'ingegnere Giuseppe Spera, Roma, 1907.

"Fury" first appeared. These should be 1851 and 1849 respectively, and as the drawings show these latter dates distinctly we will in this case have to lay the blame on the shoulders of the long-suffering printers. C. H. CARTLEDGE.

Convention of the American Street and Interurban Railway Association, and Affiliated Associations.

The twenty-sixth annual convention of the American Street and Interurban Railway Association and its affiliated associations, the American Street and Interurban Railway Engineering Association, the American Street and Interurban Railway Accountants' Association and the American Street and Interurban Railway Claim Agents' Association was held at Atlantic City, N. J., Oct. 14 to 18 inclusive.

ENGINEERING ASSOCIATION.

The Engineering Association, which includes the mechanical, electrical and maintenance of way departments, held its meetings in the sun parlor on the Steel Pier from Oct 14 to 16, President H. H. Adams (Baltimore) in the chair. President Adams in his opening address laid particular stress on the work of the committee on "Standards," and strongly recommended the adoption of the committee's report. He acknowledged the hearty co-operation and assistance given this committee by the manufacturers and extended an invitation to them to take part freely in the discussions. Referring to one of the questions in the "Question Box" relating to the number of men employed in maintenance in the various engineering departments, he pointed out the value of comparative data in determining whether this work was being done as economically and efficiently as it might be with the facilities at hand.

Other addresses were delivered by John I. Beggs (Minneapolis), president of the "American" Association; Past President Olds (Milwaukee), who reviewed briefly the progress in electric railway engineering since its beginning, and C. L. S. Tingley, President of the Accountants' Association.

The following reports and papers were presented at the meetings: Control Apparatus, paper by F. E. Case, General Electric Co.; Maintenance and Inspection of Electrical Equipment, J. Lindall (Boston Elevated), chairman; Care of Electric Railway Tracks, paper by L. Wilson (Minneapolis); Rail and Rail Matters, Julian Griggs (Scioto Valley Traction Co.), chairman; Rail Corrugation, F. G. Simmons (Milwaukee), chairman; Standards, W. H. Evans (Buffalo), chairman; Open Versus Closed Terminals for Car Storage, E. W. Olds (Milwaukee), chairman; A Year's Experience with Gas Engines, paper by Paul Winsor (Boston Elevated); the Parsons Steam Turbine, paper by St. John Chilton (Allis-Chalmers Co.); Operation of Curtis Turbines in Railway Service, paper by A. H. Kreusi (General Electric Co.); Recent Developments in Steam Turbine Power Station Work, paper by J. R. Bibbins (Westinghouse Mach. Co.); "Question Box" of 55 questions. Some of these papers with the discussion on them will be reprinted in subsequent issues.

The officers elected for the coming year were: F. G. Simmons (Milwaukee Electric Railway & Light Co.), President; Paul Winsor (Boston Elevated), First Vice-President; F. H. Lincoln (Philadelphia Rapid Transit Co.), Second Vice-President; W. H. Evans (International Railway Co., Buffalo), Third Vice-President; J. W. Corning (Boston Elevated), Secretary and Treasurer; Members of Executive Committee, W. J. Harvie (Utica & Mohawk Valley), Wm. Roberts (Northern Ohio Traction & Light Co., Akron), E. O. Ackerman (Columbus Railway & Light Co.), John J. Murphy (Chicago Union Traction Co.).

"AMERICAN" ASSOCIATION.

The American Street & Interurban Railway Association met in the sun parlor on the Steel Pier, Oct. 16 to 18, with President John I. Beggs (Twin City Rapid Transit Co., Minneapolis) in the chair. President Beggs in his annual address first called attention to the fact that the Secretary of the Association now has permanent offices in the new United Engineering Societies Building, 29 W. 39th street, New York. He proposed a plan for the establishment of paid secretaries for all four of the affiliated associations and the maintenance of a statistician and other clerks to carry on the fast growing work of the associations. He regretted that the past year had been marked by very unsatisfactory relations existing between many of the companies, members of the American Association, and the municipalities in which they operated. He believed, however, that the wave of unreasoning prejudice, denunciation and unwise legislation was at its crest and is already beginning to recede. He ventured to predict that until a radical change is worked in the minds of the public it will be almost impossible to obtain additional capital necessary to make the extensions and improvements necessary to give to the cities and towns the transportation facilities which their increasing growth demands. He looked forward to the time when the several states would appoint intelligent and impartial commissions to investigate and regulate the conditions of operation and remove the company's property from the exploitation of grafting local politicians. The continued development of single-phase alternating-current machinery was gratifying but it should not be lost sight of that equally important developments were constantly being made in direct-current machinery. The matter of depreciation accounts was important particularly in view of the present agitation in favor of municipal ownership and valuation of public service properties.

The presidents of the three affiliated associations also spoke at the opening meeting and gave a brief report of the year's progress to the parent association.

The following committee reports and papers were presented at the meetings, some of which will be reprinted in subsequent issues with the discussion thereon: Car Wiring, J. W. Corning (Boston Elevated), chairman; Standardization of Equipment, H. C. Page (Springfield, Mass.), chairman; The Technically Trained Man and the Electric Railway Profession, paper by Prof. H. H. Norris (Cornell University); The National Fire Protection Association, paper by Ralph Sweetland (Boston, Mass.); Influence of the Design of Railway Structures on Economy of Operation, paper by H. T. Campion and William McClellan (Consulting Engineers, New York); Rules for Government of Motormen and Conductors, E. G. Connette (Worcester), chairman; Light Freight Handling by Electric Lines, paper by P. P. Crafts (Iowa & Illinois Ry. Co.); Freight Service on Electric Railroads, paper by H. H. Polk (Interurban Railway Co., Des Moines); A Department of Publicity, paper by J. H. White (Boston Elevated); Advertising from the Street Railway Standpoint, paper by A. W. Warnock (Twin City Rapid Transit Co., Minneapolis); Problems of a Small Road, paper by H. S. Cooper (Galveston Electric Co.); Insurance, H. J. Davies, chairman; Rules for the Construction of Car Houses; Municipal Ownership, C. D. Wyman (Boston), chairman; Heavy Electric Traction, Calvert Townley (N. Y., N. H. & H.), chairman; Compensation for Carrying Mail, G. H. Harries (Washington), chairman; Use of T-Rail in Cities, paper by C. Gordon Reel (Kingston, N. Y.); Public Policy of the Past and Future, paper by C. L. Allen (Utica & Mohawk Valley); Interurban Railway Fares, paper by Theodore Stebbins (New York); Municipal Ownership in Great Britain and the United States, paper by William J. Clark (New York); Public Relations, W. Caryl Ely (Buffalo), chairman.

The officers elected for the coming year were: President, C. G. Goodrich (Minneapolis); First Vice-President, J. F. Shaw (Boston); Second Vice-President, A. W. Brady (Anderson, Ind.); Third Vice-President, T. N. McCarter (Public Service Corporation of N. J.); Secretary and Treasurer, B. V. Swenson (New York).

CLAIM AGENTS' ASSOCIATION.

Meetings of the American Street and Interurban Railway Claim Agents' Association were held at the St. Charles Hotel, Oct. 14 to 16, with H. C. Bradley, Acting President, in the chair. The following papers were presented: Policy of the Claim Department to the Injured Employee, by R. H. Schoenen (Lehigh Valley Traction Co., Allentown, Pa.); The Claim Agent of To-day and His Work, by H. K. Bennett (Fitchburg, Mass.); How I Manage Bad Cases, by H. P. Vories (Pueblo, Colo.); Selecting and Training Investigators and Adjusters for the Claim Department, by E. C. Carpenter (Indiana Union Traction Co.); Making the Claim Department Effective, by C. B. Hardin (United Railways Co., St. Louis); Instruction of Employees in Accident Work, by F. W. Johnson (Philadelphia Rapid Transit Co.).

The following officers were elected for the coming year: President, H. R. Goshorn (Philadelphia Rapid Transit Co.); First Vice-President, A. J. Farrell (International Ry. Co., Buffalo, N. Y.); Second Vice-President, W. F. Weh (Cleveland); Third Vice-President, J. S. Harrison (Jacksonville, Fla.); Secretary and Treasurer, B. B. Davis (Columbus, Ohio).

ACCOUNTANTS ASSOCIATION.

The American Street and Interurban Railway Accountants Association met at the Chalfonte Hotel, Oct. 15 to 17, with President C. L. S. Tingley in the chair. The programme included the following papers and committee reports, some of which will be reprinted in subsequent issues: Amusement Park Accounts, paper by F. J. Pryor (American Railways Co., Philadelphia); Mechanical Devices and other Office Appliances, paper by F. E. Smith (Chicago Union Traction Co.); Where Maintenance Ends and Depreciation Begins, paper by J. H. Neal (Boston Elevated); committee reports on "Standard Classification of Accounts" and "International Standard Form of Report."

The officers elected for the coming year were: President, F. R. Henry (St. Louis, Mo.); First Vice-President, R. N. Wallis (Fitchburg, Mass.); Second Vice-President, W. H. Forse (Indiana Union Traction Co.); Third Vice-President, S. C. Rogers (Newcastle, Pa.); Secretary and Treasurer, E. M. White (Birmingham, Ala.).

Exhibits at the Street Railway Conventions.

The following were among the exhibitors at the American Street and Interurban Railway Association convention at Atlantic City, Oct. 14 to 19. The exhibits were arranged on the Steel Pier and all the booths and decorations were the same as used for the exhibits at

the M. C. B. and M. M. Association conventions last June. The exhibit was larger than in any previous year.

Adams & Westlake Co., Chicago.—Gravity ratchet brake handles; street car hardware; street and interurban railway signal lamps of all kinds; arc and incandescent electric headlights.

Allis Chalmers Co., Milwaukee, Wis.—Three car train (two motor and one trail car) air brake equipment with Allis-Chalmers OB governor and type J emergency valve; single car straight-air brake equipment; sectional models of governor and emergency valve; exhibit of essential parts of Allis-Chalmers improved Parsons steam turbine and large revolving racks containing pages from company's publications.

American Blower Co., Detroit, Mich.—One 80-in. steel plate fan, belt driven; one No. 5, type P, blower with nozzle outlet; one 5-in. x 5-in. type A, vertical engine, driven by direct connected generator run as motor; steam coil heater section; model of dry kiln; one 24-in. "A. B. C." disk ventilating fan.

American Brake Shoe & Foundry Co., Mahwah, N. J.—Exhibit of M. C. B. standard brake heads and shoes; proposed standard brake head and shoe, interchangeable with M. C. B. standards, for electric trucks having wheels of 3-in. tread or wider; proposed standard brake heads and shoes for electric trucks with wheels having treads less than 3 in. wide; standard brake heads and shoes adopted by the Central Electric Railway Association. Brake shoes include "Diamond S," Streeter, "U," and "Special" shoes, plain and flanged, with and without steel back reinforcement.

American Locomotive Co., New York.—Electric motor trucks for medium and high-speed service.

American Mason Safety Tread Co., Boston, Mass.—Samples of American Mason safety treads; Empire safety treads; Karbolith car flooring.

American Railway Supply Co., New York.—Employees' hat and coat badges.

Athu Steel Casting Co., Newark, N. J.—Cast-steel body and truck bolsters; Titan manganese cast steel motor gears for electric trucks.

Baldwin Locomotive Works, Philadelphia, Pa.—Class 90-40 electric motor trucks under W., B. & A. car exhibited on track by Niles Car & Mfg. Co., and equipped with G. E. 125 h.p., A. C. motors on each axle, 5½in. x 10-in. journals, steel tired wheels.

Carey Manufacturing Co., Phillip, Cincinnati, Ohio.—Samples of asbestos paper and millboard, all weights; asbestos wick, rope and sheet packing; 85 per cent. magnesia coverings; cork and wool felt coverings for low temperature insulation; magnesia flexible cement rooting.

Chicago Pneumatic Tool Co., Chicago.—Full line of electric and pneumatic tools; electric drills for A. C. and D. C. current, sizes from ¾-in. to 3-in.; grinders, tool post, pedestal and portable types; electric hoists, 250 lbs. to 2,000 lbs. capacity; electric track drill for bonding; electric drill for driving screw spikes.

Consolidated Car Heating Co., New York.—Electric car heaters, longitudinal and cross-seat types; portable vestibule heater; car heater and headlight switches; automatic cab heater switch; 600-volt signal system to replace dry batteries, to enable passengers to signal motorman or conductor; air motor system for operating doors of electric cars.

Cook's Standard Tool Co., Kalamazoo, Mich.—Standard car and track jacks; Standard and Climax track drills; track tool grinders and high speed drill bits; cattle guards.

Crocker Wheeler Co., Ampere, N. J.—Photographs of large power-generating stations.

Curtain Supply Co., The, Chicago.—Curtains of Pantasote, Oakette and Crown materials, equipped with Forsyth No. 86, Ring No. 88 adjustable and self-righting fixtures; Keeler eccentric fixtures for closed cars; Acme, Climax and Forsyth cable fixtures; Ring closed groove fixtures for open cars and for Brill semi-convertible cars.

Dearborn Drug & Chemical Works, Chicago.—Boiler compounds and methods of water treatment; samples of oils and greases.

Dixon Crucible Co., Jos., Jersey City, N. J.—Structural steel building painted with Dixon's silica-graphite paint; samples of graphite pencils, crucibles, lubricants; graphite gear grease; motor brushes; graphite products particularly adapted to street railway use.

Duff Manufacturing Co., The, Allegheny, Pa.—Duff ball-bearing jacks; Barrett trip jacks, Barrett automatic lowering jacks; Barrett armature lifts.

Edwards Co., The O. M., Syracuse, N. Y.—Exhibit of 26 designs of window fixtures; four designs of vestibule trap doors; shade rollers and roller sash balances; window fixtures for drop sash.

Electric Storage Battery Co., Philadelphia, Pa.—Type R 83 chloride accumulator cell of 5,000 amperes capacity; smaller cells for signal work, spark coils, etc.; carbon regulator; recording and regulating hydrometers; automatic cell filling apparatus; apparatus for regulating A. C. loads.

Evans, Almirall & Co., New York.—Photographs and plans of installations of the Evans Almirall system of water heating by forced circulation with exhaust steam.

Galena Signal Oil Co., Franklin, Pa.—Reception booth.

Garlock Packing Co., Palmyra, N. Y.—Samples of fibrous and metallic packing.

General Electric Co., Schenectady, N. Y.—Parts of 1,000 k.w. Curtis turbo-generator; G. E. railway motors; air-brakes; control apparatus; full line of electric specialities.

Gold Car Heating & Lighting Co., New York.—Exhibit of electric heaters and switches.

Goldschmidt Thermit Co., New York.—Specimens of work done with thermit, including welded motor cases, pipe joints, rails; specimens of metals free from carbon, including metallic manganese, chromium, molybdenum, ferro-vanadium, manganese-zinc, manganese-copper, manganese-tin, ferro-titanium, ferro-tin, etc.; crucibles, mold boxes and other apparatus used in the thermit process. Demonstrations out of doors of thermit welding of rail bonds, gear cases, etc.

Gould Storage Battery Co., New York.—Types S, U and O storage batteries in lead lined tanks; type O battery in Appert glass jar; sets of types WS and X storage couples; samples showing development of plates and photographs of storage battery installations.

Grip Nut Co., Chicago.—Square and hexagon grip nuts in all sizes.

Howe Sand Dryer, C. F. Towne, Sales Agent, Binghamton, N. Y.—A 10-ton capacity Howe sand dryer in operation; model of 20-ton capacity dryer, showing arrangement of vapor boxes and steam coil pipes.

Johns Manville Co., H. W., New York.—Victor combination meters, both portable and switchboard types; overhead line material; Noark fuses; Transite asbestos fireproof lumber; rail bonds; asbestos pipe covering, roofing and packing; J. M. friction tape and other insulating and fireproof materials.

Kalamazoo Railway Supply Co., Kalamazoo, Mich.—Root snow scraper and flanger; Improved Moore track drills; track drill chuck; high-speed track drill bits; Kalamazoo reinforced pressed steel wheels.

Kinnear Mfg. Co., Columbus, Ohio.—Full-size rolling steel doors for car barns, operated by chain and combined crank and motor hoists.

Lackawanna Steel Co., New York.—Abbott rail joint plates; Abbott composite steel and concrete tie; Abbott track gage plate.

McConway & Torley Co., The, Pittsburgh, Pa.—Pair of model cars fitted with Janney M. C. B. coupler and radial draft gear as designed for electric interurban and street cars, sample of Cox rail joint.

Maryland Railway Supply Co., Baltimore, Md.—Section of track showing the "Spike Strut" rail fastener as applied to standard T-rail and ties; a longitudinal section through a tie, exhibiting the action of the "Spike Strut" on the wood fiber and position assumed when driven home; Witherbee storage battery. Monarch metal polish.

Mummert, Wolf & Dixon Co., Hanover, Pa.—The "Plurality Die" bolt cutter; samples of bolt cutting dies.

National Lock Washer Co., Newark, N. J.—Models of car windows fitted with National cam curtain fixture; balance protected groove curtain fixture, sash lock and sash balance; samples of lock washers in different sizes and styles.

Norton Grinding Co., Worcester, Mass.—Pair of ground car wheels mounted on axle and revolving against indicators to show accuracy of wheels; standard street car axle finished by grinding; photographs of car wheel grinder; two panels showing samples of alundum grinding wheels and India oil stones.

Pantasote Co., New York.—Samples of Pantasote car curtains and seats upholstered in Pantasote.

Pittsburgh Pole & Forge Co., Pittsburgh, Pa.—Sections of tubular iron poles with hot process joints; rail bender.

Quincy-Manchester-Sargent Co., Chicago.—Q. & C. Bonzano rail joints for T and girder rails; Q. & C.-Stanwood car steps; anti-creepers; compromise joints; Samson rail bender.

Rail Joint Co., The, New York.—Exhibit of "Continuous," Weber and Wolhaupter types of rail joints for T and girder rails and compromise joints.

Ramapo Iron Works, Hillburn, N. Y.—Automatic switch stands; switches and frogs; tie plates.

Ridgway Dynamo & Engine Co., Ridgway, Pa.—Booth in concert hall with catalogues and photographs of power plant installations.

Riverside Metal Co., Riverside, N. J.—Reception booth in ballroom.

Samson Cordage Works, Boston, Mass.—Waterproof trolley cord; colored bell and register cord; wire center armature cord; solid braided rope.

Schoen Steel Wheel Co., Pittsburgh, Pa.—Two sets of motor truck wheels mounted on axles taken from service, one freight and one passenger, showing wearing qualities of Schoen rolled steel wheels; full line of sample rolled steel wheels for all classes of electric service.

Sherwin-Williams Co., The, Cleveland, Ohio.—Samples of all kinds of car, locomotive and structural paints and varnishes; pole paint; Insulating varnish and impregnating compounds.

Standard Paint Co., New York.—Samples of Ruberoid roofing, colored roofing and flooring; S. P. C. flexible iron fender paint; P. & B. baking varnishes; clear and black finishing varnish; air-drying and core-plate varnishes; S. P. C. armature and field coil varnish; electrical compounds; insulating tape.

Standard Steel Works, Philadelphia, Pa.—Rolled and forged steel wheels mounted on axles, taken from service; steel-tired wheels with various tire fastenings; pressed steel gears; cast steel gears and forged gear rim; helical and double elliptic truck springs.

Symington Co., The T. H., Baltimore, Md.—Proposed standard journal boxes for electric motor equipment; special journal boxes for third-rail shoe supports, etc.; Symington machine pivot journal box lid; Symington M. C. B. type lid; special journal boxes for street cars with limited clearance; Baltimore ball-bearing center plates and side bearings; Gilebrist rail chairs.

Underwood & Co., H. B., Philadelphia, Pa.—Samples of St. John self-adjusting cylinder packing; portable boring bar in operation; portable nulling machine in operation; portable crank pin turning machine; two-cylinder air motor in operation; portable Corliss valve seat boring bar; vacuum dash pots for Corliss engines.

U. S. Metal & Mfg. Co., New York.—Columbia lock nuts; Victor and Perfect car replacers.

Walworth Manufacturing Co., Boston, Mass.—High and low-pressure valves, steam specialties and tools; Walmanco high-pressure steam joint; safety water column; Neverstick blow-off cock.

Washburn Steel Castings & Coupler Co., Minneapolis, Minn.—M. C. B. type coupler for interurban cars applied with radial draft gear; box pilot coupler for electric locomotives; type K radial traction coupler; couplers for dump and ballast cars.

Western Electric Co., Chicago.—Electrose line insulation; Shelby trolley poles; Kalamazoo trolley wheels and hasps; deltabeston wire; Amazon and Dryfield tapes, and a full line of other electric specialties.

Westinghouse Companies, Pittsburgh, Pa.—The Westinghouse Electric & Manufacturing Company exhibited a full line of single-phase and direct current motors for electric traction; span of catenary construction with pantagraph trolley in operation; arc lamps; 500 k.w. Westinghouse-Parsons steam turbine open for inspection (joint exhibit with Westinghouse Machine Company); Union switch system of multiple control; single-phase electric locomotive (on track space). The Westinghouse Traction Brake Company exhibited AML equipment, electro-pneumatic brake system, portable blowing outfit, AMM and SME equipments, EL electric locomotive equipment, Westinghouse automatic car and air coupler.

Wharton, Jr., & Co., Inc., Wm., Philadelphia, Pa.—Exhibit of manganese steel special track work for steam and electric railways; spring switch throws, anti-kickers, tongue locks and other switch constructions.

Wilson Manufacturing Co., Jas. G., New York.—Sliding swing door with chain hoist; rolling wood door with glass panels for roundhouses; interlocking slat rolling steel door; solid sheet type rolling steel door; also drawings and photographs showing rolling doors electrically operated.

Yale & Towne Mfg. Co., The, New York. Duplex and triplex chain hoists of various sizes; electric trolley hoists; chain blocks; photographs of shop hoists.

Gas Engines in Street Railway Service.*

The Boston Elevated Railway Co. has now been operating gas engine plants for electric generating purposes for more than a year with very satisfactory results. At the Somerville power station there is a pair of gas producers, two gas engines of 600 h.p. and two 350 k.w. generators.

This plant was started in May, 1906, and since then has given continuous, reliable and satisfactory service. There have been no shutdowns, no accidents and no failures. The fuel has been soft coal, the same as used in our steam stations, mostly run-of-mine Pocahontas.

A great deal of water is used for scrubbing the gas and for cooling purposes. The average amount has been 281 lbs. per k.w.-hour. When this water was bought, as it was for a few months, it cost about twice as much as the coal. Since November, 1906, it has been pumped from a very dirty brook by means of two-stage centrifugal pumps, electric driven; and filtering through a pressure sand filter. This outfit has been entirely satisfactory and has given us no trouble. The suction lift is 12-ft. and the pressure at the pumps 30-lb.

The discharge of water from the gas scrubbers is very dirty,

*Abstract of paper presented to the American Street and Interurban Railway Engineering Association, in convention at Atlantic City, by Paul Winsor, Chief Engineer of M. P. & B. S., of the Boston Elevated Ry.

being full of floating lampblack, and is altogether too black to put back into our dirty brook. A sand filter basin 246 sq. ft. in area and tile under-drained, removes all of the lampblack, so that water is being turned back into the brook in a cleaner condition than when it was taken out.

During the first months, back fires and pre-ignitions were much too frequent, occurring almost every day. Lowering the compression on one of the cylinders changes in the igniters, and experience have reduced these troubles so that now two or three weeks are passed without a single one. This plant has proved absolutely reliable. It can be put into service any time in less than five minutes—much quicker than can our steam plants. It can carry good loads and do it continuously. Each unit has carried 450 kilowatts (652 brake horse-power) for an hour with swings to 495 kilowatts (717 brake horse-power).

For the first seven months of this year this plant used 2.034 lb. coal per k.w.-hour, while the steam plants averaged 3.477-lb. per k.w.-hour—a saving of 41.5 per cent. One of the smaller steam plants, containing three 200-k.w. compound condensing engines, used 4.414-lb. per k.w.-hour; this gas station used only 46.1 per cent. as much.

There is good evidence to show that a gas engine plant, making its own producer gas, will operate at least as reliably as a steam plant and will use from 30 to 60 per cent. less fuel, depending somewhat on the size of the gas plant, but principally upon the size of the steam plant. The drawbacks to the gas plant are the high first cost and the smallness of the size of the units, the largest gas engine now built, being of but about 3,000 kilowatt capacity.

Convention of the Superintendents of Bridges and Buildings.

The Association of Railway Superintendents of Bridges and Buildings held its seventeenth annual convention in the Republican Hotel, Milwaukee, Wis., October 15, 16 and 17. President J. H. Markley (T., P. & W.) was in the chair. The convention was welcomed by Mayor Becker, of Milwaukee. R. H. Aishton, General Manager of the Chicago & North-Western, delivered an address, in which he spoke of the importance of the work of this association, and suggested the adoption by it of standard methods and designs covering much of its work and thereby aiding the American Railway Association. The address of President Markley had for its chief theme self-reliance, and the members were urged to cultivate and exhibit this quality in the discharge of their official duties.

The present membership of the association, including nine new members taken in during the convention, is 374. The balance in the treasury is $1,370. H. P. Morrill (C. & N.-W.), C. W. Vandegrift (C. & O.), and J. H. Cummin (L. I.) were elected life members. Suggestions to change the name of the organization to The Railway Bridges and Buildings Association, also to change the time of meeting, were discussed, but both were rejected. The officers for the ensuing year are: President, R. H. Reid (L. S. & M. S.); First Vice-President, J. P. Canty (B. & M.); Second Vice-President, H. Rettinghouse (W. C.); Third Vice-President, F. E. Schall (L. V.); Fourth Vice-President, W. O. Eggleston (Erie); Secretary, S. F. Patterson (B. & M.), (re-elected); Treasurer, C. P. Austin (B. & M.), (re-elected); Members Executive Committee, A. E. Killam (I. C.), J. S. Lemond (Sou.), C. W. Richey (Penna.), T. S. Leake (Mo. P.), W. H. Finley (C. & N.-W.), J. N. Penwell (L. E. & W.). Washington, D. C., was selected as the next place of meeting.

There were two addresses delivered during the convention, the first being by W. H. Finley, Assistant Chief Engineer of the Chicago & North-Western, on the Quebec bridge and the failure of same. It was a discussion of the design of the structure as compared with other notable long-span bridges, particularly the Firth of Forth bridge in Scotland, and of the American type of structure as compared with other types; a denial of the assertion, made in many non-technical quarters, that the attempted span was too great for the present state of the art, and some comment regarding the possible cause or causes of the failure. The second address was by Prof. W. K. Hatt, of Purdue University, on the work of the Forest Service of the United States Department of Agriculture in investigating the strength of structural timber. He explained the elements influencing the strength of such timbers, exhibiting specimens sawed from different kinds of woods, such as long-leaf yellow pine, short-leaf pine, Douglas fir, etc.

Following its peculiar custom, the convention devoted the remainder of the first day and a part of the second to the discussion of last year's reports. Little new information of importance was developed; in fact, this customary threshing over of old straw seems of exceedingly doubtful value, since not only of itself is it of little if any profit, but it curtails seriously the time which ought to be devoted to the new reports. If the association will persist in this practice it should reverse its present procedure, disposing of its new reports first, and then devoting what time may remain to the reports of the previous year.

The standing-committee subject of water supply was the first of the new reports taken up. The report was merely the [illegible] results of some pumping tests made on the Illinois Central railroad. A member asked about the practice at some stations of turning the pump exhaust into the discharge line in order to raise the temperature of the water for locomotive use. No one had any information to offer on this subject, however. The matter of using kerosene in gasolene pumping engines received the next attention. One member reported using this oil after getting the pump started and heated up with the gasolene, saving considerable in the cost of operation. It was stated that gasolene engine makers would equip the engines for the oil, the change for a 10 or 12 h.p. engine, for example, costing about $50. Methods for using the kerosene engine were described. One member complained that in his use of the two fuels he had had trouble with the exhaust, which emitted smoke in variable, indicating imperfect combustion.

On "Fire Protection," standing subject No. 3, there was no report, but the subject was discussed. P. Swenson (Sou.) protects the bridge stringers with galvanized iron and reported that some which had been so covered for 17 years were still in good condition. President Markley allows his timbers to season for a year before covering with metal, which insures longer life through greater freedom from decay. But while the use of the galvanized iron unquestionably prolongs life, it prevents inspection, and is objectionable on this account, as has been brought out before in similar discussions of the subject. Mr. Killam (Int. of Can.) keeps all rotten spots adzed off the tops of the ties and bridge timbers, which has proved an excellent preventive of fires.

Mr. Sibley (N. Y., N. H. & H.) asked if water barrels were effective in proportion to the cost and trouble of keeping them constantly in condition for instant use. Mr. Canty (B. & M.) thought them undesirable and the continual loss of the pails a great bother as well as a continual expense. J. F. Parker said that on the Coast Lines of the Santa Fe they use metal barrels. Those on the bridge or trestle have a piece of burlap convenient for soaking in the water and dashing it on an incipient fire. The barrels at the ends of the bridge have hinged tops that are closed and locked with a switch lock. Queries about avoidance of freezing of the contents of protective barrels in cold weather brought statements that the use of a strong brine prevents this.

There was no discussion or other action on the report on "Fences, Road Crossings and Cattle Guards."

"Preservatives for Wood and Metal" brought out the usual queries and testimony concerning the life of creosoted timber, the amount of penetration obtained, etc. The advantages of crude oil as a preservative were spoken of by some members, but the greatly increased inflammability was a serious objection to its use. However, J. F. Parker reported that the Santa Fe has been using it for 10 years, soaking the timbers for entire bridges, and they give no thought to any augmented fire risk and have no trouble in that respect either.

On the matter of preservatives for metal, Mr. Penwell (L. E. & W.) thought there was nothing that comes up to red lead. Mr. Reid (L. S. & M. S.) told of a tar compound that is being applied to their track elevation bridge floors in Chicago. The workmen call it "dope" and it is highly effective, taking off mill scale when it is removed and leaving the steel surface bright and clean. The great problem, in connection with a suitable and effective preservative, is in getting the steel work properly cleaned for repainting, this being a vital point.

It was decided to make this subject of preservatives for wood and metal a standing committee subject.

In presenting the report on smoke-jacks, Mr. Lichty (C. & N.-W.) spoke of the maintenance troubles that the building department has with these very necessary and usually more or less unsatisfactory features of engine houses. The committee report, which is printed in part on another page, and the discussion in the convention, indicate a general preference for wooden jacks. In reference to the Chicago & Eastern Illinois' wooden jacks, A. S. Markley said they have had the design in use for 10 years or more and all of their houses are so equipped, except one built this year on which they are trying one of the patented materials. He asserted that weather conditions have far more effect on the action of a jack than its form. The drawing of the C. & E. I. jack reproduced in the report shows a cap on the top. This has been dispensed with as being a detriment to the free action of the jack. The amount of rain which the exposed top will admit is unobjectionable. Very few of these jacks, even of the first applied, have had to be removed on account of decay; there has been no trouble whatever from fire, since there is no place for soot and other fire-causing materials to lodge, and they do not have to paint them, relying instead on the soot and moisture to form a coating on the inside, which protects them effectually. Their cost, at present lumber prices, is from $20 to $25.

Mr. Penwell explained that the Lake Erie & Western jack shown in the report is newly adopted by them. It is square in section, costs about $60, and its life, based on past experience, is estimated at seven years.

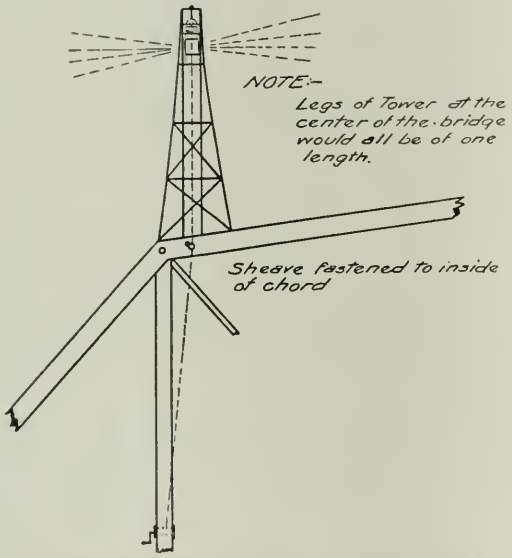
P. J. Onell (L. S. & M. S.) thought the weight of cast-iron jacks a very objectionable feature, 1½ or 2 tons in each panel of the engine house roof being sure to cause trouble unless the roof is specially designed or reinforced to sustain such a load.

Because of its interest it was agreed to continue the subject for another year.

The report on fastenings for freight house and other doors was not discussed.

"Towers and Guides for Drawbridge Lights" likewise received little discussion. The chairman of the committee stated that in investigating the subject he was surprised to discover that 68 per cent. of the railroads of the country have no drawbridges. This matter of character and location of lights for these bridges is controlled by the Government's lighthouse board, of course, the application being the point which each road determines for itself. Ease of placing and removing is the important feature, and the scheme of the Toledo, Peoria & Western shown herewith was considered the best of any reproduced in the report. Concerning it J. H. Markley said: "The one great advantage is that no guide for the lamps is needed until the bottom of the tower is reached; at that point the bale of the cage containing the lamp enters the guide head and is raised to the top of the tower. It matters not how much the lamp swings or in what direction, it cannot enter the guide head but one way, which is the right way. There is no climbing whatever to do; the operator stands on the deck of the bridge and with a ½-in. rope that passes over a pulley at the top of the tower, raises everything into position."

On the subject of protecting steel bridges against the action of



Toledo, Peoria & Western Railway's Method of Hanging Light on Drawbridge.

brine from refrigerator cars, while it was evident that the members are extremely anxious to have this evil corrected in some effective way, but realized their impotence to have the private car line owners respond to any demands they might make, or already have made. J. P. Snow (B. & M.), in a written communication, thought that Government aid should be invoked to compel the private car owners to act in the matter. A. S. Markley said that while the use of concrete decks on bridges eliminated the trouble so far as floors were concerned, that still left the rails unprotected and Government aid could be asked on the grounds of endangering traffic.

The subject of concrete building construction received no discussion. Also the subject of the action of sea water on concrete was only briefly discussed. Mr. Parker (A., T. & S. F.) said they had tried all kinds of imported and domestic cements for this use, and had found only one that is satisfactory, giving the name of the brand.

On "Expansion and Contraction of Concrete Walls," the discussion consisted almost entirely of citations by different members of observations and experiences in regard to the effect of temperature changes on such structures.

The following are the standing committee subjects for 1908.

1. Pile and frame trestle bridges.
2. Fire protection.
3. Fences, road crossings and cattle guards.
4. Construction of cofferdams.
5. Preservation of timber.
6. Coaling stations and cinder pits.

The special subjects for committee investigation and report are:

1. Waterproofing of concrete-covered steel floors and subways.
2. Modern equipment and tools for the erection of steel bridges.
3. Protection of structures against the effects of electric currents.
4. Protection of embankments from the effects of high water by riprap or otherwise.
5. Experience in the use of gasolene and kerosene engines, or combination of same, for water supply, drawbridges, etc.
6. Modern dwelling houses for section foremen and section men in outlying districts.
7. Reinforced concrete culverts and short span bridges.
8. Methods of erecting truss bridges, (a) under traffic, (b) free of traffic.

Bridge and Buildings Supply Men's Association.

At the Milwaukee convention of the Superintendents of Bridges and Buildings the exhibitors held a meeting and formed a permanent organization bearing the name given above. The officers are: President, Charles Ernshaw, Manager Standard Paint Co., New York; Vice-President, W. W. Johnson, Franklin Manufacturing Co., Chicago; Secretary, T. R. Wyles, Vice-President Detroit Graphite Co., Detroit, Mich.; Treasurer, S. Reid Holland, Eastern Granite Roofing Co., Chicago; Executive Committee: For one year, F. J. Johnston, American Hoist & Derrick Co., St. Paul, Minn., and H. A. Neally, Jos. Dixon Crucible Co., Boston, Mass.; for two years, J. T. McGary, American Valve & Meter Co., Cincinnati, Ohio, and C. C. Lazenby, Otto Gas Engine Works, Chicago; for three years, N. C. Durie, N. C. Durie Co., St. Louis, Mo., and J. H. Eames, Sherwin-Williams Paint Co., Chicago.

Following is the list of exhibitors at the convention:

Allith Mfg. Co., Chicago.—"Reliable" round-track door-hangers; fire underwriters' approved automatic door equipment; continuous parallel door equipment for freight stations, warehouses, etc.

American Hoist & Derrick Co., St. Paul, Minn.—Photographs of the "American" ditcher, hoisting engines, etc.

American Valve & Meter Co., Cincinnati, Ohio.—Catalogues, blue-prints, etc., of stand-pipe float valves, tank fixtures, switchstands, etc.

Barrett Mfg. Co., New York and Chicago.—General line of the Barrett specifications for roofing and water proofing; tar-rock sub-floors for machine shops and storehouses.

J. A. & W. Bird Co., Boston, Mass.—"Rex Flintkote" roofing, Ibex insulating and building paper, Bird's bull's-eye belting, Ripolin enamel paint and Rex red roof paint.

Buda Foundry & Mfg. Co., Chicago.—Carborundum tool grinders, ball-bearing bridge jacks, Buda reinforced lever scales and street crossing gates.

Carbolineum Wood Preseeving Co., Milwaukee, Wis.—Photographs of structures using "Carbolineum" wood preserver; testimonials, etc.

Philip Carey Mfg. Co., Cincinnati, Ohio.—Full line of "Carey" roofing for buildings.

Detroit Graphite Co., Detroit, Mich.—Samples of "Detroit" graphite paint, literature, etc.

Paul Dickinson, Inc., Chicago.—Dickinson cast-iron smokejacks and cast-iron chimneys and ventilators for roundhouses; photographs of roundhouses containing the Dickinson devices.

Jos. Dixon Crucible Co., Jersey City, N. J.—Dixon's silica graphite paint for steel bridges.

N. C. Durie Co., St. Louis, Mo., and Chicago.—Malleable iron washers for bridge and building construction.

Eastern Granite Roofing Co., New York. Granite roofing for buildings.

Fairbanks, Morse & Co., Chicago.—Literature descriptive of pumping plants, coaling stations, motor cars, etc.

Franklin Mfg. Co., Franklin, Pa.—Samples of asbestos lumber and shingles.

E. F. Houghton & Co., Chicago.—"Vim" leather packings for deep-well pumps; new "Vim" leather air-brake packings of steer hide, treated by new process.

H. W. Johns-Manville Co., New York and Milwaukee, Wis.—"Maguasite" smokejack, "vitribestos" smokejack, asbestos roofing and pipe covering, "keystone" hair insulator, asbestos building lumber, building papers, etc.; the "Exceloid" roofing.

Chas. R. Long, Jr., Co., Louisville, Ky.—Station and bridge paints.

J. C. McFarland & Co., Chicago.—"Alpha" double-hung hollow metal window frames for office, mercantile and factory buildings; photographs of buildings containing "Alpha" frames.

National Roofing Co., Tonawanda, N. Y.—General roofings, "Hydroclad" double-faced roofing for cement work, "Security" brand of asphalt roofing, and "Permanere" mineral asphalt paint.

Natural Carbon Paint Co., Freeport, Ill.—Samples of metals protected with "Mindura," showing effect of several years' wear under railroad bridges. Samples of pigment and ore from which pigment is prepared.

Otto Gas Engine Works, Chicago.—Photographs and drawings of coaling stations, water-softening plants, etc.

Arthur E. Rendle, New York and Western Paradigm Co., Chicago.—Full-sized models of "Paradigm" skylights and fireproof windows glazed with ribbed glass and wire glass, supplemented with full-sized details of all parts of the structures.

Standard Asphalt & Rubber Co., Chicago.—Waterproofing for concrete structures, bridge floors, etc., damp-proofing for buildings and protection against electrolysis, mastic flooring and brick paving with asphalt filler.

Standard Paint Co., New York.—"Ruberoid" roofing, "Flexlte" colored paints, and "S. P. C." iron paints.

Stover Motor Car Co., Freeport, Ill.—Six passenger gasolene motor inspection car.

Stowell Mfg. & Foundry Co., Milwaukee, Wis.—"Wilbern" adjustable hangers for freight house doors, latches for roundhouse and depot doors, and hangers and fixtures for fireproof doors.

U. S. Wind Engine & Pump Co., Batavia, Ill.—"Mansfield" and U. S. water columns, and U. S. hydraulic valve.

Gifford Wood Co., Hudson, N. Y.—Pamphlets showing ice elevators, conveying machinery and ice tools.

Causes of Defects and Failures of Steel Tires.*

BY GEORGE L. NORRIS, M.E.,
Chemist, Standard Steel Works.

With few exceptions, the tires used in the United States are all made from (acid) open-hearth steel, which, because of its uniformity in quality and cheapness, as compared to crucible steel, has practically driven the crucible steel out of the market. In Europe most tire steel is made by the open-hearth process, and some by the crucible process, but tires of (basic) Bessemer steel are also commonly used. The conditions of service, especially as to wheel loads, are not, however, as severe as in America.

The grade of steel used for tires in Europe is much softer than that used in America, as shown by some of the typical analyses in the table in the next column.

Up to 1890 it was the general practice to make tires from short ingots, each ingot being sufficient to make only one tire. As it is practically impossible to cast an ingot of steel, no matter how small, without pipe and segregation in the upper end, tires made from the short or single tire ingot are liable to contain defects from this cause. In manufacturing from a short ingot no cropping is discarded from the top of the ingot, the only discard being the small disc of metal punched from the center of the bloom.

About 1890 the Standard Steel Works conducted a series of tests comparing the tires made from short or single tire ingots and long ingots from which several tires could be cut, and in which the top portion of the ingot containing the piping and segregation was discarded. A paper on the results of these tests was contributed to the American Institute of Mining Engineers by A. A. Stevenson, M.E. As a result of these investigations the Standard Steel Works adopted the practice of making all tires from bottom poured long ingots, as the only way to reduce to a minimum the number of tires failing in service on account of casting defects in the ingot.

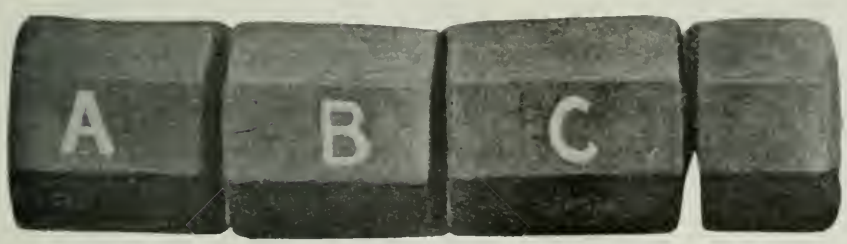
Both the long and short ingots are usually bottom-cast in groups, fed from a central runner. The long ingots are octagonal in section, about 72 in. long, and vary from 13 in. to 20 in. across. The short ingots are usually cylindrical, though conical ingots are common abroad, and generally have a dome shape top. They vary in diameter and height according to the size of tire to be made. Unlike the long ingot which remains fluid for some time and gives an opportunity for the steel to teem, and the gases and impurities to rise to the top, the short ingots set quickly and the piping, gas cavities and other defects, as compared with the long ingot, occupy relatively a larger portion.

Typical Analyses of Tire Steels.

	American.	French.	English.	English export.	German.	Krupp export.
Carbon	.55—.75	.40	.56	.52—.61	.35	.55—.85
Silicon	.250	.100	.080	.190	.150	.300
Phosphorus	.050	.050	.055	.030	.035	.060
Manganese	.65	.68	1.25	.75	.98	.60
Sulphur	.050	.055	.050	.030	.040	.045
Ult. tensile strength	100,000 to 135,000	95,000	85,000	107,000 to 123,200	90,000	105,000 to 135,000
	2 in.	(8 in.)	2 in.	2 in.	2 in.	2 in.
Elongation, per cent	20 to 10	12	26	17 to 11	28	17 to 8
Reduc., per cent	30 to 12		39	23 to 18	58	25 to 9

Even with the minimum amount of piping possible, the punching does not always entirely remove the defects, and consequently the tires made from short ingots more frequently contain these defects. The illustrations, Figs. 1 to 12, plainly show the superiority of the long ingot over the short for manufacturing tires of homogeneous structure. Fig. 1 is a full length section of a long ingot, from which the piped portion above the line *a-b* is discarded, while Fig. 2 is a section of the ordinary short or single tire ingot from which nothing is discarded but a small thin disc in punching the bloom. Fig. 3 is a section of a tire bloom from a long ingot. The contrast between it and the short ingot is very marked. Fig. 4 shows the manner of cutting an ingot into tire blooms. Figs. 5 and 6 show the fractures of a long ingot cut up into blooms, and Fig. 7 is an enlarged view of a typical fracture. The central pipe shown in the left-hand blooms of Fig. 6 is punched out in forming the tire. Fig. 8 is an etched section of a tire made from a long ingot bloom, and shows the homogeneity of structure obtained by this method of manufacture. Figs. 9, 10 and 11 show etched sections of tires made from short ingots, illustrating the presence of the original casting defects. Fig. 12 is a section through a conical ingot such as is used to some extent in Europe. For soundness this possesses no advantage over the ordinary cylindrical, short ingot.

Fig. 2. Fig. 1. Fig. 3.



Tire Tire Tire. Discard.

Fig. 4.

During the past few years, owing to increased speeds, wheel loads and severity of service, steel tires have more frequently developed that condition on the tread, commonly termed "shelly" or "flaky" spots. This condition is also often referred to as "soft spots."

Fig. 5.

*A paper read at the October meeting of the Western Railway Club.

"porous," or "honey-combed metal," "sand holes" and "unwelded metal." It is in the nature of a breaking down of the tread into flakes or scales by numerous cracks which penetrate into the tire, principally in the area of rail contact. A tire developing such a condition is not considered dangerous, and consequently is not always promptly removed. Hence the shells or flakes rapidly spread over a greater length of the tread, and the cracks penetrate so deeply into the tire that a large amount of steel is wasted in turning up the tire to remove all traces of the shelliness. Fig. 13 shows the appearance of the tread of a typical shelly tire.

The causes which produce this condition of shelly or flaky treads may be inherent defects in the steel, such as pipe, gas cavities, slag and segregation, but are more commonly the conditions of service.

Inherent defects in the steel are confined almost exclusively to tires made from short ingots and rarely occur in tires from long ingots, for the reason that the top portion of the ingot containing the pipe, slag, segregation and gas cavities is discarded. The relation between the piping and casting defects of the ingot and the shelliness of the tire is plainly shown in Fig. 9. Usually the appearance of the tread of a shelly tire, due to inherent defects in the steel, is different from the ordinary shelliness, due to service conditions. Instead of the tread showing spots with numerous thin flakes, as in Fig. 13, there is apt to be only a single spot from which a large shallow piece has spalled out (see Fig. 14), or there may be several spots where pieces have broken out of the tread, leaving distinctly granular fractures, as in Fig. 15. An etched transverse section of this tire (see Fig. 16), shows that these defects are due to entrapped slag.

As has been stated, by far the greater number of shelly tires are

Fig. 7.

Fig. 6.

produced by conditions of service, and in the case of tires from long ingots this is practically the sole cause of this trouble. The conditions of service most prominent in causing shelliness are: Brake burns, unequal diameters of wheels upon the same axle, which may result in causing the wheel to become eccentric through slipping; eccentricity of the wheel, in its turn causing pounding. These conditions are all intensified by speed and load, but more especially by speed. It is probable that what is commonly termed "brake burn" is the chief cause producing shelliness. When the brakeshoe retards the revolution of the wheel to the extent that the distance traversed by the car exceeds that rolled by the wheel, a high degree of heat is generated locally on the tread, due to the slipping of the wheel on the rail. This results in the production of several small, hard slip spots, or brake burns on the tread within the limits of the rail contact. These small hard spots are usually covered with irregular heat cracks, which through the pounding of the wheel on the rail and joints, and under the influence of various stresses to which the tires are subjected, tend to penetrate into the tire along the line of the resultant forces, causing the steel to break up into shells or flakes. In the case of chilled wheels the brake burns produce what is termed comby tread, and the penetration of the cracks is along the cleavage planes of the white iron crystals forming the chill and perpendicular to the tread.

Many of the hard slip spots developed disappear through the friction of the tire on the rail, or under the scouring or tooling effect of the brakeshoe, without breaking up into shelly or flaky spots. In those cases, eccentricity of the wheel results, and long, rolling flats are produced, sometimes 30 in. to 40 in. long and as much as $\frac{1}{2}$ in. deep at the lowest point. Frequently such wheels will have two rolling flat spots. The severe punishment through pounding and slipping which eccentric wheels undergo, produces excessive and deep shelling. That the wheels become eccentric or out of round through the hard, slip spots has often been tested, by putting a pair of wheels showing such spots, but not shelled, into the lathe. It is not infrequent to find that the tool will skip for a space of 2 to 3 ft. while cutting to a depth of $\frac{1}{16}$ in.

It is conspicuous that some of the roads having the greatest

Fig. 8.

Fig. 9.

Fig. 11.

Fig 12.

Fig. 10.

Fig. 14.

Fig. 13.

Fig. 16.

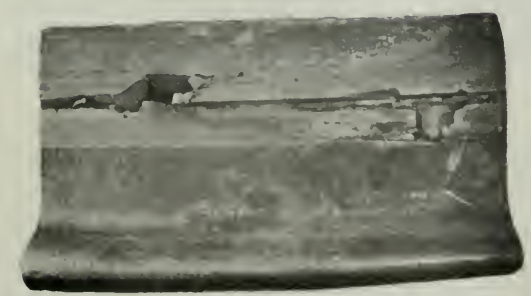


Fig. 15.

amount of trouble from shelly tread tires find the trouble most serious on low-grade divisions with infrequent brake applications, and on the heavy grade or mountainous divisions of these same roads the trouble is only slightly developed. This indicates that the long continued brake application on the heavy grades is effective in grinding off the small hard spots, or in other words the tread is worn down faster than the rate of penetration of the heat cracks in the burned or slip spot area.

The formation of the shelliness from the hard, slip spots, or brake-burned areas is very well shown by the illustrations. Fig. 17 is a view of a tire showing several of the brake-burn spots, one of which has started to form a shelly spot. Fig. 18 is a section through this spot on line *a-b* polished and magnified two diameters. The white area *a-b* is very hard and might be likened to a case-hardened spot. Fig. 19 is a section through another spot on the same tire, polished and slightly etched to emphasize the contrast. It is the breaking up of these hard areas that originates the detailed cracks which penetrate into the tire and cause shelliness. Fig. 20 is an etched section of a shelly tire, and shows no inherent defects. Fig. 21 is a view of the tread of the same tire which shows an advanced stage of shelliness. Fig. 22 is a section cut from the tire as indicated on Fig. 20, and polished and magnified 40 diameters. It corresponds to the hard area shown on Fig. 18, the letters *a-b* on Fig. 22 marking the limit of depth of the hard spot. The metal between *a-b* and the tread shows a badly cracked condition, and it is through the penetration and extension of these cracks that shelliness is caused and spreads as long as the tire remains in service after this condition originates. Figs. 23 and 24 are etched sections to show the microstructure of Fig. 22 magnified 50 diameters. In both Figs. 23 and 24 the line *a-b* corresponds to *a-b* in Fig. 22. In the case of Fig. 23, which is located outside of the cracked or shattered area, cleavage has not taken place along this line as is the case in Fig. 24. The microstructure of the metal between the line *a-b* and the tread is distorted, but there is no tendency indicated toward separation of the micrograins along the lines of ferrite. This would be the case if the shelliness was due to microscopical particles or filaments of entrapped slag, as these usually occur in the ferrite. The microstructure below the line *a-b* is entirely unaltered and the line of demarkation is very sharp, cutting as it often does through the micrograins and separating them into distorted and undistorted portions. Figs. 25 and 26 illustrate clearly how these cracks extend and multiply. Fig. 25 is a polished but unetched specimen from a

Fig. 17.

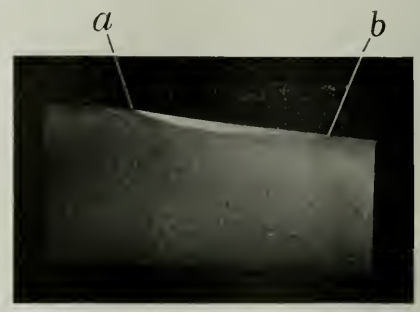


Fig. 18.

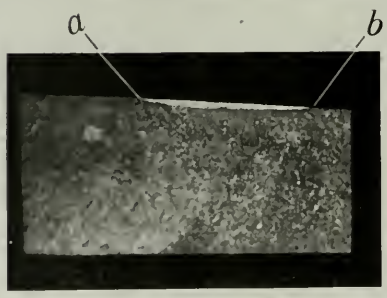


Fig. 19.

Fig. 20.

Fig. 21.

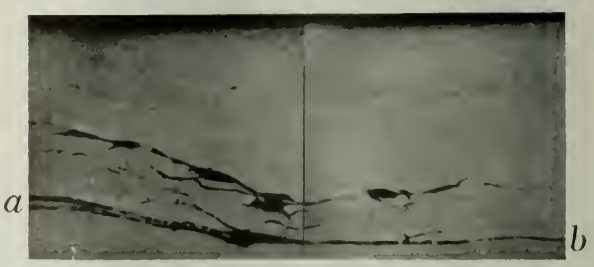


Fig. 22.

tire in the initial stages of shelling, magnified 35 diameters. Fig. 26 is a portion of the same specimen, etched and magnified 50 diameters. There is no evidence of any inherent defects. Fig. 27 is a longitudinal section of a shelly tire and gives a good idea of the manner in which the shell cracks penetrate into and break up the steel. Neither this section nor the transverse section, Fig. 28, shows any inherent defects.

It is notable that driving tires are practically free from shelling, which certainly would not be the case if the shelliness was largely the result of inherent defects in the steel, improper treatment during manufacture, or defects of workmanship. The few cases of driving tires which have been examined were due to inherent defects in the steel. Brake burns and slip spots are apparent on the tread of driving tires, but the rate of penetration of the cracks, owing to their greater diameter and flatness of arc, is slow, and consequently their removal by brake wear is quite certain. Furthermore, the service conditions of driving tires are less severe than those of tender, trailer and coach wheels. The number of revolutions is less, the area presented to the rail is greater, and the brake application is more effective. The static wheel load for driving wheels of modern high-class passenger locomotives averages about 22,000 lbs. per wheel, while in the case of many trailing wheels and wheels under large capacity tenders, the wheel load is far great and is carried on a smaller area of rail surface.

The liability to shell is far greater in the case of tender wheels under heavy tanks in through passenger service than any other class of equipment. The service conditions of the tender wheels are the hardest of all the wheels, owing to the constantly shifting and varying load carried. The varying load not only affects the percentage of brake application, giving a variation in the retarding effect of the brakeshoe on the wheels, and increases the liability to

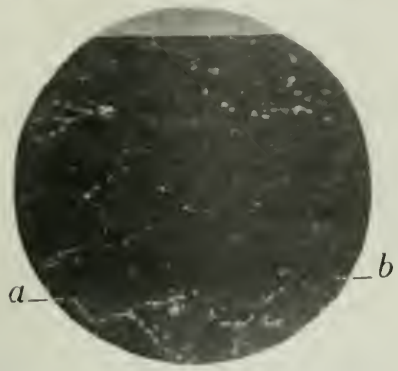


Fig. 23.

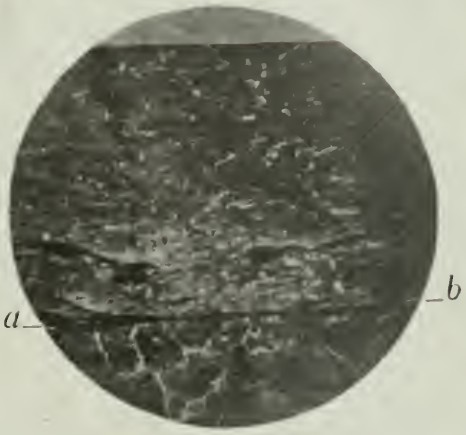


Fig. 24.

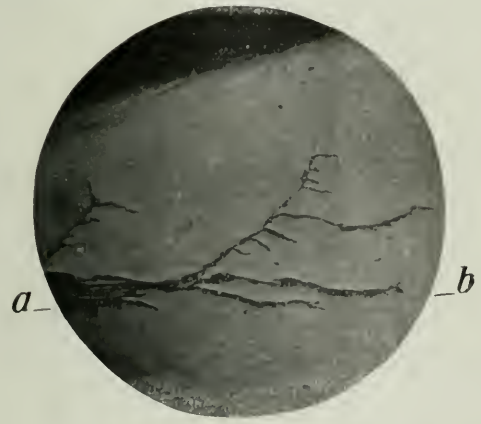


Fig. 25.

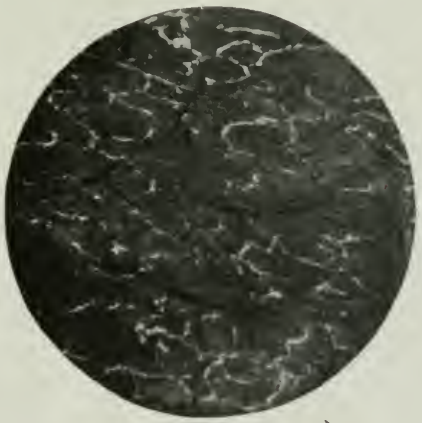


Fig. 26.

Fig. 27.

Fig. 28.

brake burn spots, but also causes the tender to ride rough and to pound the wheels. This is on account of the stiffness of the springs, which are designed for full load, but carry a light load much of the time in service. There is a marked increase in the number of shelly tires during the winter season, which is natural, as all conditions of operation are more severe. In general the wheels under tenders do not receive the same attention as wheels under coaches. The inspection may be as close, but it has been observed that those roads having the most trouble from shelly wheels keep tender wheels in service that they would not tolerate under coaches. This observation is confined by the records of the wheel lathes which show an average of about twice as much metal turned off the tender wheels as from the coach wheels.

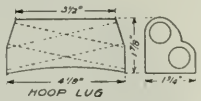
Trailer wheels probably rank next to tender wheels in tendency to develop shelliness. Most of the cases of shelly trailer wheels observed have been under engines in through passenger service, and this wheel load has averaged 20,000 lbs. and upward per wheel. This great load, with the tendency of the trailer wheels to "pick up" on the application of the brakes and develop brake burn spots is doubtless the reason why they have given so much trouble from shelliness.

Coach and engine truck wheels come next in order. Most of the shelly coach wheels have been under heavy cars in through passenger service. The majority of cases have been distinctly traceable to brake burns.

(To be concluded.)

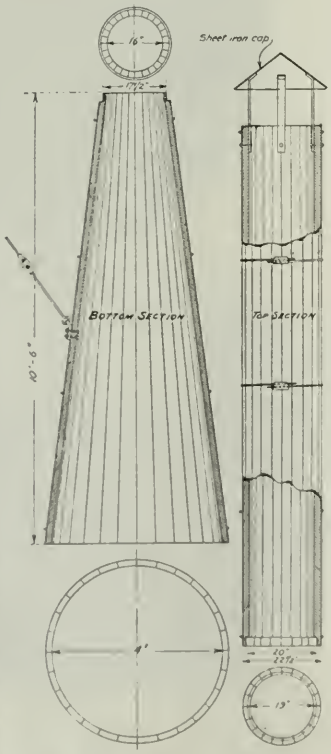
Smoke-Jacks for Engine Houses.*

The committee is as unable, after nine years have elapsed, as was the committee which reported in 1898, to say which is the best form and best material for engine house jacks. It is safe to say, however, that some of the compositions of asbestos that were new at that time have proved to be failures, and railroad men are as eager as ever at the present time to find a substitute for the many kinds of cumbersome and expensive jacks now in use, which will be reasonably cheap in first cost and easy to maintain in service.

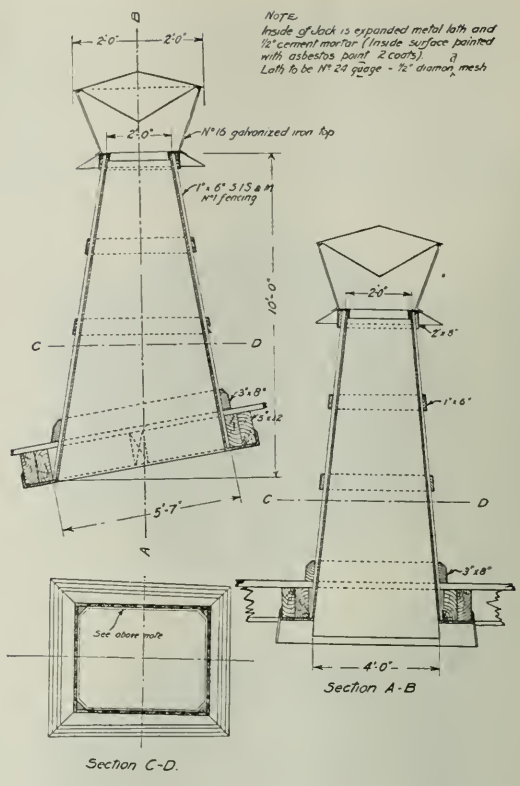


Jacks are made in all conceivable shapes, sizes and forms to meet certain requirements and conditions in the different kinds of engine houses, but generally they are classed as two distinctive types, the one having the telescopic drop section fitting down closely over the stack of the locomotive after it has been placed, and the other having a large flaring section which is stationary, under which the engine may be placed without accuracy, and is larger proportioned in every way than the first-named type. The latter-named style answers to a greater extent for ventilation on account of its larger dimensions and must necessarily allow the escape of more heat in cold weather unless special arrangements are made to avoid it.

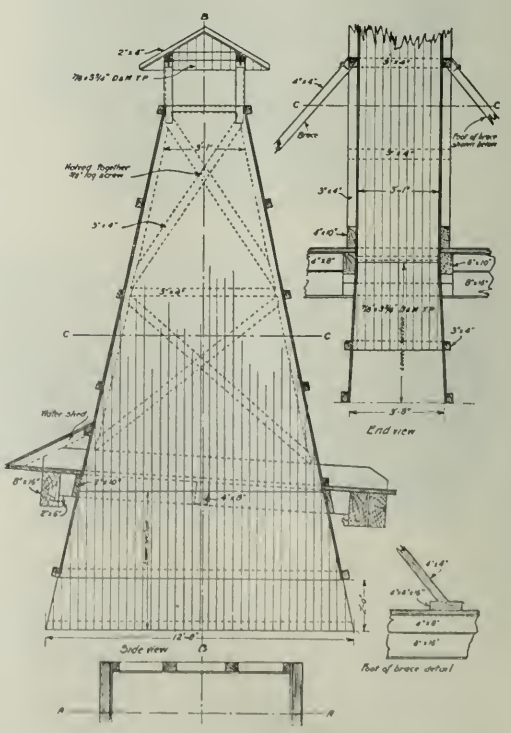
It is well known that the various forms of iron and steel when used for this purpose decompose very rapidly, cast iron being bet-



Chicago & Eastern Illinois Wooden Smoke-Jack. Cost in Place, $20 to $25.



Northern Pacific Wooden Smoke-Jack. Cost in Place, $30 to $40.

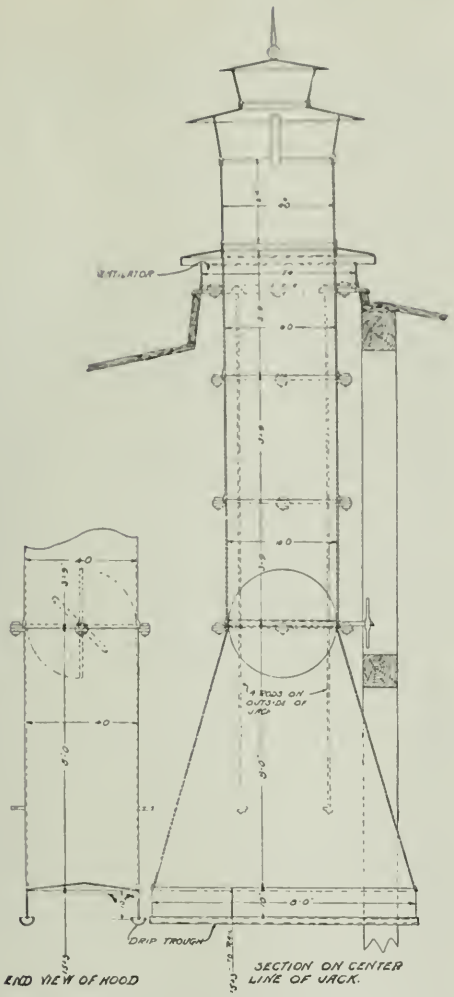


Erie Wooden Smoke-Jack. Cost About $100.

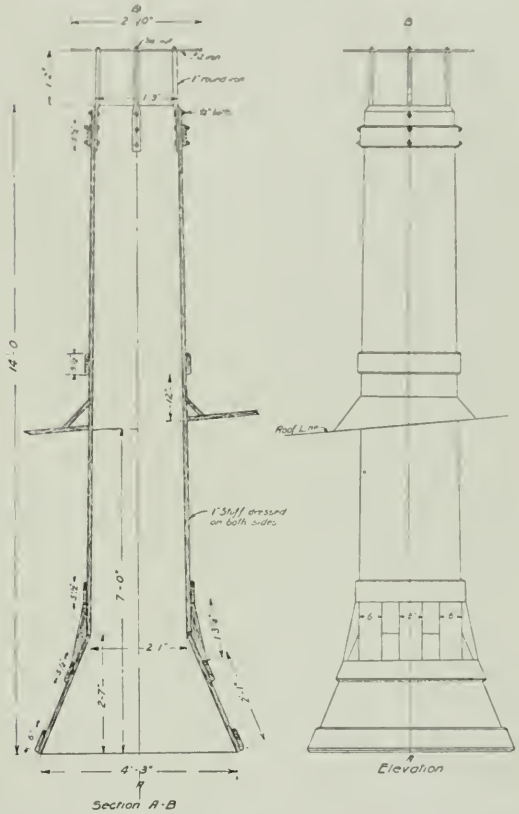
*From a committee report to the Milwaukee convention of the Superintendents of Bridges and Buildings.

ter adapted than wrought iron or steel, but these when made thick enough to last any considerable length of time are cumbersome and expensive and often crack during the first season owing to contraction and expansion. The sheet iron jacks last ordinarily only two to five years.

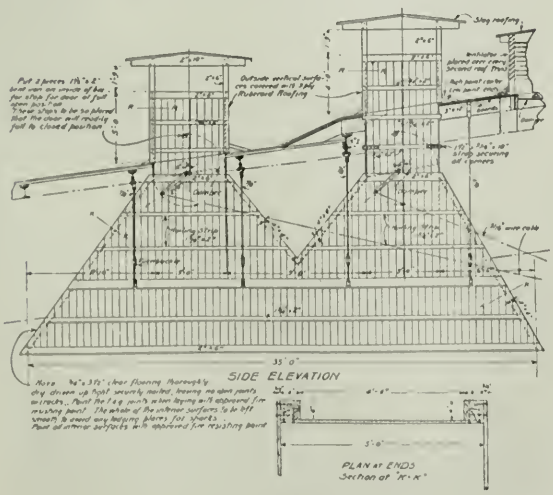
Stoneware or earthenware, commonly designated as tile, has been extensively used for jacks, and a considerable number of such jacks are still in use, but in northern climates they are being gradually abandoned and replaced with other kinds on account of being cumbersome and cracking when subjected to extreme heat and cold. This form of jack usually consists of several joints of tile mounted

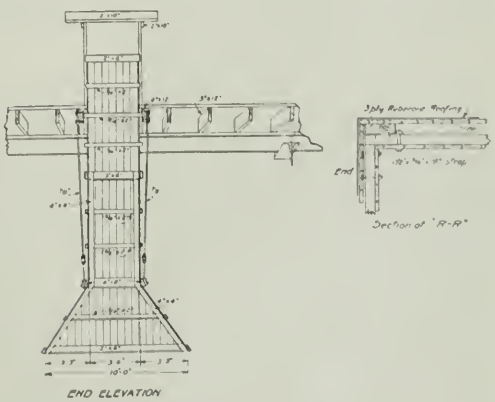


Dickinson Cast Iron Smoke-Jack; Pennsylvania Railroad.



Lake Erie & Western Wooden Smoke-Jack. Cost in Place About $60.





Pittsburg & Lake Erie Wooden Smoke-Jack. Cost About $300.

upon a roof casting and surmounted by a sheet metal cap and having either a telescopic section or a stationary hood under the roof, made in either case of iron. This lower section and the cap are subjected to rapid disintegration and have to be renewed frequently.

Wood seems to withstand the action of the gases better than metal and it has been successfully used by some roads for many years without any trouble whatever, while other roads experienced loss from fire and many do not use them for fear of similar results.

Attention is directed to a statement made on page 184 of the Eighth Annual Proceedings, wherein a member stated that they had been using wooden jacks for 20 years on every engine house but one (which was equipped with cast-iron), and he was sorry that the one exception did not have wooden jacks. He further stated that they use the stationary style (without drop section), and that they did not use any sort of protection against fire in the way of sanding or fireproof paints, being careful in the use of them until they became saturated or coated inside from natural use. Others have used the wooden jacks successfully for years. The committee would therefore earnestly recommend a careful investigation of wooden jacks to ascertain if possible whether the fault has not been in the style or methods of construction, and misuse where failures have occurred, rather than in the kind of material. It is quite certain that a wooden jack fitting closely over the mouth of the stack, or nearly so, would be more likely to cause trouble than a large-mouthed jack, where plenty of air passes through with the smoke and gases.

Various compositions of asbestos, cement, etc., have been extensively experimented with in recent years for this purpose, many of which proved to be short lived, and none to date have stood the test sufficiently long to prove that they are worth the price which is charged for them, regardless of the fact that they may be guaranteed by the manufacturers for a specified term of years.

The report is signed by M. J. Flynn, C. A. Lichty, D. L. McKee and A. F. Miller.

Efficient Operation on the New York Central.

The possibilities in handling dense traffic with the aid of block signals are well shown by the following record at three block stations on the Hudson division of the New York Central for the 24 hours from midnight to midnight, October 18 and 19:

Sixty-eight westbound and 71 eastbound trains passed block station 58, which is just south of Poughkeepsie—a train movement for each 21 minutes of the 24 hours.

At block station 31, just south of Croton, there were 96 westbound and 98 eastbound trains—one movement every 15 minutes of the 24 hours.

At block station 9, between Spuyten Duyvil and Yonkers, there were 107 eastbound and 104 westbound trains—a train movement every 13 minutes of the 24 hours.

Of these trains there were 22 eastbound and 20 westbound through freights, which handled 2,028 cars; in addition to this there were six work trains in service south of Poughkeepsie.

As a particular indication of the density of the traffic: At one period of the day seven trains passed block station 9 westbound in 24 minutes and eight trains eastbound passed in 33 minutes; a train an average of each 4⅛ minutes eastbound and 3¼ minutes westbound.

The efficiency is reflected in that two through eastbound passenger trains were delayed a total of 12 minutes; two eastbound locals a total of 39 minutes; one westbound local 12 minutes, and two westbound through passenger trains a total of 28 minutes, one of which overcame the delay and arrived at Albany on time.

Report on Signal Lamps—Railway Signal Association.*

Your committee concurs in the reports made at the annual meetings of 1905 and 1906. It would be desirable to arrive at definite standards of dimensions, so that the present confusion of lamps and brackets could be eliminated. There are many variations in the vital measurements, which affect their fitting properly, which are just enough off to prevent interchangeability, and yet are not so radical but that they might be modified to a common standard. With very few exceptions, 5 in. and 5⅝ in. are the sizes of lenses everywhere.

Experience seems to show that the white bullseye, which was formerly used so generally as a back-light, is not now deemed satisfactory, and we find its use is being rapidly dispensed with; in its place plain ground glass is used, which serves every purpose, and eliminates the possibility of a confusion of signals.

In previous annual reports the Lamp Committee has spoken of the prism glass reflector. It is meeting with considerable favor, due to its ability for increasing the intensity of the light, and there being no deterioration in its reflecting powers from continuous service, as is found in metal reflectors. This reflector is, of course, applicable only to the one-lens lamps.

It would be advisable to continue this committee for another year, to study the question of proper maintenance of signal lamps. By a more thorough education in this direction, general efficiency will be improved. Some roads have drawn up rules for the care and handling of signal lamps, and their experience would be of material assistance in compiling a complete set of rules.

Harry Hobson, chairman; C. S. Stephens, C. J. Cannon, F. E. Wass, Chas. Geary.

*Condensed

The 1907 Grain Crop.

The following estimates are taken from the *Journal of Commerce*:

Indicated Harvest for 1907.

	October, 1907. Bushels.	Acres.	Harvest of 1906. Bushels.	Acres.
Winter wheat*	409,500,000	28,132,000	492,888,000	29,599,961
Spring wheat	216,067,000	16,464,000	242,372,966	17,705,868
Total wheat	625,567,000	44,506,000	735,260,966	47,283,829
Total corn	2,491,715,000	98,099,000	2,927,416,091	96,737,581
Total oats	741,521,000	31,491,000	964,904,522	30,958,768
Total barley	147,192,000	6,152,000	178,916,484	6,323,757

The official preliminary estimates of yields per acre compare as follows:

	Oct., 1907	Oct., 1906	Oct., 1905	Oct., 1904
Winter wheat	*14.6	16.7	14.3	12.3
Spring wheat	13.1	13.7	14.7	12.7
Oats	23.5	31.2	33.9	32.1
Barley	23.9	28.3	26.7	27.2
Rye	16.4	17.0	16.6	15.2

*August report; nothing later.

The condition of corn on October 1 was 78, as compared with 80.2 last month, 90.1 on October 1, 1906, 89.2 at the corresponding day in 1905 and a 10-year average of 79.6.

The following table shows for each of the 25 principal corn states the condition on October 1 in each of the last three years and that on Sept. 1, 1907, with the 10-year averages:

States.	Oct. 1, 1907.	Sept. 1, 1907.	Oct. 1, 1906.	Oct. 1, 1905.	Ten-year average.
Illinois	86	86	87	96	84
Iowa	76	76	97	90	82
Nebraska	69	75	90	95	67
Missouri	84	86	90	94	80
Texas	78	80	76	76	73
Kansas	67	72	85	87	69
Indiana	84	84	96	99	86
Georgia	92	92	89	86	82
Ohio	78	77	99	91	84
Kentucky	88	87	99	95	82
Tennessee	86	86	94	84	78
Alabama	85	87	88	84	79
North Carolina	89	92	84	83	82
Arkansas	60	62	93	79	78
Mississippi	74	77	88	71	76
Indian Territory	68	72	93	93	87
Oklahoma	66	70	95	83	72
South Carolina	93	93	81	75	77
South Dakota	72	70	93	95	82
Virginia	86	86	92	97	87
Louisiana	70	75	84	69	81
Minnesota	73	76	95	95	85
Michigan	76	78	95	89	84
Wisconsin	77	80	98	96	87
Pennsylvania	75	70	95	96	86
Total for U. S.	78.0	80.2	90.1	89.2	79.6

Corn Harvest Indications, with Comparisons.

	Oct. 1, 1907	Sept. 1, '07.	Oct. 1, 1906.
Condition	78.0	80.2	90.1
Indicated yield, pr acre	25.4	25.9	29.1
Area, acres	98,099,000	98,099,000	95,535,050
Indicated yield, bush.	2,491,715,000	2,540,000,000	2,780,000,000
Estimated crop, 1907		98,099,000	2,491,715,000

Actual Corn Harvest.		Actual Corn Harvest.	
1906	96,737,581 2,927,416,091	1899	94,916,911 2,666,440,279
1905	94,011,369 2,707,993,510	1898	77,721,781 1,924,184,660
1904	92,231,581 2,467,480,934	1897	80,095,051 1,902,967,933
1903	88,091,993 2,244,176,925	1896	81,027,156 2,283,875,165
1902	94,043,613 2,523,648,312	1895	82,975,830 2,151,138,580
1901	91,349,928 1,522,510,891	1894	62,582,269 1,212,770,052
1900	83,320,872 2,105,102,516		

Foreign Railroad Notes.

In Munich there has been a strike of teamsters, including those of the firms which have contracts with the State Railroads to deliver freight to consignees from the stations. The authorities gathered as many employees as possible, chiefly trackmen, to drive the teams, disclaiming any intention to affect the result of the strike, but claiming that the railroads must make every possible effort to fulfil their contract to deliver freight to consignees.

The length of the completed railroads in French Indo-China, which have for years been reported to be 1,491 miles in the statistics of the railroads of the world, was really at the close of 1906 only 940 miles, according to the French Colonial Minister. All lines but one earn more than their expenses. They have cost about $25,000,000. The Yunnan Railroad in China, which is a French enterprise connecting with a colonial railroad, has so far cost $18,900,000 for 292 miles completed, and has met with serious obstacles.

GENERAL NEWS SECTION

NOTES.

Los Angeles papers report the establishment in that city of schools of telegraphy by both the Atchison and the Southern Pacific companies.

The Western Union Telegraph Co., which has been paying operators more than double pay since the strike of a few weeks ago, on October 19 restored the former conditions, but announced that increased rates of regular pay would soon be promulgated.

The Texas Railroad Commission has modified its order, recently issued, requiring railroads to report accidents by telegraph, and now directs that the reports be sent by mail. This change, it is said, is due to the fact that the railroads have sent the telegrams collect. The commission had no appropriation for making the payments.

The Wabash and the Chicago & Alton have arranged to jointly operate as double track their single-track lines from Mexico, Mo., to Clark, 26 miles. The Alton tracks will be used for all eastbound trains of both roads, while the trains going west will go over the Wabash. Automobiles will be run between the two stations at Sturgeon.

In competing for eastbound steamship business, the Erie, it is said, has filed a rate of $10 for second class tickets from Chicago to New York. This rate, which is a cut of $6.75, will become effective November 20 and will be in effect at least 30 days. A special meeting of the Central Passenger Association has been called for October 25 to decide what action other trunk lines will take.

The Railroad Commission of Canada has sent to all the railroads a circular reminding them that 30 per cent. of their engines and cars have defective safety appliances, the inspectors of the Commission having lately made extensive examinations of cars. The Commission expresses the hope that the railroads will correct these defects and thus obviate the necessity of further action by the Board.

At New Durham, N. J., this week 10 freight conductors and brakemen of the New York Central (West Shore) were arrested and held in $1,000 bail each, on charges of larceny. Detectives of the road, disguised as tramps, hid in the yard where considerable quantities of silks and other valuable freight had been stolen from cars, and, after watching three or four nights, found the evidence for which they had been looking.

The Union Pacific road is going to resume the practice of allowing the extension of the limits of round-trip tickets in case of the sickness of the holder, on the presentation of a physician's certificate to that effect. The Interstate Commerce Commission has ruled against the practice, but the U. P. holds that where the privilege is extended to all alike under similar circumstances, and the practice is set forth in the tariffs, it is perfectly legal.

Prof. Henry C. Adams, who is preparing the regulations under which the Interstate Commerce Commission is to keep its records of railroad operations and accounts, has invited to advise him in his work President F. A. Delano, of the Wabash; Vice-President Julius Kruttschnitt, of the Southern Pacific, and Theodore Hinchman, a Consulting Engineer, of Detroit. These gentlemen will give their attention more particularly to the question of depreciation of property and other subjects on which Professor Adams desires the results of railroad experience.

On the occasion of the convention of the American Association of General Passenger and Ticket Agents, in Washington last week, a committee conferred with the Interstate Commerce Commission, with a view to a possible complaint to test the legality of the practice of employing ticket agents on commission. It is said that some railroads now employ doctors, dentists, hotel clerks and liquor men to sell tickets; and that in these cases the purchaser and the agent often divide the commission allowed by the roads on such sales, which, of course, constitutes a discrimination in passenger rates.

No bill of lading can be drafted which will meet the approval of the shipper, the railroad and the banker, but the Interstate Commerce Commission, following its hearings on the subject, intimates that it will undertake the task of formulating and promulgating a uniform bill in the not distant future. As the basis of its work in this direction it will take the bill prepared by the special committee representing the three interests involved. The criticisms passed on this bill during the hearings will be taken into consideration, and the Commission has invited suggestions in writing, such suggestions to be in before November 1. From the position taken by some of the railroads at the hearing, it is a foregone conclusion that the Commission's bill of lading will be assailed at many points. The authority of the Commission to promulgate the bill will be questioned, and its character as a negotiable instrument will be tested in the courts. The bankers, moreover, declare that no matter what the Commission may say as to the negotiability of a bill of lading, that quality cannot be given to the instrument without authority of law.

The extensive installation of block signals on the Union Pacific and Southern Pacific within the past three years is well known. At the present time and with the completion of additional installations already authorized the two systems will have a total of 5,7[illegible]. The Union Pacific has in operation, equipped with automatic signals, 459 miles of single track and 244 miles of double track. An additional 176 miles of double track and 197 miles of single track will soon be put into service. More than 500 distant switch signals, protecting the movement of trains approaching 158 stations and sidings on the main line of the Kansas and Colorado divisions, have also been put in place.

In consequence of the reduced rates now prevailing in the state of Pennsylvania the Baltimore & Ohio has withdrawn the Washington stop-over privilege on tickets sold from Pittsburgh to Philadelphia. The rate between the cities named has had to be reduced to $6.98, which is a dollar less than the regular fare from Pittsburgh to Washington. Passengers for Washington are buying Philadelphia tickets and throwing away the Washington-Philadelphia portion. Those with baggage cannot take advantage of this, as the baggage has to be checked through to Philadelphia. On through tickets to Baltimore, New York and other places not in the state of Pennsylvania the Washington stop-over is continued.

Press despatches from Montgomery, Ala., say that, following a conference between the President of the Southern Railway and the Governor of Alabama, that road is to adopt, on December 1, throughout Alabama, a general passenger rate of $2\frac{3}{4}$ cents a mile, and freight tariffs based on the rates charged in Georgia; and that the lawsuits now pending to test the constitutionality of the 2-cent fares and other low rates ordered by the Alabama legislature, are to be withdrawn. In North Carolina it is reported that a somewhat similar compromise will soon be agreed upon between the Governor and the officers of the principal railroads. The lawsuits are to be dismissed and the railroads are to adopt and use, until the next session of the legislature, the low rates ordered by the state.

Sunday Law in Massachusetts.

The following law, providing for one day's rest in seven, is now in force in Massachusetts:

Section 1.—Except in cases of emergency or except at the request of the employee, it shall not be lawful for any person, partnership, association or corporation to require an employee engaged in any commercial occupation, or in the work of any industrial process, or in the work of transportation or communication, to do on the Lord's day the usual work of his occupation, unless such employee is allowed during the six days next ensuing 24 consecutive hours without labor.

Section 2.—This act shall not be construed as authorizing any work on the Lord's day not now authorized by law; nor as applying to farm or personal service, to druggists, to watchmen, to superintendents or managers, to janitors, or to persons engaged in the transportation, sale or delivery of milk, food or newspapers. * * * Penalty $50.

Economical Loading of Cotton.

"The economic necessity which demanded cars of increased carrying capacity, demands that the increased capacity be utilized. The car shortage is not due so much to a real deficiency in the number of cars as it is to the fact that the cars in service are not being used to the best advantage. With careful loading 51 uniform bales of uncompressed cotton can be loaded in a standard box car, and an average of 42 bales can probably be obtained. If, in loading uncompressed cotton for its initial movement to the compress this can be accomplished, the efficiency of equipment will be increased approximately 70 per cent. over present average practice (25 bales).

"For many years the unit of loading compressed cotton has been 50 bales to the car, because of the practice in selling cotton to use a unit of 100 bales, and because the standard car when this unit was adopted was 34 ft. in length. The present standard car is 36 ft. long, and it is easy to load 60 bales, as now compressed, on the floor. Fifteen additional bales can be placed on top so that it is now easy to load 75 bales of compressed cotton in a box car of the present standard, and the railroads are trying to secure such loading.

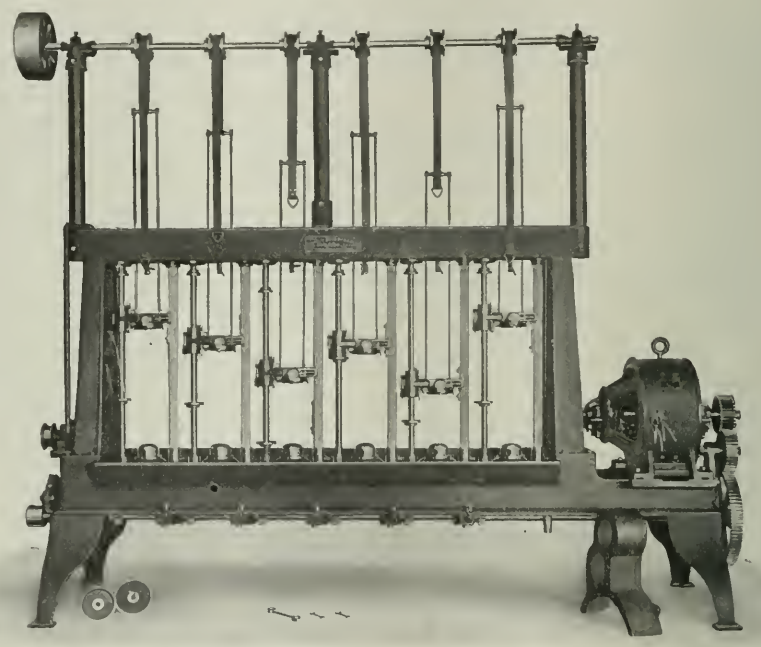
"Some of the compresses have contracted to make 75 bales the minimum load. We hope to make contracts with all of them on this basis. Many of the southern spinners have agreed to co-operate

by ordering their shipments in units of 75 bales. We are anxious that the New England spinners should adopt the same plan. This matter is of too large importance to be subservient to the unit rule of the New York Cotton Exchange."—*L. Green*, Freight Traffic Manager, Southern Railway.

Harrington Staybolt Threading and Reducing Machine.

The experience of locomotive builders and railroads has proved the superior advantages of using boiler staybolts which have been turned to a reduced diameter at the center over the old method of using bolts threaded for their entire length. When the center portion of the staybolt is reduced, a smooth surface comes in contact with the water and the strains due to expansion and contraction of the firebox sheets have less tendency to break off the stays. The Harrington staybolt threading and reducing machine shown herewith cuts the threads accurately and automatically reduces the center of staybolts to any desired form in one operation. The machine has six spindles and will thread staybolts of any length up to 30 in. They can be inserted and removed while the machine is running. The capacity of the six-spindle machine at a spindle speed of 80 r.p.m. is 225 staybolts per hour, $7\frac{1}{2}$ in. long and 12 threads per inch, threaded and reduced in the center. For a working day of 10 hours, the average output would be 2,250.

The heads which carry the dies and reducing tools are each mounted on two upright guide bars. They are fed downward by lead screws to correct any inaccuracy of the threads cut by the dies. The threading dies and reducing tools are both automatically thrown in and out, and the split nut engaging the lead screw is thrown open at the bottom of the cut. The head is quickly returned by a strap over a pulley lift and requires no appreciable effort by the operator. The threading dies have four cutters of high-speed steel. They are adjustable and of the quick opening and closing type. There are two reducing tools mounted in each head and acting opposite ly to each other to prevent side strain. They are both controlled by one former, the shape of which is exactly similar to the desired reduction in the stay rod. It is fastened to the square guide bar by bolts in T-slots and is adjustable the entire length. The spindles and lead screws are controlled by two horizontal shafts underneath the bed. The change feed gearing is at the outside end and easily accessible.



Harrington Staybolt Threading and Reducing Machine.

The machine is built either for belt or motor drive, as may be desired. The cutting oil is carried from the large reservoir in the tank overhead by a geared pump and is fed directly onto the work in a stream. With each machine is provided one set of high-speed steel threading dies per spindle for any one pitch, one pair of reducing tools and one former per each spindle, and the necessary change feed gears for 10, 11 and 12 threads per inch. The floor space occupied is 4 ft. in width and 11 ft. 6 in. long for belt, or 13 ft. 6 in. long for motor drive. The height to top of pulley on lift shaft is 11 ft.

The machine is made by Edward Harrington, Son & Co., Inc., Philadelphia, Pa.

Fuel Department on the Santa Fe.

For the purpose of maintaining a more complete supervision of the receipts, issues, distribution and accounting for fuel the Atchison, Topeka & Santa Fe has established a fuel department, with C. F. Ludington as Chief Fuel Supervisor, with headquarters at Topeka, and H. E. Westcott, Fuel Supervisor for the Coast Lines, with headquarters at San Bernardino. These men will appoint and be responsible for the work of all employees engaged exclusively in receiving, storing, delivering and accounting for all fuel. The fuel department will receive and compile all reports from fuel stations, making such reports to the audit and other departments as may be necessary. It is the intention to relieve agents and others in the transportation and mechanical departments, as fast as practicable, from responsibility in fuel department matters.

Per Diem on the New Haven.

The disagreement between the New York, New Haven & Hartford and its western connections, concerning rates for car service, remains unsettled. Elaborate statements on both sides of the controversy have been published but little or nothing is brought out that is new. On behalf of the New Haven, it is declared that the rental should not be the same for an old $300 car as for a new one worth $1,200; that the average gross receipts per carload on the New Haven line for freight received from the West are $18; and that the average freight car interchanged is worth about $475, making the annual rental 40 per cent. of the value of the car.

On the other hand, someone representing the American Railway Association says that the New Haven is little if any worse off than the Reading, the Central of New Jersey, the Long Island and other eastern roads; that at the former rates for freight cars the New Haven has always had an advantage over the other roads; that a scale of different rates for different sizes of cars would afford opportunity for juggling in interchange; that the New Haven is already receiving a very much larger share of the through revenue on through shipments than its mileage entitles it to; that the "four days free" law of Connecticut is not so important as it seems, because the average consignee unloads cars in $2\frac{1}{2}$ days, which is only 25 per cent. longer than in other states, and no longer than in Virginia; that the New Haven might defy the Connecticut law on interstate shipments if it saw fit but from motives of policy does not do so. The latest demand of the New Haven is for equal interchange and $1 per car reclaim. This proposition has been declined by the connecting roads.

Following this statement an officer of the New Haven has issued a rejoinder in which he says:

The New Haven road is a great switching yard for its trunk line connections. It does not receive for the character of business it does a large division of the rates—no more of a division than would any other road similarly situated and obliged to furnish the enormously expensive terminals that the New Haven does. The average detention of a freight car in the territory served by the New Haven is approximately nine days, which, at 50 cents a day, averages a charge of about 30 per cent. of the gross receipts of the New Haven for doing the business. The New Haven road knows of no reason why it should arbitrate a matter of this kind, believing the best arbitration in the world is that of the courts. It has no objection to arbitration beyond the fact that it is generally a

compromise. * * * It would be a relief to the New Haven road if it could go out of the all-rail coal business, but that would inflict loss upon individuals. It is true that the law of Connecticut may not be applicable to interstate shipments, but it was intended by the legislature that it should apply to all shipments, and it would be impolitic for the New Haven to try to accomplish by indirection an evasion of the will of the people of the state. The New Haven has ordered a large equipment of freight cars, and when well equipped its policy will be to require the use of its own equipment on shipments to and from its own stations, and not to permit the nondescript equipment now being delivered it by its connections to remain in the service, 50 per cent. of which is worth not to exceed one-third of the average of what it will be prepared to furnish upon request. It is unfortunate that the roads should be unable to agree among themselves. It is not going to be productive of benefit to the New Haven to even win in such a controversy, but an indisposition to be fair on the part of its connections forces its hand to a tribunal wherein neither party will have any advantage and where it is willing to rest its case.

"Say, Doc, if I have to have a doctor, I'd rather trust to you than to that bunch over there."

—McCutcheon in *Chicago Daily Tribune.*

Deaths from Concrete Collapses.

A New York press agency reports that in the half year ending Dec. 31, 1906, 31 persons were killed by collapses of concrete buildings in the United States. The accidents occurred at South Framingham, Mass.; Elyria, Ohio; Mineola, N. Y.; Long Beach, Cal., and Rochester, N. Y. This year two persons were killed in the failure of a concrete building in Philadelphia. In every case, it is said, the builder claimed that he had taken all known precautions against collapse.

The "Montreal" Street Car.

The New York City Railway has ordered 155 new cars to be used on its Madison and Fourth avenue (surface) line, which are similar to those in use for the last two years in Montreal with entrances and exits so arranged that fares can be collected as the passengers enter, and the company promises that these cars shall be put in service early in December. The new cars are 48 ft. long and 32 ft. long over the body, seating 36 passengers. Each car has four motors and air-brakes. The rear platform, which is 7 ft. 6 in. long, is divided by a railing into two parts, one for passengers entering and the other for passengers going out, and the entrance portion will hold 20 passengers, so that that number can be admitted and the car started and the fares then collected, as the passengers pass into the car, during its passage to the next stopping place. The platforms are enclosed or vestibuled. The conductor will ordinarily stand on the rear platform, there being no necessity for him to go inside the car to collect fares. Push-buttons are provided between each two windows, by which passengers can signal to have the car stopped. Passengers may leave the car at the front end, but all must enter at the rear. The cars cost $7,200 each.

It is said that since the Montreal lines have been fully equipped with cars of the new style passenger receipts have increased 27 per cent. and more in single months as compared with the business under old conditions, and some of the increases per car per hour have been as high as 50 per cent. At the same time cars are averaging 10 per cent. better speed, and there is a striking decrease in pattern accidents, in consequence of the conductor's desk in front of the entrance and exit of passengers.

Report on the Meat Industry.

A capital of $10,625,000,000 is directly concerned in raising of meat animals and their slaughtering and packing, according to a report on meat supply issued by the Department of Agriculture. This amount is five-sixths as large as all capital invested in manufacturing in 1904. Seven-eighths of the meat and meat products was consumed within this country. The stock of meat animals has increased since 1810, but has not kept pace with the increase in the population.

The welfare of the raisers of meat animals and of the slaughterers and packers is dependent upon finding foreign markets for the surplus of the production of meat above the home consumption. There was a total of 93,502,000 meat animals slaughtered and exported in 1900, of which the exported live animals numbered 276,000. The dressed weight of the 93,502,000 meat animals constituting the meat supply of 1900 was 16,549,921,000 lbs., of which 14,116,886,000 lbs. entered into domestic consumption, lard being included with the dressed weight of pork.

The report adds: "That meat consumption per capita has declined in this country since 1810 is plainly indicated. There is some ground for believing that at that time meat constituted about one-half of the national dietary in terms of total nutritive units consumed, whereas now it constitutes about one-third."

How important meat is in the diet of different countries is shown in the following meat consumption per capita in 1904 in dressed weight: United States, 185 lbs.; United Kingdom, 121; Australia, 263; New Zealand, 212; Cuba, 124; France, 79; Belgium, 70; Denmark, 76; Sweden, 62; Italy, 46.

1908 M. C. B. and M. M. Conventions.

At a meeting of the Executive Committees of the Master Car Builders' and American Railway Master Mechanics' Associations at the Hotel Belmont, New York City, October 21, it was decided to hold the 1908 annual conventions of those Associations at Atlantic City, N. J. The Master Car Builders' Association will meet June 17, 18 and 19, and the American Railway Master Mechanics' Association June 22, 23 and 24. The headquarters of the Associations will be at the Marlborough-Blenheim. The same special rates made by certain of the Atlantic City hotels last June will apply for the 1908 conventions. The meetings of the associations as well as the exhibits, excepting track exhibits, will be on Young's "Million Dollar" Pier. The track exhibits will be placed not more than four blocks from the pier. The same uniform decorative scheme that was so successful at this year's conventions, with some modifications to suit the new pier, will be provided. Nearly all of the exhibits will be under cover, 60,000 sq. ft. net (exclusive of aisles) of space having been allotted for exhibits. In June last the exhibitors on the Steel Pier used about 55,000 sq. ft., exclusive of aisles. The charge to exhibitors in June next for space, including building of booths, crex matting for the floors, enamel letters for signs, and telephone service, will be not more than 33 cents a square foot as against 50 cents a square foot paid for space on the Steel Pier in June last.

Troubles Not Exactly Like Ours.

The auditing department of the Mexican Central is ferreting out dishonest employees. Ticket sellers overcharge passengers, and several arrests have been made, the first being of the ticket agent at Juarez. The auditing department has now succeeded in having guards put on all trains, save a very few, and an armed force is always handy in case of need to protect the baggage of passengers at stops when the passengers may desire to leave the car.—*Mexican Herald.*

INTERSTATE COMMERCE COMMISSION RULINGS.

Interstate Commission vs. Georgia Commission.

In an opinion by Chairman Knapp the Commission has announced its decision in the case of the Paper Mills Company, of Baltimore, Md., against the Pennsylvania Railroad and others. The defendants refused to apply carload rates to the transportation of paper bags and wrapping paper in mixed carloads in southern classification territory. The Commission held that this is not unlawful.

It appeared that complainants, as compared with their Atlanta competitors, are handicapped where they undertake to sell in the state of Georgia. So far as this results from differences in location

between the different manufacturing plants it is natural and therefore legitimate; but the positions of the competing parties would be reversed if the Atlanta concerns should undertake to make sales in the vicinity of Baltimore. The handicap results in large degree from a rule of the railroad commission of Georgia requiring defendants and other carriers to apply their carload rates to the intrastate transportation of wrapping paper and paper bags in mixed carloads. The Commission decided that a like rule should not be required as to interstate shipments unless, in view of all the conditions, some provision of the regulating statute would otherwise be disregarded. The Commission further declared that where a regulation pertaining to transportation has been in force a long time business interests become so adjusted thereto that any abrupt and material change is almost certain to produce undue and therefore unlawful discrimination.

Reparation for Increase in Grain Rates.

The Commission, in an opinion by Commissioner Harlan, has announced decision in the cases of the Harth Brothers Grain Co. v. the Illinois Central et al., A. Waller & Co. v. Illinois Central et al., and Waller, Young & Co. v. Illinois Central et al.

For several years defendants maintained uniform rates on shipments of grain and kindred products to Atlanta, Ga., and points beyond, from a group of towns on their lines beginning on the north with Henderson and Uniontown, Ky., and including Morganfield, Henshaw, Corydon, Grove Center, and other nearby points; but on December 15, 1904, defendants increased the rates to said destination points by adding 4 cents per 100 lbs. on all shipments originating at any point in the group described except Henderson and Uniontown. This gave to Henderson and Uniontown lower rates than those applicable from the intermediate points. On April 5, 1905, defendants canceled the increased rates from the intermediate points, restoring the former rates, and thus again putting all points in this group upon an equal rate basis. Complainants filed petitions to obtain reparation on their shipments of hay and grain made from said points under the increased rates. Defendants stipulated that they would submit to a reparation order on the basis of 3 cents per 100 lbs. on all shipments made during the period of the effectiveness of the higher rates. Upon that basis final adjustment of the controversy was agreed to, and reparation orders aggregating $1,333 were entered.

MANUFACTURING AND BUSINESS.

Edward G. Buchanan has been elected Vice-President of the Carbon Steel Company, New York, with headquarters, as heretofore, in New York.

It is said that land has been bought at New Chatham, N. S., for a new car building plant. The name of the new company has not been announced.

The Dominion Car & Foundry Co., Montreal, Que., has begun a 500 ft. long extension of its car shops. It is also building a forge shop and a power plant.

The Raymond Concrete Pile Co., Chicago, has been awarded the contract for the foundations of the power house of the Home Electric Light & Power Co., at Tyrone, Pa.

E. A. Pittis, southern representative of The Midvale Steel Company, Philadelphia, Pa., who has been on leave of absence for a year, has fully recovered his health, and will resume his duties on November 1.

The A. B. C. Bearing Corporation of Virginia, has acquired from the Atlantic Brass Company, of New York, all the patent rights and licenses of the A. B. C. journal bearing and wedge. The offices of the new company are in the American National Bank building, Richmond, Va.

Beyer, Peacock & Co., Manchester, Eng., are believed to have bought land near Lachine, Que., for a large locomotive building plant. It is said that the Grand Trunk has guaranteed orders for 60 locomotives a year from the new plant for five years, and the Canadian Pacific, 10 locomotives a year.

The Pressed Steel Car Co., New York, and the Western Steel Car & Foundry Co., New York, have established a branch office in St. Louis, Mo., to take care of business in what is to be known as the Southwestern district. W. P. Coleman is Manager of Sales and C. D. Terrell, Assistant Manager of Sales. The office is in the Bank of Commerce building.

Julian L. Yale & Co., Chicago, have been awarded a contract by the Canadian Northern for the complete Miller system of heat distribution for the shops at Winnipeg. This firm has also received an order for the Miller system from the Dominion Car & Foundry Co. for its Montreal shops. In all, 12 contracts for equipping Canadian Northern shops at different points have been awarded to the firm.

The Railway Equipment Co., Portland, Ore., has bought six acres of ground on the Willamette river about 3 miles from Portland, and will build shops for repairing locomotives and rebuilding cars. Machinery for making frogs, switches, and general track work will also be installed. The tract has both water and rail facilities. The company would like to receive catalogues from manufacturers of railroad shop tools.

The Natural Carbon Paint Co., Freeport, Ill., had a group picture made of delegates and guests at the Milwaukee convention of the Association of Railway Superintendents of Bridges and Buildings. Each member of the association is to be presented with a copy bearing the name of the company on the back. It will form an acceptable souvenir of the convention. The idea was that of A. M. McFarland, Eastern Sales Manager, who had charge of the exhibit at Milwaukee.

Receivers were appointed on October 22 for the Westinghouse Electric & Manufacturing Company, the Westinghouse Machine Company and the Security Investment Company. It was expected that receivers would be appointed the next day for the Nernst Lamp Company. All the companies are solvent, but their capital is tied up in plant and material. The tight money market made it so difficult to get working capital to meet obligations that it was decided that all interests would be best served by receiverships. The Westinghouse Air Brake Company and the Union Switch & Signal Company are not affected. The receivers are as follows: For the W. E. & M. Co., T. Hart Given, President of the Farmers Deposit National Bank; H. S. A. Stewart, real estate dealer, and E. M. Herr, Vice-President of the W. E. & M. Co.; for the W. M. Co., William McConway, President of the McConway & Torley Co., Pittsburgh; W. H. Donner, President of the Union Improvement Company, and E. E. Keller, Vice-President of the W. M. Co.; for the S. I. Co., the Fidelity Trust Company, of Pittsburgh.

David B. Carse, M. Am. Soc. M. E., has resigned from the chairmanship of the Advisory Committee of the U. S. Steel Corporation. Mr. Carse and his brother, John B. Carse, have composed this committee since its formation five years ago, the duties of the committee being to keep track of all expenditures of the company under the appropriations by the Finance Committee. John B. Carse will take care of the future work of the committee. David B. Carse, before going to the U. S. Steel Corporation, was president of Carse Brothers Company, Chicago, and, before that, General Manager of Greenlee Bros. & Co., Chicago. He was the resident engineer in charge of the construction of the Hegewisch Works, now known as the Burnham Works of the Pressed Steel Car Co., New York. Mr. Carse is now taking up again the business of Carse Bros. Co., dealing in machinery and supplies for railroad work. It has been reorganized and its headquarters removed from Chicago to New York, with offices at 12 Broadway. A department of electrical specialties has been added.

Iron and Steel.

The Baltimore & Ohio has ordered 300 tons of steel for bridges.

The Erie is said to be in the market for steel for four or five small bridges.

The Pennsylvania has ordered 300 tons of bridge steel from the American Bridge Company.

The Pittsburgh & Lake Erie has ordered 500 tons of bridge steel from the American Bridge Company.

The Southwestern Railroad of Texas has ordered 2,000 tons of rails from the Carnegie Steel Company for delivery this year.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Chicago & North-Western.—E. E. Osborn, Vice-President and Secretary, has been elected also a Director, succeeding Albert Keep, deceased. See Chicago, St. Paul, Minneapolis & Omaha.

Chicago, St. Paul, Minneapolis & Omaha.—Marvin Hughitt, President, has been elected Chairman of the Executive Committee. W. A. Gardner, Vice-President of the Chicago & North-Western, succeeds Mr. Hughitt, and has also been elected a Director, succeeding Albert Keep, deceased. T. A. Polleys, Tax Commissioner, has been elected Secretary, succeeding E. E. Woodman, who resigned on account of ill-health, but who remains Right of Way Commissioner.

Lehigh & New England.—R. H. Wilbur has been elected Vice-President and General Manager. See Lehigh Coal & Navigation.

Lehigh Coal & Navigation.—R. H. Wilbur, formerly General Manager of the Lehigh Valley, has been elected Vice-President of the Lehigh Coal & Navigation Co. George B. Harris, Vice-President, has been elected Second Vice-President.

New York Public Service Commission.—Archibald Buchanan, Jr., Superintendent of Motive Power of the Central Vermont, has been appointed Chief of the Bureau of Inspection of the Public Service Commission, Second district, with office at Albany, N. Y., effective November 1.

Pennsylvania.—Percival Roberts, Jr., M. Am. Soc. C. E., etc., a Director of the Philadelphia National Bank, has been elected a Director of the Pennsylvania, succeeding A. M. Fox, deceased.

Operating Officers.

Atchison, Topeka & Santa Fe.—F. A. Lehman has been appointed Superintendent of Transportation, succeeding C. W. Kouns, promoted.

Canadian Northern.—W. A. Brown has been appointed Superintendent of the Fourth district, with office at Edmonton, Alb., succeeding C. Carey, resigned.

Chicago & Alton.—See Toledo, St. Louis & Western.

Chicago, Burlington & Quincy.—Frank E. Ward, General Manager of the Great Northern, has been appointed General Manager of the Burlington Lines East of the Missouri River, with office at Chicago, succeeding J. M. Gruber, resigned.

James Russell, Superintendent at Beardstown, Ill., has been appointed Superintendent at Brookfield, Mo., succeeding J. E. Votaw, resigned. P. H. Hough, Trainmaster at La Crosse, Wis., succeeds Mr. Russell. F. C. Heisel succeeds Mr. Hough.

Chicago, Rock Island & Pacific.—A. B. Copley, Superintendent of Terminals at Kansas City, Mo., has been appointed Superintendent of the Indian Territory division, with office at Halleyville, Ind. T., succeeding W. Rudd, resigned. M. J. Kennelly has been appointed Superintendent of the Louisiana division, with office at Eldorado, Ark., succeeding J. C. Nolan, resigned.

El Paso & Southwestern.—The office of F. B. King, Superintendent of the Western division, has been moved from El Paso, Tex., to Douglas, Ariz.

Erie.—T. O'Neill, Trainmaster at Galion, Ohio, has been appointed Assistant Superintendent at Kent, Ohio, succeeding E. C. Allen, promoted. C. G. Smith succeeds Mr. O'Neill. F. M. Hawley, Trainmaster at Salamanca, N. Y., has been appointed Trainmaster at Susquehanna, Pa., succeeding C. A. Ford, resigned to go to the Pennsylvania Steel Co. W. H. Daley, chief despatcher at Salamanca, succeeds Mr. Hawley.

Great Northern.—See Chicago, Burlington & Quincy; also Northern Pacific.

Kansas City Southern.—F. B. De Garmo, Trainmaster at Pittsburg, Kan., has been appointed Superintendent at that place, succeeding H. E. Whittenberger, who is now Superintendent of the Eastern division of the Grand Trunk. J. E. Murphy succeeds Mr. De Garmo.

Missouri, Kansas & Texas of Texas.—R. J. Sullivan, Superintendent of the Shreveport and Mineola divisions and the McKinney branch, has returned from leave of absence. George Stoner, who has been acting in his place, has resumed his office as Trainmaster of the Dallas and Denton divisions and the Bonham branch.

Mt. Jewett, Kinzua & Riterville.—George W. Johnson has been appointed Superintendent, succeeding D. W. Boh, resigned.

New York Central & Hudson River.—F. N. Melius, Jr., has been appointed Assistant Trainmaster, with office at Poughkeepsie, N. Y.

H. Scott, Assistant Trainmaster at Clearfield, Pa., has been appointed Trainmaster of the Beech Creek district of the Pennsylvania division, with office at Jersey Shore Junction, Pa. W. A. Hammer, chief despatcher at Jersey Shore Junction, succeeds Mr. Scott.

Northern Pacific.—George T. Slade, formerly General Superintendent of the Great Northern, has been appointed General Manager of the Northern Pacific Lines East of Trout Creek, succeeding Henry J. Horn, resigned.

Portland & Seattle.—Mott Sawyer has been appointed Trainmaster, with office at Vancouver, Wash.

Toledo, St. Louis & Western.—The authority of W. A. Freese, Superintendent of Telegraph of the Chicago & Alton, has been extended over the Toledo, St. Louis & Western.

Vera Cruz & Pacific.—T. J. McCune, Superintendent of Transportation, has been appointed Superintendent, with office at Tierra Blanca, Vera Cruz.

Traffic Officers.

Louisville & Nashville.—L. R. Wasson, General Agent at Detroit, Mich., has resigned to go into other business.

Southern Indiana.—J. T. Averitt has been appointed Assistant General Freight Agent with office at Chicago.

Engineering and Rolling Stock Officers.

Atchison, Topeka & Santa Fe.—Alfred Lovell, Superintendent of Motive Power, has resigned.

Boston & Albany.—A. J. Frick, Master Mechanic of the Boston division, has been appointed Master Mechanic of the Albany division, with office at Springfield, Mass., succeeding P. T. Lonergan, resigned. E. H. Smith succeeds Mr. Frick with office at Allston, Mass.

Central Vermont.—See New York Public Service Commission.

Chicago & Alton.—See Toledo, St. Louis & Western.

Hocking Valley.—Winford L. Mattoon, who was recently appointed Principal Assistant Engineer of the Hocking Valley and the Zanesville & Western, was born in 1881 at Plain City, Ohio. He took a classical course at Denison University, Granville, Ohio, and then went to the Ohio State University for three years. In 1903 he went to the Pennsylvania Lines West, where he had already worked for one summer during his college course. After a few months he went into an engineering corps on the Hocking Valley and the next year was appointed Assistant Engineer of the Chicago, Rock Island & Pacific at Trenton, Mo. After serving as Assistant Roadmaster and again as Assistant Engineer on different divisions of this road, he was last winter appointed Engineer of Maintenance of Way of the Corning division of the Toledo & Ohio Central and the Zanesville & Western, where he remained until his recent promotion.

Illinois Central.—J. H. Nash, Master Mechanic at East St. Louis, Ill., has been appointed Master Mechanic at Paducah, Ky., succeeding R. E. Fulmer, resigned to go to another road.

Lehigh & New England.—R. G. Kenly, General Superintendent, has been appointed also Acting Chief Engineer, with office at Bethlehem, Pa., succeeding W. J. Young, resigned.

New York Central Lines.—R. D. Smith, who was recently appointed Assistant Superintendent of Motive Power, in charge of all matters pertaining to the Boston & Albany, was born in New York and educated at Albany, N. Y. He worked as a machinist in the Delaware & Hudson shops, and then went to the Kansas City, St. Joseph & Council Bluffs as a gang foreman. He worked as fireman and then engineman, and, after the road was absorbed by the Chicago, Burlington & Quincy, was made assistant foreman of the machine shops at Aurora, Ill. He was later made foreman at that place and then general foreman of the locomotive and car departments. In 1888 he was appointed Master Mechanic at Chicago, where he remained until 1902, when he was made Superintendent of Motive Power of the Lines West of the Missouri River. In 1906 he was appointed Mechanical Expert for the Lake Shore & Michigan Southern, where he remained until his recent transfer.

Seaboard Air Line.—A. J. Poole, who was recently appointed General Master Mechanic, was born in 1869 in Sumter County, Ga. After a common school education, he began railroad work in 1886 as an apprentice on the Central of Georgia. After working in several railroad shops in the South, he went to the Seaboard Air Line, in 1894, as a machinist. After two years he was made roundhouse foreman at Americus, Ga., and in 1900 was appointed general foreman of shops. Three years later he was made Master Mechanic of the Fourth and Fifth divisions, and was later transferred to the Third and the Atlantic & Birmingham divisions, where he remained until his recent promotion.

Toledo, St. Louis & Western.—The authority of W. D. Taylor, Chief Engineer of the Chicago & Alton, has been extended over the Toledo, St. Louis & Western.

Western Maryland.—R. C. Evans, Master Mechanic at Elkins, W. Va., has been appointed Superintendent of Motive Power, with office at Union Bridge, Md., succeeding W. Miller, resigned.

Special Officers.

Atchison, Topeka & Santa Fe.—C. F. Ludington has been appointed Chief Fuel Supervisor, with headquarters at Topeka, Kan., and H. E. Westcott, Fuel Supervisor of the Coast Lines, with headquarters at San Bernardino, Cal.

LOCOMOTIVE BUILDING.

The Baltimore & Ohio, it is said, will soon be in the market for 50 locomotives.

The Quebec & Lake St. John is said to have ordered 150 box cars from Rhodes, Curry & Co.

The Southern has ordered one Shay locomotive from the Lima Locomotive & Machine Company.

The Carolina & North-Western has ordered one Shay locomotive from the Lima Locomotive & Machine Company.

The Manufacturers' Railway, St. Louis, has ordered one Shay locomotive from the Lima Locomotive & Machine Company.

Vickers Sons & Maxim, London, Eng., have ordered one four-wheel saddle tank switching locomotive from the Davenport Locomotive Works.

The Boston & Maine has ordered 15 six-wheel switching locomotives from the American Locomotive Company for January, February and June, 1908, delivery.

The Canadian Northern has ordered 500 thirty-ton box cars from Rhodes, Curry & Co., and is said to have ordered 300 Hart convertible ballast cars from the Canada Car Co.

The Kansas City Southern has ordered 21 consolidation locomotives and nine switch engines from the Baldwin Locomotive Works. All these engines are to be delivered during December, 1907.

The Wisconsin Central, as reported in the *Railroad Gazette* of October 11, has ordered eight simple consolidation (2-8-0) locomotives and two switching locomotives from the American Locomotive Co. The consolidation locomotives are for January, 1908, delivery, and the special equipment for them is as follows:

General Dimensions.

Type of locomotive	Consolidation
Weight, total	163,400 lbs.
Weight on drivers	142,000 "
Diameter of drivers	63 in.
Cylinders	21 in. x 26 "
Boiler, working steam pressure	200 lbs.
" number of tubes	306
Firebox, length	108 in.
" width	63 "
Tank capacity	6,000 gals.
Coal capacity	12 tons

Special Equipment.

Air brakes	Westinghouse
Bell ringer	G. Ilmar
Piston rod packings	Jerome
Steam heat equipment	Wisconsin Central

The switching locomotives are exact duplicates of the last locomotives ordered from the American Locomotive Co.

The Eagle Lumber Company, Eagle Mills, La., has ordered one consolidation (2-8-0) locomotive from the Davenport Locomotive Works.

General Dimensions.

Type of locomotive	Consolidation
Weight, total	90,000 lbs.
Weight, on drivers	80,000 "
Diameter of drivers	48 in.
Cylinders	16 in. x 24 in.
Boiler, diameter	50 "
" working steam pressure	160 lbs.
" material	Worth steel
" number of tubes	160
" diameter of tubes	2 in.
" length of tubes	13 ft. 8 "
Firebox, length	72 "
" width	42 "
" material	Worth steel.
Tender	1 tank
Tank capacity	2,700 gals.
Coal capacity	3½ tons.

Special Equipment.

Air brakes	Westinghouse automatic
Injectors	Monitor
Lubricator	Detroit Bull's-eye
Sanding devices	Leach
Packing	Jerome metallic
Tires	Midvale

CAR BUILDING.

The Chicago & North-Western has ordered 25 passenger coaches from the Pullman Co.

The Wabash, Chester & Western has ordered 25 cars from the American Car & Equipment Co.

The Buffalo, Rochester & Pittsburgh is said to be in the market for 750 gondola cars of 100,000 lbs. capacity.

The Missouri River & North Western has ordered 15 gondola cars from the American Car & Equipment Co.

The Arkansas, Louisiana & Gulf has ordered 25 cars from the American Car & Equipment Co. J. M. Parker, Monroe, La., is General Manager.

The Harriman Lines, as reported in the *Railroad Gazette* of October 18, have ordered 16 passenger cars from the American Car & Foundry Co. and 10 from the Pullman Co.

The Idaho & Washington Northern, as reported in the *Railroad Gazette* of October 18, has ordered four cabooses from the Pullman Company, for November delivery. These cabooses will be 34 ft. 9½ in. long, 9 ft. 10¼ in. wide, over all and 14 ft. 4¼ in. high, over cupola. The special equipment includes:

Brakes	Westinghouse
Couplers	Tower
Draft rigging	Westinghouse friction

The San Antonio & Aransas Pass, as reported in the *Railroad Gazette* of August 9, is asking prices on 200 ventilated box cars and 275 plain box cars for December, 1907, delivery.

The Atchison, Topeka & Santa Fe, as reported in the *Railroad Gazette* of October 18, has ordered 100 refrigerator cars of 60,000 lbs. capacity from the American Car & Foundry Company. These cars will measure 32 ft. 6 in. long, 8 ft. 2¾ in. wide and 7 ft. 3 in. high, inside measurements. The special equipment includes:

Bolsters	Atchison, Topeka & Santa Fe standard
Brake beams	Crewo
Brakes	Westinghouse
Draft rigging	Miner
Trucks	Atchison, Topeka & Santa Fe standard.
Wheels	American Car & Foundry Co.

The Long Island, as reported in the *Railroad Gazette* of October 18, has ordered 50 all-steel vestibuled passenger coaches, of which 30 will be without saloon and will seat 72 persons, and 20 will have saloon and will seat 69 persons. Delivery is to be made February 15, 1908. The cars will measure 53 ft. 8¼ in. long, 8 ft. 11⅜ in. wide and 8 ft. 4⅞ in. high, inside measurements, and 64 ft. 5¾ in. long, 9 ft. 11½ in. wide and 13 ft. 8 in. high, over all. The special equipment includes:

Bolsters, truck	Pennsylvania R. R. standard, built-up type
Brake-shoes	Christie
Brakes	Westinghouse
Brasses	Ajax (as to bronze
Couplers	Janney, three stem
Curtain fixtures	National Lock Washer Co.
Curtain material	Pantasote
Door fastenings	J. L. Howard & Co.
Draft rigging	Westinghouse friction
Heating system	Long Island R. R., straight steam
Light	Pintsch gas, mantle lamps
Springs	Union Spring & Mfg. Co.
Trucks	Pennsylvania R.R. special steel, 4 wheel
Wheels	Schoen rolled steel

RAILROAD STRUCTURES.

ALIQUIPPA, PA.—The Pittsburgh & Lake Erie has decided to make additions to its yards. All the land necessary for the improvements has been bought. The yards will be more than a mile long.

ALTOONA, PA.—It is said that the Pennsylvania is negotiating with the city officials to abolish grade crossings at 37th, 33d and 29th streets, by building overhead bridges.

ASTORIA, ORE.—The Harriman interests, it is said, have bought 4,000 ft. of water frontage on the west side of Young's bay as a site for future terminals.

BEAVER, PA.—The Pittsburgh & Lake Erie is planning to build a bridge over the Ohio river at the mouth of Beaver river to cost about $350,000. The company has bought a large amount of land for approaches and as a site on which to relocate its tracks. A new passenger station is also to be built and other improvements made at a total cost of about $2,000,000.

CAMPBELLTON, N. B.—It is said that the proposed bridge over the Restigouche river here, which is to be 3,330 ft. long, is assured. The structure will cost about $600,000. T. Malcolm can give information.

COATESVILLE, PA.—Contracts are reported let by the Philadelphia & Reading for building a four-span steel girder bridge 250 ft. long over the west branch of Brandywine creek.

EVANSVILLE, IND.—The Evansville & Terre Haute is putting up a new passenger station here, to cost about $125,000.

GOMEZ PALACIO, MEX.—The Mexican Central, it is said, is planning to put up large shops and terminals here.

HARRISBURG, PA.—An ordinance is before the City Council for building a bridge by the Philadelphia & Reading over its tracks at Thirteenth street.

HOUSTON, TEX.—The International & Great Northern has finished its docks on the Houston ship canal just below Houston. The company owns a frontage of several miles on the canal, and will construct extensive terminal facilities on this property.

JERSEY SHORE, PA.—A contract has been given to the York Bridge Company at $51,945 for the new bridge over the Susquehanna river here.

LANCASTER, PA.—The Board of Trade is trying to secure the building of bridges over the Pennsylvania and the Philadelphia & Reading tracks here. The question is now being considered by a special committee.

MILWAUKEE, WIS.—The planing mill of the Chicago, Milwaukee & St. Paul shops was this week destroyed by fire; loss $100,000.

MONTREAL, QUE.—The Montreal City Council has appointed a committee to consider a proposition to depress the tracks of the Grand Trunk in this city 15 ft. The plans call for the construction of overhead bridges at street crossings.

NEW YORK, N. Y.—The city has bought additional land for the

new Brooklyn bridge terminal in the Borough of Manhattan and for the subway loop connecting the Brooklyn and Williamsburg [illegible].

Ottawa, Ont.—A number of satisfactory bids were recently received for the foundations for the new Grand Trunk passenger station, baggage annex, train shed and concourse and also for the hotel and subway connecting same with the station by B. L. Gilbert, of New York, the chief architect of the buildings. The company is ready to begin work on the station to cost $1,000,000 and on the hotel to cost $1,500,000 this fall or next summer. The commencement of the work depends on the carrying out of the agreement made by those interested in Ottawa with the Grand Trunk as to the fixed assessments. (Aug. 23, p. 215.)

Rockport, Ind.—Surveys are being made to locate the site for the proposed railroad bridge over the Ohio river, to be built by the Owensboro & Rockport Terminal & Bridge Co. A. S. Kennedy, President, Rockport.

Terre Haute, Ind.—The Evansville & Terre Haute will enlarge its freight house here at a cost of about $16,000.

Waycross, Ga.—The new shops for the Atlantic Coast Line under construction for the past year, are about finished, and will soon be put in operation. The cost of the buildings is about $300,000 and other improvements and machinery bring the total up to about $2,000,000.

Williamsport, Md.—At a recent meeting of the Washington & Potomac Bridge Company, the report of the Engineer was accepted. It has been decided to shortly ask bids for building a concrete bridge about 1,500 ft. long and 30 ft. wide over the Potomac river here. W. D. Byron & Sons are said to be interested.

The Town Council has granted permission to the Washington & Berkeley Bridge Company to enter the town. The company proposes to build a bridge over the Potomac river.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

Atchison, Topeka & Santa Fe.—Local reports say that this company has given contracts for rebuilding its line from Cicero, Kan., to Mayfield, and for enlarging its yards at Wellington.

Baltimore & Ohio.—This company, it is said, will build a large freight classification yard at Somerset, Pa.

Work is under way on a five-mile line from Boswell, Pa., to the Somerset Coal Company's works.

Boston & Eastern (Electric).—Under this name a company will apply to the Massachusetts Legislature for authority to bore a tunnel under the harbor to East Boston. The plans filed by Engineer James Bickford with the State Railroad Commission call for a tunnel over a mile long, to cost with approaches, about $11,000,000.

Butler & Chicora (Electric).—Application has been made by this company for a charter to build an electric line from Brady's Bend, Pa., southwest to Chicora, with a branch south to Kaylor, a total of 15 miles. John Daly, W. G. Stern, W. Criswell and W. J. Burgan, of Pittsburgh, and E. W. Dewey, of the Allegheny River Improvement Association, are interested.

Chicago, Milwaukee & St. Paul.—This company, it is said, has begun operating its Pacific extension from Mobridge, S. Dak., on the Missouri river, west 100 miles, to Lemmon, in Butte county. This, added to 95 miles of completed road in Montana (from Harlowton west to Lombard on the Montana Railroad), which was bought by the company, and 40 miles laid from the end of that section east, makes a total of 235 miles ready for business out of the 731 miles from the Missouri river to Butte. Work is progressing at various points in Washington and Montana.

Chicago, Rock Island & Pacific.—Reports from Waurika, Okla., say that this company is carrying out work to cost about $500,000, improving its yards and adding new stations, switches and terminals.

Cleveland, Cincinnati, Chicago & St. Louis.—Announcement is made by this company that it now has in operation 42 miles of double track between Terre Haute, Ind., and Indianapolis. About 32 miles of second track remains to be built.

Dallas Interurban.—Contracts, it is said, will shortly be let by this company for building an electric line from Dallas, Tex., east via Mesquite and Forney to Terrell, 30 miles. The names of the promoters are not given.

East Erie Commercial Railroad.—A charter has been granted this company, with $25,000 capital, to build a line 2½ miles long from Erie, Pa., south to a connection with the Lake Shore & Michigan Southern. It is proposed also to connect with other lines in Erie. Directors are: M. E. Griswold, Jr., President; F. C. Pratt and J. C. Sherwin.

Evansville & Terre Haute.—This company will build an industrial extension 1½ miles long at Vincennes, Ind., to cost about $21,000.

Galveston & Houston (Electric).—Contract for building this proposed electric line from Houston, Tex., southeast to Galveston, about 51 miles, it is said, will be let as soon as plans for building the causeway are accepted by the railroads interested. The county of Galveston has authorized an issue of bonds to pay for its share of the work on the causeway. Stone & Webster, of Boston, Mass., are interested in the proposed line. (Apr. 26, p. [illegible].)

Inter-California.—See Southern Pacific.

Kentucky North and South.—Surveys are reported made and work soon to be begun, on this proposed line from Fullerton, Ky., south to Bristol, Tenn., about 200 miles. The work will include a tunnel about half a mile long through Cumberland mountains at the Kentucky-Virginia line. (July 26, p. 111.)

Mexican Central.—The extension of this road from Marfil north to Guanajuato, five miles, it is said, will soon be finished.

Mexican Roads.—It is said that the Mexican Government will grant a liberal subsidy to the company which is to build a line from Balsas, on the Mexican Central, west to the Port of Zihuatanejo, on the Pacific Coast, about 125 miles. Preliminary surveys are now being made by Gen. Henry Ide Willey, of Mexico City, who represents a syndicate, having funds to carry out the project. At the Port of Zihuatanejo, the Government proposes to make extensive harbor improvements. (Oct. 4, p. 103.)

Surveys, it is said, have been made for a proposed line from Salvatierra, Guanajuato, on the National of Mexico, west to Puruandio, Michoacan, 50 miles. Andrez Bermejillo, of Mexico City, is the principal promoter. C. A. Malau, of Guadalajara, is Chief Engineer.

Minneapolis, St. Paul & Sault Ste. Marie.—This company, it is said, will build a railroad from Garden, Mich., north to its main line at Cook's Mills, ten miles. The Vans Harbor Land & Lumber Company will provide the right of way and the railroad company is to furnish the rails and other equipment.

Missouri Roads (Electric).—Plans are being made by a company to build an electric line from Mexico, Mo., north to Memphis, 90 miles. A. W. Carpenter, of Memphis, and D. Fitzgerald, 80 Wall street, New York, are said to be interested.

Nevada Roads.—Plans are being made by a company to build a line from Ely, Nev., southwest to Goldfield, 180 miles. The estimated cost of building the line will be $1,800,000. It is said that the Guggenheimer interests, associated with Tex Rickard, of Salt Lake City, are back of the project.

New York Subways.—The Public Service Commission of the First district, it is said, will report favorably on the proposition to build a subway on the East Side of the Borough of Manhattan. The proposed route, as laid out by the old Rapid Transit Commission, is from a point in the Bronx through Third avenue, across Manhattan bridge to Brooklyn, and thence under Flatbush and Fourth avenues to Coney Island. The cost of the section on the Manhattan side of the East river will be between $35,000,000 and $40,000,000, and if contractors fail to bid on the work, the Commission will recommend that the subway be built by the city. The Commission has already authorized the Brooklyn part of the line.

Parral & Durango.—This company has under consideration the question of building an extension of its road from its present southern terminus, at Mesa de Sandia, Durango, southeast to Tepehuanes, 80 miles, where connection is to be made with the Mexican International. This would furnish a new and shorter line between Parral and Durango.

Pennsylvania Roads.—Announcement is made that surveys have been made for a line from Uniontown, Pa., west to Wheeling, W. Va. J. V. Thompson, and associates, of Uniontown, who were interested in the Uniontown & Wheeling Short Line, which has been taken over by the Wabash, are interested in the project.

Pennsylvania Roads (Electric).—A proposition is under consideration to build an electric line from New Castle, Pa., northeast via Harlansburg, Slippery Rock, Grove City, Raymilton and Polk to Franklin, 51 miles. B. E. Cutler, of Grove City, is the chief promoter.

Philadelphia & Reading.—Contracts are reported let by this company for a change in alinement on about half a mile of road at Coatesville, Pa., and for a steel bridge over Brandywine creek.

Pittsburgh & Lake Erie.—J. M. Schoonmaker, Vice-President of this company, denies that the traffic arrangement recently effected with the Coal & Coke and Morgantown & Kingwood, owned by the Davis-Elkins interests in West Virginia, means running over the latter road in the route to Bellington, instead of building a new

line. The original plan to build along the Monongahela river through Morgantown to Fairmont, thence up the Tygart Valley through Grafton to Bellington, is to be carried out. This will give connection with both of the Davis-Elkins roads. (Apr. 5, p. 499.)

San Antonio & Mexico.—Application will soon be made by a company under this name for a charter to build about 500 miles of railroad; a main line from San Antonio, Texas, south to Brazos Santiago, near the mouth of the Rio Grande river, 200 miles, a branch from a point north of Pleasanton, Atascosa county, west via Eagle Pass to Del Rio, 170 miles, and a branch from near Oakville, east through Bee and Refugio counties to San Antonio Bay, 80 miles. A branch is also projected through the northern part of Nueces county to Aransas Pass, 50 miles. Surveys are to begin at once. The incorporators include: Colonel Uriah Lott, of San Antonio; D. J. Woodward, J. J. Stevens, G. W. West and J. E. Jarratt.

Shamokin & Edgewood (Electric).—This company has been granted permission to build about 53 miles of extensions, including a line west to Sunbury, 18 miles; also through Irish Valley, 15 miles, and from Paxinos to Seven Points, 10 miles.

Southern Pacific.—The Inter-California, projected from Calexico, Cal., near the international boundary southeast through Mexico, thence northeast across the boundary near the Colorado river to a connection with the Southern Pacific near Yuma, Ariz., of which 15 miles was built last year, will shortly be put in operation from Calexico south to Paradones, 37½ miles. (Mar. 12, p. 392.)

Texas Roads.—The official statement recently issued by the Texas Railroad Commission for the fiscal year ended June 30, 1907, gives the total mileage of track as 15,482 miles, consisting of 12,575 miles of main line and 2,907 miles of sidings. During the year 517 miles of main track and 314 miles of side track were added. Of this the following companies added new mileage: Abilene & Northern, 38 miles; Beaumont & Great Northern, 20; Burrs Ferry, Browndell & Chester, 7; Caro Northern, 16; Houston Belt & Terminal, 8; Wichita Falls & Northwestern, 16; Wichita Valley, 60; Galveston, Harrisburg & San Antonio, 26; Houston & Texas Central, 94; Pecos & Northern Texas, 57; Texas Central, 41, and Trinity & Brazos Valley, 144. The statement does not include the logging roads, of which there are a large number, having an aggregate length of more than 1,000 miles.

A project is being promoted by James W. Swain, of Fort Worth, Tex., to build a line about 400 miles long from Fort Worth, Tex., west to Roswell, N. Mex.

Texas Roads (Electric).—Contract is reported let to the Suderman-Dolson Company, of Houston, to build an electric line from Fort Worth, Tex., to Mineral Wells, about 50 miles. Work is now under way. C. M. Davis, Chief Engineer.

Contract is also reported let to the American Engineering Company, of Indianapolis, for building an electric line from Fort Worth west to Mineral Wells by a different route.

Rights of way, it is said, have been secured and financial arrangements are being made by Dr. T. M. Barnes, of Fort Worth, for building an electric line from Waco, Tex., southeast to Marlin, 25 miles, thence southwest to Temple, 30 miles.

Waco, Hamilton & Brownwood.—It is said that financial arrangements have been made by this company and contracts will shortly be let for building its proposed line from Waco, Tex., west to Brownwood, about 120 miles. Stephen Turner, Chief Engineer. (Oct. 4, p. 403.)

Western Illinois Traction.—Incorporated in Illinois with $100,000 capital and office in Chicago. The company proposes to build an electric line from Lyons, Cook county, west through Du Page and Kane counties to Aurora, 30 miles. The incorporators include: M. M. Miller, L. Michael, L. Crollin, E. J. Schmidt and W. Klein.

Wisconsin Central.—A franchise, it is said, has been granted this company to enter the city of Duluth, Minn., and a contract has been made with the Northern Pacific to use its bridge over the St. Louis river. (Sept. 23, p. 372.)

Wisconsin Roads (Electric).—Contract is reported let to the Milwaukee Construction Co. for building an electric line from Fond du Lac, Wis., north along the east shore of Lake Winnebago, connecting with the Knox Transportation Company either at Appleton or Kaukauna, about 50 miles. The promoter's names are not given.

RAILROAD CORPORATION NEWS.

Bloomington, Pontiac & Joliet Electric.—Control of this company has been bought by interests in control of the Joliet, Plainfield & Aurora. The Bloomington, Pontiac & Joliet Electric has 20 miles of road in operation from Pontiac, Ill., to Dwight, and it is understood that the extensions to Bloomington and to Joliet will be completed. The Joliet, Plainfield & Aurora runs from Joliet, Ill., to Aurora, 20 miles, and is the connecting link between the Chicago & Joliet Electric and the Aurora, Elgin & Chicago. It is owned and operated by the Joliet & Southern Traction Company.

Central of Georgia.—Oakleigh Thorne, President of the Trust Company of America, New York, has sold his share in the stock of the Central of Georgia. Mr. Thorne and Marsden J. Perry bought all the stock of the road last June. (June 28, p. 949.)

Cleveland & Pittsburgh.—The New York Stock Exchange has been asked to list $796,250 additional special guaranteed betterment stock, making the total listed $8,274,050.

Evansville & Terre Haute.—Results of operation for the year ended June 30, 1907, are given in the following table. The company is to spend $183,000 on a passenger station and the improvement of freight terminals at Evansville, Ind.

	1906-'07.	1905-'06.	Change.	
Average miles operated	310	310		
Freight earnings	$1,586,742	$1,489,423	Inc.	$97,319
Passenger earnings	587,885	585,219	"	2,667
Mail earnings	54,487	53,788	"	699
Express earnings	36,464	33,511	"	2,953
Miscellaneous earnings	1,637	1,740	Dec.	104
Gross earnings	$2,267,215	$2,163,681	Inc.	$103,535
Maintenance way and structures.	$280,144	$226,477	Inc.	$53,667
Maintenance of equipment	403,082	308,496	"	94,585
Conducting transportation	386,076	495,538	Dec.	109,462
General expenses	74,308	80,906	"	6,599
Operating expenses	$1,143,609	$1,111,418	Inc.	$32,192
Net earnings	$1,123,606	$1,052,263	Inc.	$71,343
Other income	25,514	24,612	"	902
Total income	$1,149,120	$1,076,875	Inc.	$72,245
Taxes	$103,278	$92,284	Inc.	$10,993
Interest and rentals	580,622	550,281	"	30,341
Net income	$465,221	$434,310	Inc.	$30,911
Dividends	223,662	223,662		
Additns., improvemts, betterms..	.....	42,921	Dec.	42,921
Year's surplus	$241,559	$167,727	Inc.	$73,832

Illinois Central.—At the annual meeting called last week, the counting of proxies was stopped when it became evident that Stuyvesant Fish had more than the Harriman interests. According to the provisions of the temporary injunction, the meeting was accordingly adjourned to December 18 to allow time to decide the question as to whether the 286,731 shares owned by the Union Pacific, the Railroad Securities Company and the Mutual Life Insurance Company may be voted by the Harriman interests. It is said that, of the remaining stock, Mr. Fish controlled 40,000 shares more than the Harriman interests. (Oct. 18, p. 474.)

Joliet & Southern Traction Company.—See Bloomington, Pontiac & Joliet Electric.

Joliet, Plainfield & Aurora (Electric).—See Bloomington, Pontiac & Joliet Electric.

Kansas City Southern.—Results of operation for the three months ended September 30 were as follows:

	1907.	Change.	
Gross earnings	$2,654,690	Inc.	$604,806
Operating expenses	1,633,065	"	308,128
Net earnings	$1,021,625	Inc.	$296,678
Taxes	55,327	"	7,215
Net earnings, taxes deducted	$966,298	Inc.	$289,463

Lehigh Valley.—This company has sold to Brown Bros. & Co., New York, the First National Bank, New York, and Drexel & Co., Philadelphia, $2,000,000 4½ per cent. car trust notes, maturing in 20 equal semi-annual instalments up to and including September 1, 1917. They are secured on steel frame box cars, gondolas and steel coal cars.

McCloud River.—This company has made a new first mortgage to the Mercantile Company, San Francisco, as Trustee, securing an issue of $1,200,000 5 per cent. 30-year bonds. The old bonds, amounting to $316,000, have been retired. The road runs from Sisson, Cal., on the Southern Pacific, to McCloud and other points, 50 miles in all.

Pere Marquette.—Judson Harmon, Receiver, and W. W. Crapo, of the stockholders' protective committee, are to act as arbitrators to complete the reorganization of this company. The plan has been approved by Judge Horace Lurton in the Federal Court, and it is expected that the receivership will be terminated within a month.

Wrightsville & Tennille.—The Georgia Railroad Commission has given this company permission to issue $250,000 bonds secured on its 105 miles of road. The proceeds are to be spent for betterments, mostly on the Dublin & Southwestern, a 31-mile subsidiary. (Aug. 1, p. 138.)

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EDITORIAL ANNOUNCEMENTS.

THE BRITISH AND EASTERN CONTINENTS edition of the Railroad Gazette is published each Friday at Queen Anne's Chambers, Westminster, London. It contains selected reading pages from the Railroad Gazette, together with additional British and foreign matter, and is issued under the name Railway Gazette.

CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.

ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

CONTENTS

VOL. XLIII., No. 18. FRIDAY, NOVEMBER 1, 1907.

The New York, New Haven & Hartford has dismissed between 2,500 and 3,000 men, most of them working hitherto on its improvements. This is a direct result of the financial stress and the necessity of providing for the cash payments of the future. The incident has its quick and sharp lesson for labor and is not limited to this particular case. The New Haven had a large amount of cash on hand. It expected to go on with its improvements. It wanted these improvements finished as soon as possible, and partly relied on them as a basis for increased future earning power. But in spite of these favoring conditions the sudden intensifying of the general financial trouble forced a change of policy. And the labor force of the corporation felt instantly the strain on capital. It illustrates a broader truth, prosaic but powerful. Capital is at one end of a rope, labor at the other. Capital is jarred and the rope begins a series of wave movements. They may be rapid, they may be slow, they may be long, they may be short; but, in all cases, they reach the whole length of the line from capital to labor. And when tight money, tight capital and tight credit, albeit somewhat identical terms, unite in a convulsion, the man at the shovel and tamping bar feels an impact like that felt by the man in Wall street. The truism has had many and familiar examples; but not often has it been shown up so suddenly, so uniquely, so quickly and on such a scale as in the New Haven case, where the wage earner's prosperity abruptly shifts to adversity. The political workers in our legislatures, more versed in railroad baiting than in handling the pick, have opportunity to take notice and warning. A great political campaign is set down on the calendar for next year. The enthusiasms of full-dinner-pail constituents are the extreme reverse of the complaints of men with empty dinner pails. "You have hurt the railroads, but what have you done to us?" The men at the other end of the rope already know what has been done to them.

The standards for parts of electric motor trucks, which were recently adopted by the American Street and Interurban Railway Engineering Association, are shown in another column in this issue. They represent the first serious attempt to bring about some uniformity in electric truck building and, no doubt, are only a forerunner of future work toward standardization in other details of street and interurban car construction which will be no less far reaching and important than the last 30 years' work of the Master Car Builders' Association. Present practice in electric car and truck building is a curious mixture of the old ideas handed down from the days of horse cars and of many details of steam railroad car construction. Variety and individuality have marked the development, with the result that on the same road or system of roads many widely different patterns of trucks and truck details are in use. This works a hardship alike on the manufacturer of equipment and the officers and men in charge of the repair and maintenance of the cars. Of course, such a situation is not so bad on most electric roads as it would be on steam roads because as yet there is no general interchange of equipment. The value of standardization, however, is now well known to those steam roads which, in the last few years, have systematically carried out the idea in every possible detail of car and locomotive building. The individual electric roads will find it no less valuable in reducing the cost and time of making repairs and promoting generally a higher standard of maintenance.

The standards adopted by the Association include axles, journal bearings and boxes, brake-shoes and wheel contours. These are the essential elements of the running gear. Axles are perhaps the most important, since the dimensions of wheels, journal bearings and the motor attachments depend on the size and shape of the axle with which they are used. The general design of the six standard axles adopted is similar to the M. C. B. standards in respect to size of journals and capacity, the sizes ranging from $3\frac{3}{4}$ in. x 7 in. to $5\frac{1}{2}$ in. x 10 in., with capacities from 15,000 lbs. to 38,000 lbs. The diameter of the wheel fit has been enlarged, somewhat, because the axles are used for driving; and the center portion between gear fits is made of uniform diameter without taper towards the center. In the five largest axles the diameter is made larger than that of the three corresponding M. C. B. axles to provide for the additional stresses imposed by the weight of the motor and the torsion of driving. The journal bearings and boxes are substantially M. C. B. standard with alternative designs of boxes to be used with trucks having springs over the journals. More confusion existed in the

matter of brake heads and shoes than in any other detail considered by the committee and the two designs adopted are radical departures from the present practice on many roads. M. C. B. standards were here again used as a working basis and the design of head and shoe for wide tread wheels (3-in. and over) are both interchangeable with the Christie head and shoe. For wheels with treads narrower than 3-in., a modified Christie head and shoe were adopted. It was found to be impracticable to design a single head which would take shoes varying from 2¼-in. to 4-in. tread, and these are the wide variations which are found in practice. Two designs of wheel treads were adopted, both differing widely from the M. C. B. standard, which is recognized in the report of the committee but not shown as a third alternative although it is in increasing use on heavy interurban roads which have entrances into cities over private right-of-way. The light wheel has a tread only 2½ in. wide and a flange 1 1/16 in. thick and ¾ in. deep. The existing franchises in some cities, particularly in the New England states, prevent the use of tracks and special work suitable for wheels of wider tread and deeper flange and the design adopted is an undesirable makeshift to provide for conditions which cannot at present be changed. The heavy design A is intended for combined city and interurban work and has been found in service to give the required safety for any but the highest speeds and at the same time to run over all modern special work without damage. The deeper flange is no wider than in the light wheel and can be run on either grooved or girder rail. The wide tread materially reduces the wear on the surface of special work. In conclusion it may be said that these standards are not experimental, having all been tried in the most severe service, and that they meet with the unanimous approval of all the manufacturers.

GEORGE WESTINGHOUSE.

For a second time in a crisis this wonderful engineer appears near the center of the stage with the light turned on his financial constructions, and by the results of inspection and full knowledge these essential, but to him incidental, products of his genius must stand. Some things are certain in this uncertain world, and among them is the human certainty that his work will go on and will be conducted by him without other than slight check, because it is World's work, making materials which are the results of original study, invention and adaptation for the most part having to do with the arts of transportation, and all for saving life and producing better implements of civilization. If there were doubt of this, if there were fear of his "going to the wall," it would be a matter of concern to every railroad officer who respects his profession and takes it seriously; and also to his business rivals, commercial enemies, who have never failed to acknowledge the indebtedness to this great inventor and producer.

There are 21 American and 10 foreign Westinghouse companies,* with 210 officers, $120,000,000 capital, $90,000,000 annual output, 24 factories with 7,000,000 ft. of floor space, and an army of 38,000 employees. And these huge machines are not simply notable because they make most of the automatic brakes and a fair share of the signals, draft gear and electric light, power and traction materials for the civilized world. Their beneficent power and influence is due rather to the original investigation, invention and design and development which have been an incentive and a spur to other engineers and manufacturers.

So swift a pace was never before known as that set for getting full knowledge of how to control electric force for the uses of mankind; and few indeed of the great men who have made their mark in this field fail to credit that pace to Mr. Westinghouse. Probably the greatest single thing in this way which he has done was in introducing and developing in America the use of the alternating current for transmitting and applying electricity. He was one of the first to see the possibilities of the applications of the alternating current, and with his characteristic courage and vigor he proceeded to buy patents, to invent, to develop apparatus and methods and to push forward commercially along that line. He had a tremendous fight against established interests, but he has revolutionized practice, and the theories he sustained with such vigor and at such expense in money and personal comfort, are now accepted by the electrical engineers of the world.

He has sole credit for originating a method of stopping trains and controlling speed so as to make high speed and heavy train movement possible, and with the help of his staff he has been able during the past 38 years to successively improve and adapt that method to all new conditions. In doing this he has saved thousands of lives, directly in the actual train service, and indirectly, to a degree not measurable, in the resultant quick transportation of food, materials and people.

What may be called his second important series of studies for securing safety and increasing the capacity of railroads was to the same end of preventing collisions and permitting increased density of traffic. In invention and development of automatic block signaling and power interlocking he was one of the pioneers, and in results undoubtedly the most important of all of them. Our readers are fairly familiar with his work in these lines. They can, however, have no conception of the tenacity of purpose and the prodigal expenditure of mental energy that have gone to develop the special arts and apparatus which are the reason for existence of the Air Brake Co. and the Union Switch & Signal Company.

In the same line of thought he began more than 20 years ago studies and experiments in draft gear for the purpose of making it possible to haul long trains of heavily loaded cars, reducing the shocks and preventing the disastrous breakaways. Early failures in his friction draft gear meant nothing to him. He is classed as one of those who have "the courage of their convictions," but this is not accurately descriptive. His belief becomes his principle, and when he believes he acts on it with no thought of the quality of courage and no need to muster it. To him the success of the friction draft gear and its useful function were foreordained.

The briefest enumeration of the ways in which Mr. Westinghouse has made high speed, heavy trains and more frequent trains possible and safe sounds like a eulogy, but there is no intention of that sort in this writing. It is, rather, to remind every railroad officer who honors his calling that this man who has done so much for us is facing a financial storm with the same quiet confidence that he has shown with hundreds of mechanical difficulties, and that he deserves to have the support of railroad officers, engineers, and business rivals. He is capable of great work in this world for many years to come, and we must not lose the benefit of that work.

One contribution made by Mr. Westinghouse to the welfare of mankind is not known by many people outside of a limited district. He was a pioneer in the development of the method of using natural gas as a fuel. When he took up the matter its use was quite limited and was crude, wasteful and dangerous. He saw the methods of transportation in handling gas must be revolutionized before it could be successfully used in a large and general way, and to his engineering sense is due the development of the successful method of transmitting gas in large volumes at low velocity and under low pressure.

At this time, in addition to an enumeration of his work, something about Mr. Westinghouse's personal characteristics may aid the younger generation to understand the situation. He is a man of great physical strength, he has lived an abstemious and sober life. He has never smoked a whiff, he never drinks anything but possibly a glass of wine with his dinner. He has always eaten sparingly and carefully and, while he has worked tremendously, his work has been widely varied and a succession of mental diversions, a substitute for amusements in keeping mind and body stimulated and elastic. Physically he seems as young as an ordinary business man of 45 or 50, and he has a reasonable expectation of 20 years of valuable work, although he was born in 1846.

Intellectually, he was probably never more powerful than he is to-day. It is to be supposed that the imaginative side of his mind is less vigorous now than it was twenty years ago, although that is by no means certain, because he is a man so phenomenal in

*The principal American companies are: American Brake Co., Athn Steel Casting Co., Bryant Electric Co., Canadian Westinghouse Co., Cooper-Hewitt Electric Co., East Pittsburgh Improvement Co., Nernst Lamp Co., R. D. Nuttall Co., Perkins Electric Switch Mfg. Co., Pittsburgh Meter Co., Security Investment Co., Union Switch & Signal Co., Westinghouse Air Brake Co., Westinghouse Automatic Air & Steam Coupler Co., Westinghouse, Church, Kerr & Co., Westinghouse Electric & Mfg. Co., Westinghouse Foundry Co., Westinghouse Inter Works Railway Co., Westinghouse Lamp Co., Westinghouse Machine Co., Westinghouse Traction Brake Co.

The principal European companies are: The British Westinghouse Electric & Mfg. Co., Ltd., Societe Anonyme Westinghouse, Le Havre, France; Societe Electrique Westinghouse De Russie, Traction & Power Securities Co., London, Westinghouse, Cooper, Hewitt Co., Ltd., London; Westinghouse Electrizitats Actiengesellschaft, Westinghouse Metal Filament Lamp Co., Ltd., London; Westinghouse Metallfaden Gluehlampen fabrik Gesellschaft m. b. H., Westinghouse Brake Co., Ltd., Compagnia Italiana Westinghouse Die Frenl.

Some idea of the scope of the several manufacturing companies can be got from a brief list of their more important products. Electric apparatus of all kinds. Train brakes. Locomotive brakes. Electric-car brakes. Automatic slack adjusters. Automatic air and steam couplers. Friction draft gear. Automatic and manual block signals. Hand-operated and power operated interlocking machines. Gas producers. Gas and water meters. Steam and gas engines. Turbines. Mechanical stokers. Air compressors. For installation and construction work, one of the larger corporations is occupied exclusively as designing and constructing engineers. For example, the company had charge of the layout and construction of the Boston South Terminal and now has the mechanical and electrical engineering and equipment of the Pennsylvania's New York terminal, involving an expenditure of $25,000,000.

make-up. In capacity for sustained attention, in power of analysis and reason, and in command of a vast store of experience, he is probably to-day a better man that he ever was before. All of this being so, it is impossible for those who know him to think of him as relaxing his efforts or suffering any diminution of power or control.

It would be quite impossible to even attempt to give any notion of the multitudinous interests into which his restless mind has penetrated, always with the aim of producing practical and useful results. For while he is a man of imagination and of visions, the governor of his mind is always set to the end of utility.

Why has he done this? Why has he set aside ease and pleasure? Why has he given his years to unceasing toil? Why has he repeatedly ventured fortunes in great enterprises? He might have retired at 40, a very rich man with a name known and honored all over the civilized world, with a great capacity for enjoyment and with abundant means to gratify all the tastes and desires of his enterprising and versatile spirit. Probably Mr. Westinghouse himself could not answer these questions. He has worked as all great men have worked—in obedience to an internal, compelling force. It is certain that the desire to amass and leave behind him a colossal fortune has been the most insignificant element in the forces that have driven him forward. It is certain, also, that he has always felt a noble aspiration to do good in the world, to really serve mankind. Unquestionably, he loves power and responsibility. Unquestionably, too, he is keenly alive to the good opinion and the approbation of the best minds. But it is very doubtful if these recognized incentives to exertion and to self-sacrifice have been other than contributory to the main result. Behind it all lies that mysterious, impelling force (the definition or analysis of which is perhaps impossible) which pushes men forward as fast and as far as their powers permit them to go. The directions which they take, the results which they achieve, depend upon the qualities of their minds and on their moral natures; and these we can discern and analyze, but the driving power behind is often beyond our comprehension.

The sources of his power over men are perhaps easier to discern than are the underlying motives of his conduct. Men feel immediately the dominating force of his will. They recognize at once when they come in contact with him the breadth and power of his intellect. And then, as they go on, they discover his generosity, his magnanimity, the loftiness and purity of his motives, and they are attracted by the simplicity of his manners. People often say that he has great personal magnetism. So he has—whatever that may mean. But, after all, that is merely an easy phrase in which to sum up the resultant of the noble qualities of his mind and character.

THE NEW PSYCHOLOGY OF RAILROAD INVESTMENT.

As distinguished sharply from "high" financiers and minor groups of speculators who have their daily flights, high and low, in railroad securities, the real investors who buy railroad stocks to have and to hold may be roughly divided into two classes, each large. There is the ultra conservative who always writes big the word "security." His objective point is almost always the railroad bond of senior place and quality and generally the first mortgage bond, though now and then he may take a shallow dip into, what seems to him semi-speculative, the junior mortgage of a dividend-paying line. But a mortgage security on railroad property he craves and must have. The second class of investor has its special affinity for railroad stocks, dividend paying or likely to become so. The psychological influence in that class is the little touch of the gambling instinct which, to the assured and regular dividend, adds the uncertainty, tipped with hope, of larger dividends or "rights" to come. It is interesting to trace in the case of both these large groups of investors some of the changes of mental action and reaction which the remarkable drop in railroad values of the last two years has brought about.

Take first the ultra conservative or mortgage seeker in railroad investment who was content with his 3.75 per cent. return two years ago. Since then he has had no diminution of income nor, on the other hand, has he had an increase. His double gilt edged bonds have not defaulted nor are they likely to unless the heavens fall. But he has seen the purchasing power of his well-secured income diminish probably 10 per cent. in two years; and, what is more puzzling to him, not to say disquieting, he has seen the market appraisal of his solid security shrink 5, 10, 15 per cent., sometimes more. It is, in its outward phases, as though the holder of a time mortgage, secured by triple value of realty, were to be told that its assignment value were below par—as indeed is true nowadays in some cases. What wonder that, under such conditions, the conservative old investor in railroads moving in his narrow fiscal groove, finds his old standards confused, and, if he be not endowed with broad knowledge and instincts, finds also his timidities increased. Nor, safe as he may be in fact, is he exempt from the revelations of official turpitude which seem to him a present fact and liable to be a future one though in reality they have in nearly all cases been the transactions of the past the exposure of which now is the prime medicament in the cure. In the secondary causes of the existing stress in railroad loans this new psychological condition of fear, sometimes definite, more often vague, may be counted among the first. Nor is the bondholder comforted much or his fears allayed by his opportunity to secure on the senior railroad mortgage a three-quarter per cent. added interest return, if he happens to have funds to reinvest. It rather accentuates his discomfort over the low return on the "long" bonds which he bought with such placid assurance two years ago.

The investor in conservative railroad stocks has also had his mutations, mental and sentimental. Some of his standards likewise seem lost or perverted. His values have contracted, not so much in ratio to be sure as speculative shares, but to an absolute amount much greater and which often signifies greater loss, but meanwhile dividends in the case of some great lines have been increased, non-dividend roads have begun to pay dividends and income has gained. Along with this anomaly have gone others. The new stock which used to be watched for by him with hope is now a thing of dread. It used to "bull" a stock—now it "bears" it; and the certainty of its outcoming depresses usually shares below the mathematical point normally fixed by ratios of issue and the original price. He, too, thus falls into mental confusion and uncertainty. The old Latin maxim, "everything that is unknown is magnified," applies as much to railroad investment as to the general affairs of the world at large. Under the old psychology of railroad investment plus force of habit the investor who "never sold" and always "held on" and whose conservatism was such that he was even apt to decry the quoted value of his railroad securities is generally holding on still. But he is not holding on with quite the old confidence, nor, on the other hand, is he crying down now his investments. His mental attitude is mainly one of perplexity, the results of which in so large an investment class one dislikes to think of should ever dividends as well as principal be reduced.

The "locality" idea as a mental factor in railroad investment is another psychological force which has undergone a change. Up to two years ago there was a proneness on the part of the old-fashioned investor to put his money into the securities of the local line whether it was a small line or part of a great system—this under the theory, not always sustained by facts, that the security could then "be watched." It was this *motif* which has gone so far in building up localized street railways by enabling their owners to place underlying bonds. Those bonds, like all others, have shrunk to near a 5 per cent. basis. Partly owing to that fact, partly because large issues of "localized" securities have overloaded local holders there is now a distinct drift away from the "local" idea which, incidentally, has been farther warped by the magnetism of Wall street bargains in such forms, for example, as the best railroad notes. When the present anomalous condition of financial affairs, with tight capital rather than tight money as its basic cause, comes to an end it will be instructive to see how far that local investment motive resumes its sway. It is but one of the many problems of the new railroad investment psychology the solution of which challenges the curiosity of economist and philosopher.

Finally, if we turn to the immediate present and to the existing parlous and convulsive state of the investment market, we find the old-time railroad investor the mark of some novel mental forces. He sees yet another shrinkage of his standard railroad shares to a 6 per cent. basis or below, credit depressed while railroad traffic is high, and almost imperative railroad extension and improvements halted by semi-panic prices of railroad loans. But he has also his visions of reassurance. He notes the power of organized capital to resist deadly financial convulsion; the relative strength of the high grade railroad security as compared with many other forms of investment; and last but most impressive, the way in which low finance is asserting itself against high finance, and old-fashioned conservatism proving its merits over new fashioned speculation. But in that there is nothing new, psychologically or otherwise.

Southern Railway.

"The conditions of operation during the past year have been extraordinary. Great as are the burdens upon the operation of a railroad to-day by reason of the increased cost of material of all classes and the unabating expectations of labor, on the one hand, and legislative reduction of revenue and increased taxes, on the other hand, the crying need of the railroads of the South is more track, more equipment, more terminal facilities. With the strategic position and established relations which the Southern Railway now has, there would be no stint in the amount of traffic it could obtain and profitably handle if it had the facilities necessary to afford to those who offer traffic, the service they demand. During the past winter there were serious congestions of freight on the lines of this company, which were due, almost without exception, to the failure of the plant to respond to demands which were made upon it beyond its capacity. While exasperating the public, congestion rolls up the expense of operation, and both shipper and carrier suffer.

"Apart from congestion of traffic, the expenses of operation, of which mention has been made, have been extraordinary. To illustrate: during this fiscal year the rates of pay of machinists, boilermakers, blacksmiths, tinners and pipemen, car-men, engineers, firemen, conductors, trainmen, operators and maintenance of way employees were substantially increased, this increase approximating $1,250,000 per annum; while the greater price at the mines, together with freight charges paid for coal purchased for the Virginia and North Carolina lines from mines on other railroads, added nearly $250,000 to the cost of fuel in the same period. If comparisons are made with the costs of material and labor several years ago, the present burden is still more apparent. Since 1898, the cost of bridge timber has increased from $9.36 to $23.59 per thousand feet; cross-ties from 28 cents to 37.6 cents per tie; steel rails from $17.75 per ton to $29 per ton; fuel coal from 89 cents to $1.37 per ton; the cost of labor, per mile of road, has increased from $1,621.67 in 1895 to $2,513.64 in 1905, with a further advance to $3,189.11 in 1907."

Thus does President Finley sum up the causes which have brought the Southern Railway in one year from a condition of abounding prosperity, with great hopes for the immediate future, to a point where it is for the moment hard pressed on every hand. Extraordinary is a fair word to use to describe the operating conditions of the year.

The income account strikingly shows the company's changed position. Gross earnings increased $3,000,000, or 6 per cent., over 1906, but operating expenses were $4,700,000 larger, leaving net earnings smaller by $1,700,000. There was an increase of $1,600,000 in fixed charges which, added to the decrease in net earnings, caused a falling off of $2,900,000 in net income, a decrease of 56 per cent. Net income was $2,300,000, against $5,200,000 in 1906.

Two semi-annual dividends of $2\frac{1}{2}$ per cent. each on the preferred stock were charged to income in the previous year. In April, 1907, the regular semi-annual dividend of $1,500,000 was paid out of the income of the year. This year's October dividend, however, was only $1\frac{1}{2}$ per cent., calling for $900,000, and instead of being charged to the income account, as the October, 1906, dividend had been, was charged to profit and loss. With even this smaller distribution charged to the year's income, there was a deficit for the year of $616,000 instead of a surplus of $240,000, according to the company's showing.

Moreover, if the same dividends had been paid out of income and the same amount appropriated for improvements in 1907 as in 1906, the year's deficit would have been over $1,700,000, against a surplus in 1906 of $1,200,000. This is a remarkable change for the worse within a twelvemonth. As its further result, there was a decrease during the year of over $2,000,000 in the Southern's total profit and loss credit balance.

Yet in the following statement, President Finley shows the reasons why the future of the property, in spite of last year's bad record, should be bright and prosperous:

"The remarkable growth of diversified industry in the South in recent years, particularly along the Southern Railway lines, has created an internal traffic largely local as to its origin but covering a wide field in its distribution. This has given the company a sound basis of independent operation and a commanding position in its negotiation for traffic from outer sources. The extent and diversity of this commercial expansion and its beneficial effect on the interests of the company can only be fully appreciated by close and careful analyses. The main facts are that the South now melts more than half the pig iron and converts into cloth and garment more than one-fifth the cotton which it produces. Its phosphate beds have formed the basis for the manufacture of commercial fertilizer on such a scale as to make the South independent of outside sources of supply and to add greatly to her agricultural productiveness. The manufacture of furniture has grown to such proportions as are not exceeded in any other like section of the country, yet without decrease in the volume of lumber sent from the South to other markets of this country and abroad. The production of coal has, with difficulty, kept pace with the development of industry, not because of inadequate supply, but because of restricted transportation facilities. The cultivation of fruits and vegetables has afforded a large and increasing flow of that class of traffic to the eager markets of the East and North.

"That this commercial growth will continue along healthy lines is assured by profitable operation in the past and a continuing increase in demand. That it must take place in a large measure along the lines of this company is certain, because of the abundant supplies of fuel and raw materials originating along its rails, and because of the outlet it affords to all consuming markets. The Southern is therefore assured of a continued increase in its internal traffic of both raw materials and manufactured products. A single industry, the operation of which will soon begin, will add 500,000 tons to its freight traffic and as many dollars to its annual gross revennes.

"The existing relations with connections by land and sea are most satisfactory. The conditions of interchange are such as to justify the claim for increased tonnage on reciprocal grounds. Traffic arrangements with steamship connections at Virginia, South Atlantic and Gulf ports afford the fullest opportunity for the development of the largest amounts of export, import and coastwise traffic. Through service and a complete package car system operated with chief connections and supported by efficient traffic organizations guarantee a large increase in the higher classes of traffic. Reciprocal relations with lines serving the great grain and grazing sections of the North and West have enabled the company to share in a large way in the movement of meat, grain and grain products from those sections to the South and East. The large consuming section served and the important milling interest located on the lines of this company add greatly to its strength in the control of this important traffic.

"Southern Railway lines have enjoyed and are destined to increasingly share in the extraordinary industrial opportunity which exists in the South. Those lines penetrate a territory whose resources fully justify the rapidly increasing interest manifested in its economic development and progress. The minerals, timber and soils, all important elements in the best development of the nation's wealth, are paramount in the Southern country. The promotion of their proper development has received the particular attention of this company, and the policy pursued in bringing the latent resources of the South to the attention of the world is redounding to the advantage of the railroad and the rich territory it serves. This territory is being covered with new manufacturing plants (the records show 860 new industrial enterprises completed and placed in operation during the year), while the numerous existing factories established since the organization of the company are most successful and are being generally enlarged.

"Particularly the forests of the South have attracted capital for their development. Several hundred wood-working plants alone were established in Southern Railway territory during the year. The second largest furniture industrial center in the United States (High Point, N. C.), is located on this company's tracks; along the lines of the company 27 new furniture factories began operations during the year. The manufacture of wood pulp is a recent important industry, from which an entirely new and large volume of traffic may be expected. The abundant supply of necessary raw material and cheap power is attracting to the territory capitalists interested in the manufacture of paper, a promising industry from which large traffic may be ultimately expected. It is important, however, to remember that these industries can be perpetuated only if the sources of the supplies of raw materials are preserved. The forests of the South are to-day one of its chief assets, and there is opportunity to preserve them as such for all time. While other sections, by the indiscriminate cutting of their forests, have in great measure consumed their supplies of raw material for the manufacture of lumber, and of everything in which wood is used, the South still has great areas in which the forests have been practically untouched. It is hoped that the Southern people will benefit by the mistakes of others. By the adoption of a system of intelligent forestry, the woodlands of the South may be so used as to yield a substantial immediate profit, and, at the same time, be so preserved and reproduced as to be a continuing source of wealth for future generations. The railroad companies which depend so largely upon the forests for the material they consume, not to speak of commercial traffic, are fully alive to these considerations, and this company is co-operating in all reasonable ways to preserve this important element in the inherent strength of its commercial position.

"The textile industry of the South is largely confined to the districts reached by this company's lines, and gives premise of great future growth by the erection of more mills and enlargements. During the year 48 new textile manufacturing plants were completed and placed in operation in the territory served by Southern Railway lines. The electrical power developments directly tributary to the lines, and the mining districts supplying cheap coal, make beyond all peradventure the districts served pre-eminent in the South for profitable manufacturing.

"Co-ordinate with the promotion of the industrial development

is the practical solicitation of immigration. The general advertising by this company of the merits and possibilities of the country has proven an influential factor in introducing prospective immigrants to the possibilities of the South. A line of work has been carried on which tends to very greatly diversify the agricultural products of the territory and to establish the value of southern lands for a widely varied husbandry. More skilled methods of agriculture are greatly increasing the amount and value of farm products, of which there is direct evidence in the substantial increase of land values throughout all the southern states."

This is a clear, full statement of the possibilities of the property in existing and potential traffic and in industrial opportunity. It is seldom that the traffic strength of a great railroad has been thus summarized to its stockholders. President Finley's plea for intelligent forestry is particularly to be commended as an example of intelligent foresight.

What the Southern Railway needs is not traffic or opportunity, but facilities, particularly in tracks and terminals. President Finley considers that the territorial relations of the road have now been established and the policy of the future should be to strengthen the established lines, on which earnings are no longer problematical. As most important, this policy requires new second track and revision of grades and curvature on the lines of heaviest traffic.

On its total mileage of over 7,500 miles the Southern Railway had on June 30 1907, only 207 miles of double track, although as soon as work now under construction is finished there will be 292 miles. In supplying second track the first efforts have been directed to points where two or more lines converge and heavy traffic is thrown over the road. Such gauntlets exist between Salisbury, N. C., and Greensboro; Knoxville, Tenn., and Morristown; Atlanta, Ga., and Austell, and Chattanooga, Tenn., and Ooltewah Junction. At Lynchburg Va., where much freight is received from the Chesapeake & Ohio and Norfolk & Western, a new line around Lynchburg has become necessary, and double track for about 30 miles south is essential. These five gauntlets, as single-track lines, limited the capacity of the whole system, since practically all of the traffic handled between the East and the West and between the North and South had to pass over one or more of them and their maximum capacity as single-track lines had been reached. This throttling of the gauntlets affected the development of the branch lines and of the whole system. With the exception of the Lynchburg line these gauntlets will shortly be double-tracked, but there is further necessity of three other stretches of second track not yet undertaken, as well as double track for 5 to 10 miles outside of all principal terminals. What has been done to carry out this general policy of second track and line improvement and the new construction of the year is listed in the report in great detail. It was summarized in the Railroad Construction section of the *Railroad Gazette* of October 18, 1907. Profiles of five of the new lines are also given in the report.

Another important department of new work is that on the union passenger stations now building in several of the more important cities of the South. These are being built by terminal companies whose properties are guaranteed by the railroad companies which will use the stations. During the year the Southern has joined in guarantees on bonds or notes issued by the Gulf Terminal Company of Mobile, the Birmingham Terminal Company, the Charleston Union Station Company, the Meridian Terminal Company and the New Orleans Terminal Company.

Turning to the operating results, the increase in cost of conducting transportation over the 1906 year was 15 per cent. Maintenance of equipment increased 12 per cent. and maintenance of way and structures 8 per cent. Maintenance of way cost $1,415 per mile of line, against $966 in 1906. There were 358 miles of track laid with new rails, against 543 miles in 1906. The tie renewals averaged 358 per mile, against 404 in 1906, the decrease largely due to the difficulty of getting ties. Repairs and renewals cost $2,324 per locomotive against $2,632 in 1906, $842 per passenger car, against $956 in 1906, each a decrease of 12 per cent., and $74 per freight car, against $72 in 1906, an increase of 2 per cent.

The benefits of the improvements to the line are not yet shown

Southern Railway.

in the operating statistics. Although the average carload increased 2 per cent., the revenue trainload decreased from 204 tons in 1906 to 201 tons last year. Including company freight, the trainload was 236 tons in each year. The average distance haul per ton was 158 miles, against 165 in 1906. There was a decrease of 5 per cent. in the ton-mile rate. The freight earnings increased 3 per cent., while the passenger earnings increased 11 per cent.

The state railroad legislation of the year has been more uniformly severe in the southern states than in any other part of the country. The Southern Railway, penetrating as it does almost every one of the southern commonwealths, has been to a remarkable degree exposed to this hostility. So important have its relations with the public become that President Finley since his election has spent much of his time and taken advantage of every opportunity to bring before the people of his territory the ideal which he has set up of a railroad's duties towards its patrons. He sums up this ideal, and the rate legislation of the year as follows:

"As a railroad must depend for its prosperity on the confidence and support of the public served by it, the policy of Southern Railway is to merit the confidence and support of every community which it serves. Efforts are being made to cultivate closer relations with all the public and especially with the men in all lines of business who are most directly interested in the adequacy and efficiency

of transportation facilities, and to bring about a realization on their part that the company has a direct and vital interest in the success of their individual enterprises and in the prosperity of their communities. In all dealings with the public it is the purpose of the management to cultivate a spirit of co-operation, to deal justly with all the patrons of the company on the basis of sound business and economic principles, and to this end in particular special efforts have been made to bring about courteous and considerate treatment by all employees of every person transacting business with the company. These endeavors have not been fruitless. There is increasing evidence that the thinking people in the territory served by the Southern Railway appreciate the fact that they can only attain the highest degree of prosperity if they are served by carriers able to increase their facilities so as to keep pace with the growing demand for their service, and also that increased transportation facilities are of much more importance to them than any possible reduction in charges. There is a growing public opinion, among those who actually use the railroads of the South, in favor of legislative and administrative policies that will recognize that a railroad company is a business institution, subject to the same economic laws that control all other business enterprises, and that it cannot obtain new capital for the enlargement of its facilities unless investors can have a reasonable assurance that its income will be sufficient to defray its operating expenses and fixed charges, and leave a reasonable balance for dividends and surplus.

"It must be recorded, however, that during the year drastic action was taken by some of the states in which this company operates (similar to action taken in many of the other states of the Union) to reduce the maximum passenger rates. In Illinois and Indiana, where the interests of this company were small in comparison with other lines, it followed the lead of the roads having most at stake, and put the reduced rates in effect under protest, reserving the right to contest them in the future. In Alabama, where a 2½-cent rate was established by the legislature, in North Carolina, where a 2¼-cent rate was established by the legislature, and in Virginia, where a 2-cent rate was established by the Corporation Commission, the interests of this company were so large, and the effect of the reduced rate so hurtful to its revenues, that, by direction of the board of directors, suits were brought in the appropriate Federal courts to test the constitutionality of the rates, and to secure for the property the protection of the fourteenth amendment to the constitution of the United States.

"The disputed rates have been put in effect pending determination of these cases on their merits. This was not done, however, until the record was put in shape to present the fundamental questions involved to the United States Supreme Court. The board has considered it essential, not only in the interest of the owners of the property, but in the interest of the public (whose interest it is that the railroads shall not be deprived of the means of providing adequate facilities for the commerce of the country), that the issues raised by the action of these states, whether investments in railroad properties are entitled to the same measure of protection as other property and whether they can be deprived, by any form of state action, of the effective protection of the constitution of the United States, shall be finally settled with the least possible delay."

The following table summarizes, according to our usual method, the results of operation of the last two years ended June 30:

	1907.	1906.
Mileage worked	7,547	7,374
Passenger earnings	$14,683,006	$13,259,114
Freight earnings	37,368,095	36,141,547
Gross earnings	56,657,991	56,641,139
Maint. way and structures	7,660,168	7,122,355
Maint. of equipment	9,576,042	8,588,452
Conducting transportation	23,941,599	20,816,940
Operating expenses	43,068,547	38,274,102
Net earnings	13,589,145	15,367,337
Other income	1,597,225	1,214,125
Total income before charges	15,186,670	16,581,462
Fixed charges and taxes	12,896,349	11,352,396
Net income	2,290,321	5,229,066
Dividends	2,400,000*	3,000,000
Improvement appropriations	536,331	999,827
Year's surplus	646,013†	1,229,239

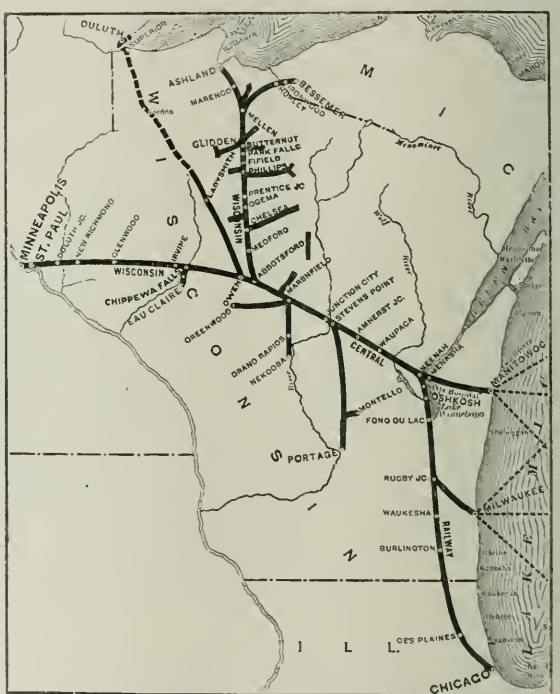
*The October dividend in 1907, amounting to $900,000 (1½ per cent. on the preferred stock) was charged to profit and loss, leaving a surplus for the year shown in the income account of $253,987. The October, 1906, dividend (2½ per cent.) was charged to income.

†Deficit.

Wisconsin Central.

In October, 1906, W. A. Bradford, President of the Chicago, Cincinnati & Louisville, having with associates bought control of the majority of the stock of the Wisconsin Central, was elected President. The current report for the year ended June 30, 1907, therefore, covers the results of eight months of operation by the new management. Gross earnings show an increase of 6 per cent., from $7,100,000 to $7,600,000. Operating expenses increased 4 per cent., leaving net earnings of $2,850,000, against $2,580,000 in 1906, a gain of 11 per cent. The operating ratio was reduced from 63.5 to 62.4 per cent. There was a net income after charges of about $1,000,000, against $737,000 in the previous year. This was carried to profit and loss, without any improvement appropriation, making a balance to the credit of profit and loss, after a deduction of $28,000, of $1,852,377. This is on the whole a satisfactory showing for the year. It must be observed, however, that operating expenses were kept down through the maintenance rather than the conducting transportation accounts, and the year's surplus increased by not making an appropriation for improvements.

While there was a trifling increase in maintenance of equipment and a decrease in maintenance of way, conducting transportation increased $240,000. Maintenance of way and structures cost $828 per mile of road (average mileage operated) against $880 in 1906. There was spent on equipment repairs $1,539 per locomotive, against $1,683 in 1906; $654 per passenger car, against $558 in 1906, and $44 per freight car, against $40 in 1906. The figures for maintaining the locomotives and freight cars are



Wisconsin Central.

decidedly low as compared with other railroads in the same territory. Thus it appears that the favorable operating results of the year were gained by keeping down the maintenance figures to about minimum requirements.

No figures are given of freight traffic by commodities, the only information on this subject being the statement that there were 4,397,000 tons of freight carried, against 4,343,000 in 1906. The average distance haul per ton was 184 miles, against 185 miles in the previous year. The ton-mile rate, however, increased from 0.66 cents in 1906 to 0.69 cents last year. On the other hand, earnings per freight-train mile decreased slightly and the average trainload (whether revenue or including company freight is not stated) fell from 325 tons to 308 tons.

On April 25, 1907, the company's large freight station at Minneapolis and its contents were burned, a loss half of which was covered by insurance. Of the other half (amount not stated), $20,000 was charged to operating expenses. To replace this station and at the same time enlarge the road's facilities at Minneapolis in proportion to the growth of the traffic, contracts have been let for a reinforced concrete freight station 117 ft. long, 66 ft. wide at the north end, 98 ft. wide at the south end and four stories high. The south end is to front on Hennepin avenue, the principal commercial street of Minneapolis. A viaduct connected with the second floor will extend from Hennepin avenue to First avenue north. The

cost, including the necessary brick paving, changing of tracks, etc., is estimated at $180,000.

Work is actively under way on the extension of the line from Ladysmith to Superior and Duluth. Ten miles of track had been laid on October 8, 1907, and more was to be put down as soon as the grade was available. Most of the clearing, grubbing, grading and pile driving was finished. Steel bridges will be erected as soon as the track is ready for them. After prolonged negotiations, a franchise for entrance to the city of Duluth has been secured. Contracts for the construction which it involves have been made and work is now in progress. Agreements for crossing other railroads and a contract for use of the Northern Pacific's bridge across the St. Louis river have also been made.

The following table shows for the last two years the principal results of operation:

	1907.	1906.
Mileage worked	1,018	977
Passenger earnings	$1,627,492	$1,481,175
Freight earnings	5,610,733	5,317,237
Gross earnings	[illegible]	7,118,576
Maint. way and structures	[illegible]	859,723
Maint. of equipment	[illegible]	806,666
Conducting transportation	[illegible]	2,618,451
Operating expenses	[illegible]	4,542,477
Net earnings	2,817,086	2,576,100
Net income	998,206	[illegible]
Improvement appropriations		[illegible]
Year's surplus	998,206	363,517

Cincinnati, Hamilton & Dayton.

It was not possible to bring about such satisfactory results on the Cincinnati, Hamilton & Dayton as those described in the review of the annual report of the Pere Marquette last week. The same methods have been applied and in the same way, but whether because as the head of the "Great Central" consolidation it became more deeply involved than its controlled road, or because, lying in more competitive territory than the Pere Marquette, it has not been able to compete as favorably with other solvent railroads, the Cincinnati, Hamilton & Dayton has not yet progressed to the point at which it can stand on its own feet, as a result of its earnings. The real reason for this state of affairs is probably contained in the concluding statement of the receiver's report, commending the results obtained by the officers and employees, which is as follows.

"The year's business has been done without additions to the motive power, equipment and facilities, which have been in view for several years and are sorely needed. The results accomplished nevertheless would not have been possible without the greatest care and intelligent devotion to their duties on the part of the officers and employees. I cannot close this report without giving them the credit which is justly due."

Apparently, it has been a case of a railroad weakened by past mismanagement and in need of new locomotives, cars and operating facilities trying to hold its own in a territory richly supplied with competing railroads. Part of the Pere Marquette's progress, on the other hand, is no doubt due to the fact that its equipment is much of it new and the rest in good condition.

As in the case of the Pere Marquette, a number of entries in the report suggest faulty accounting methods in earlier years. For instance, among last year's additions and improvements $118,000 is shown as a credit to new bridges and culverts. This amount was at the same time charged to operating expenses to adjust charges for bridges rebuilt during 1905 and 1906 charged to additions and improvements, but not properly so chargeable. There has also been $107,000 charged to profit and loss as depreciation on equipment; depreciation which was all prior to the last fiscal year and on cars and engines of obsolete type which could not be used for present day operation.

The past year's unit maintenance charges, though scarcely adequate, show up better than those of the preceding years. The following table shows the comparison:

	1907.	1906.	1905.	1904.
Maintenance of way, per mile	[illegible]	[illegible]	871	767
Repairs, locomotives, per locomotive	[illegible]	[illegible]	[illegible]	[illegible]
passenger cars, per car	[illegible]	[illegible]	[illegible]	[illegible]
freight cars, per car	[illegible]	[illegible]	[illegible]	[illegible]

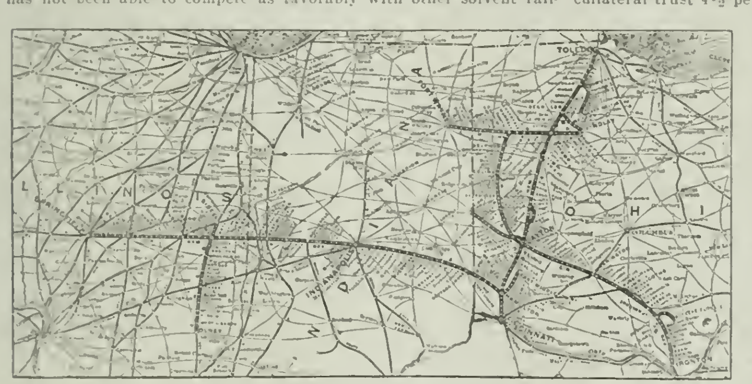
The equipment figures for 1907 are really somewhat lower than they seem, because no new equipment has been added during the year, for the cost of repairs per locomotive and per car was more than if some proportion of the equipment had been new, requiring few repairs.

The outstanding 6 per cent. receiver's certificates are shown in the following list of those issued during the year:

Outstanding June 30, 1906		[illegible]
Issued [illegible] 1906, to provide funds to pay interest due July 1, 1906, on the following bonds:		
Dayton & Michigan R.R. consolidated mortgage 5 per cent. bonds	$68,200	
Cincinnati, Hamilton & Dayton Ry. 2d (now 1st) mort. 4½ per cent. bonds	45,000	
Refunding mortgage 4 per cent. bonds	226,140	
Cincinnati, Indianapolis & Western Ry., 1st and refunding mort. 4 per cent. bonds	[illegible]	
Indiana, Decatur & Western Ry. 1st mortgage 5 per cent. bonds	79,050	
		[illegible]
Total outstanding June 30, 1907		[illegible]

The January, 1907, interest on these same bonds was paid out of earnings.

Gross earnings were $8,900,000 against $8,400,000 in 1906. Most of this increase, however, was used up in operating expenses, leaving net earnings of $2,165,000 against just under $2,000,000 in 1906. The payments for taxes were a little more than half as much as in 1906. The reason for this was that in that year a half year's taxes omitted in 1905 were charged to the 1906 earnings, for which no corresponding deduction appears in last year's account. There was a deficit after fixed charges of $861,000, which is less by $286,000 than in 1906. It must also be remembered that the item of fixed charges includes interest amounting to $675,000 on the $15,000,000 collateral trust 4½ per cent. notes which are in default.



Cincinnati, Hamilton & Dayton.

The expenses show no especially striking changes during the year. There was a decrease of $65,000 in maintenance of way, an increase of $167,000 in maintenance of equipment and of $251,000 in conducting transportation. General expenses increased $9,000. Under this head there was an increase of $22,000 in salaries of clerks and attendants and a decrease of $13,000 in law expenses. The expenses were increased and at the same time the earnings reduced by winter and spring floods throughout the Ohio valley and especially in the vicinity of Cincinnati. These caused considerable business to be temporarily diverted to other gateways and railroads. In the vicinity of Chillicothe on the Ironton line extraordinary repairs to embankments were made necessary by unprecedented floods during the month of March.

The operation of the road during the year was more efficient. The revenue ton-miles increased from 940,000,000 to over 1,000,000,000, or 6 per cent., yet there was an increase of only 2 per cent. in the freight-train mileage. While the miles run by loaded freight cars increased from 47,000,000 to 49,000,000, the miles run by empty freight cars decreased. The revenue trainload rose from 371 tons to 397 tons, and the revenue carload from 20 to 21 tons. In face of a decrease in the ton-mile rate received, the average revenue per freight-train mile increased from $2.37 to $2.45. In this respect the passenger results furnish a parallel. The passenger-mile rate decreased but the average passenger revenue per train-mile increased from 61 cents to 68 cents. Including mail and express, the passenger-train earnings per mile rose from 78 cents to 83 cents.

The net amount spent during the year on additions and betterments was about $100,000, or $100 per mile. There were 12 miles of new 85-lb. rails laid on the northern end of the Cincinnati-Toledo main line between Hamilton and Toledo. This released 70-lb. rail which was relaid partly further south on the Cincinnati-Toledo line and partly on a branch line. Work has been begun on the enlargement of the yards at Toledo and at Lima. Most of the new 85-lb. rails laid by the Pere Marquette during the year were on its Toledo division, showing that both roads have joined in the improvement of their through line between Cincinnati and Detroit.

The income results of the last three years are shown in the following table:

	1907.	1906.	1905.
Mileage worked	1,038	1,038	1,028
Passenger earnings	$1,871,019	$1,813,561	$1,912,855
Freight earnings	6,374,235	5,996,802	5,694,283
Gross earnings	8,946,935	8,398,418	8,008,918
Maint. way & structures	1,078,613	[illegible]	903,936
Maint. of equipment	1,571,756	1,404,704	1,201,603
Conduct'g transportat'n.	3,891,011	[illegible]	3,661,326
Operating expenses	6,782,126	6,419,140	6,004,966
Net earnings	2,164,809	1,979,278	2,003,952
Net deficit	861,354	1,147,631	241,224

Mexican Central.

The Mexican Central is still a nominally independent property, for the financial upheaval has prevented the Mexican government from finally carrying out the terms of its merger with the National Lines of Mexico. The government, however, holds a majority of the Mexican Central stock and has not abandoned its plans for the consolidation.

The report for the year ended June 30, 1907, is more complete than those of previous years, which have been silent in regard to many important details of the company's operations. Two needed tables are added, one showing in considerable detail the classification of freight by commodities, the other the operating statistics for the freight, passenger and total traffic and the figures for train and car loading and mileage.

Gross earnings were $15,600,000, an increase of 10 per cent. over 1906. This total includes $85,000 earnings from construction freight, following the outworn practice reintroduced in 1906 of including earnings from company business. Operating expenses increased 11 per cent., leaving net earnings of $4,580,000, an increase of 7 per cent. There was, however, owing to the increase in fixed charges through large note issues, a net deficit after charges of $140,000. It was therefore only by withdrawing $1,450,000 from the subsidy trust fund—made up of payments originally made by the Mexican government as subsidies—that it was possible to use $1,315,000 for betterments and improvements. Even by so doing, the profit and loss surplus of the preceding year which is also the total profit and loss surplus of the company had to be called upon for a few thousand dollars.

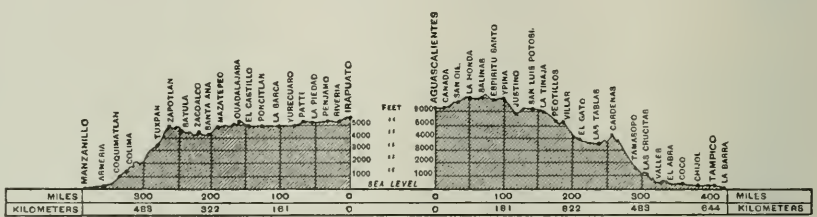
This bolstering up of the net income from operation cannot last much longer for only $1,186,000 which is less than the amount withdrawn last year remains in the subsidy fund. When this is gone the Mexican Central as an independent property would be likely to have a hard time to meet its fixed charges, and a harder to appropriate anything for betterments and improvements. It has $35,600,000 notes, collateral and equipment, outstanding, most of them maturing within the next four years. Even with higher freight rates, some of which were put in effect on August 9, 1907, with others still to be sanctioned by the government, the road would hardly be in a position by 1911, with its subsidy trust fund probably used up three years before and the consequent stopping of general improvements, to successfully refund this large amount of maturing indebtedness. The government's consolidation, however, as soon as it can be carried out, is expected to solve these difficulties by refunding the outstanding notes in the new securities of the consolidated company.

The increase in earnings during the year came almost wholly in the passenger department. Freight earnings increased only $25,000 over the previous year. This small increase is due, according to the report, to bad washouts during the rainy season in August and September, 1906, and to a serious strike in the mechanical shops during the same period. Passenger earnings, however, rose $1,250,000, or 47 per cent., over the previous year. This was due only in part to an increase in passenger travel, for it is estimated undermaintained. Maintenance of way cost $624 per mile against $514 in 1906, an increase of 21 per cent. to be sure, but by no means enough to adequately maintain a large railroad system with much through line, even in Mexico.

Repairs, including expenditures for converting locomotives into oil burners, cost $3,135 per locomotive, against $2,430 in 1906; $553 per passenger car, against $583 in 1906, and $79 per freight car, against $99 in 1906. The reduction in the freight car figure is due to the fact that 2,142 freight cars were added to the equipment during the year, while the amount spent on freight car repairs was almost the same in the two years. Besides the freight cars, 60 locomotives and 29 passenger cars were added to the equipment at a total cost for the three classes of new equipment of $3,900,000. There are now 150 oil burning locomotives on the Mexican Central, 60 of which are new, as against 50 oil burners a year ago. The effect of this change is shown in a decrease of 18 per cent. in the cost of locomotive fuel, including coal, wood and oil; with an increase in the revenue train mileage from 7,700,000 in 1906 to 8,200,000 last year.

There was a decrease in the revenue ton mileage, the freight density, the average haul and the freight earnings per mile of road and per train mile. On the other hand, the total freight earnings and the ton-mile rate were larger. The train-load, including company freight, was 227 tons, against 250 tons in 1906.

The passenger density increased from 56,372 passengers one

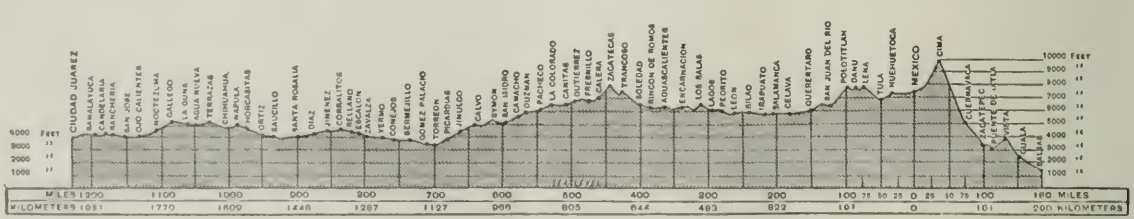


Profiles from Manzanillo to Irapuato and from Aguascalientes to Tampico; Mexican Central.

mile per mile of road to $5,656, or over 50 per cent. The average passenger trip rose from 50 miles to 64 miles, and the total passenger revenue from $2,650,000 to $3,900,000. Even with a slight decrease in the passenger-mile rate, the passenger earnings per train-mile were $2.91, against $2.13 in 1906.

Pulque, native wines and liquors, and ixtle, henequen and other fibers are unusual commodity classifications to come upon in a railroad report. They suggest the semi-tropical character of the southern part of the Mexican Central's territory. Pulque is the fermented juice of the maguey or century plant. Ore makes up 24 per cent. of the total tonnage and metals and mineral products together, 55 per cent. Forest products include 9 per cent., of which the largest classification is firewood, 5 per cent. Agricultural products cover 22 per cent., with corn 5 per cent., the largest item. Miscellaneous, including manufactures, make up 11 per cent. of the total, against 10 per cent. in 1906.

The extension of the Guadalajara division from Tuxpan to the Pacific coast at Manzanillo is now progressing rapidly. This construction was begun three years ago and was to have been finished on January 1, 1908, but in October of last year there came a disastrous flood "which was so extraordinary as to be a marvel of nature." Part of the construction work was washed out and the whole line



Profile of Main Line from the United States Boundary to Mexico City and Balsas; Mexican Central.

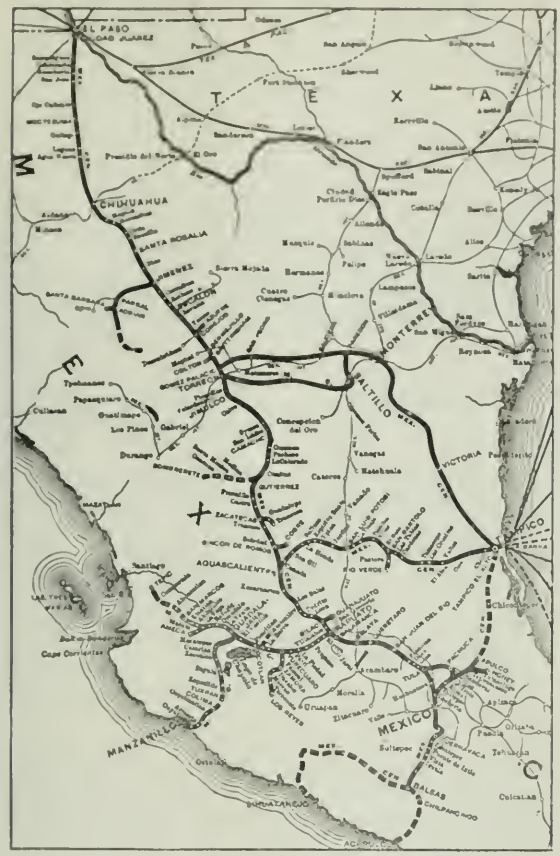
that over $500,000 of the increase is the direct result of having tickets and cash fares collected by train auditors instead of by conductors. This system was begun in the fall of 1906 and is now used on every passenger train on the road. Many Mexican Central conductors must be economizing as a result.

The unit charge in operating expenses for maintenance of way shows that without the help of the subsidy trust fund, and the resulting money for betterments and improvements, all of which were spent on way and structures, the line would have been greatly had to be rebuilt above this extraordinary flood level. This has increased the estimated cost and delayed the construction so that the road will not be opened for business before July 1, 1908. Construction of another important line long planned was begun during the year. This is the cut-off from Apulco to Tampico, which will shorten the distance between Mexico City and Tampico from 778 to 278 miles. Work was begun on the first 31 miles of this line about May 1, 1907.

Profiles of the new through line to the Pacific coast, of the

line from Aguascalientes to Tampico and of the main line south from El Paso, Tex., are shown herewith.

The following table summarizes the results of operation of the last two years. Where figures are shown only in Mexican currency



Mexican Central.

in the report they have been converted into United States currency at the rate of $2 per United States dollar:

	1907.	1906.
Mileage worked	3,195	3,156
Passenger earnings	$3,900,335	$2,650,011
Freight earnings	10,814,225	10,788,449
Gross earnings	15,618,008	14,188,403
Maint. way and structures	1,937,749	1,622,939
Maint. of equipment	2,581,368	2,031,697
Transp. and traffic exp.	5,741,597	5,526,822
Operating expenses	11,035,089	9,905,325
Net earnings	4,601,456	4,287,862
Net income after charges	111,174*	114,386
Improvement appropriations	1,315,430	695,546
Year's income deficit	1,456,904	581,160
Profit and loss surplus	208,330	210,710*
Used from subsidy trust fund	1,450,000	1,000,000
Final total profit and loss surp.	201,226	208,130

*Deficit.

Chicago & Eastern Illinois.

This year's report of the Chicago & Eastern Illinois is for the first time issued in the same form as the annual statements of the larger Rock Island properties. It is large size (9 x 12), and contains full tables of the operating and other results of the year and information describing the securities of the company. This is a change much to be commended, as the reports of the Chicago, Rock Island & Pacific and the St. Louis & San Francisco are among the best railroad reports issued. The entire capital stock of the Chicago & Eastern Illinois is owned by the St. Louis & San Francisco, all of whose common stock is in turn owned by the Rock Island Company. The Chicago & Eastern Illinois in turn owns $3,161,450 of the $3,987,383 common stock of the Evansville & Terre Haute, with which is now consolidated the Evansville & Indianapolis.

The Chicago & Eastern Illinois and its subsidiaries are shown on the accompanying map. As will there be seen the Chicago & Eastern Illinois gives the Rock Island a short through line between Chicago and St. Louis and also connects Chicago with the coal fields in eastern Illinois and western Indiana. With the Louisville & Nashville it forms part of a through line to Nashville, Tenn., Birmingham and Mobile, Ala., and New Orleans. In connection with the Nashville, Chattanooga & St. Louis, the Western & Atlantic, the Central of Georgia, the Georgia, Southern & Florida and the Atlantic Coast Line, it forms a through line from Chicago to Jacksonville, Fla. Bituminous coal furnishes over 60 per cent. of its tonnage.

Like all Rock Island lines, the most striking thing about the past year's operations is the betterment of the property out of earnings. There was 25 per cent. more spent on maintenance of equipment and 37 per cent. more on maintenance of way and structures than in the previous year. Per mile of road owned and leased, maintenance of way cost $792, compared with $511 in 1906. There were on the average 324 ties renewed on each of the 1,061 miles of main, second and third track, against 224 per mile in 1906. Over 10 miles of 85-lb. rails were laid to replace lighter sections, so that on June 30, 1907, 18 per cent. of the mileage was laid with 85-lb. rails as compared with 14 per cent. a year earlier. Heavy expenditures were made in replacing old wooden bridges with new and stronger wooden structures, also in strengthening other existing bridges to provide for heavier equipment now in use. Yet in spite of the large increase in maintenance of way expenses, even last year's figure seems low for a road with a freight traffic density of over 2,000,000 tons one mile per mile of road.

Equipment maintenance cost $2,007 per locomotive, against $2,084 in 1906; $872 per passenger car, against $884 in 1906; $45 per freight car, against $43 in 1906, and $43 per work car, against $20 in 1906. Under modern conditions it is probable that the average freight car now in service cannot be adequately maintained for $45 a year. The Chicago & Eastern Illinois, however, has a large proportion of new and modern steel coal cars which do not cost much for repairs during the first few years of service. Furthermore, a coal car does not cost as much to repair as a box car of the same age, and the Chicago & Eastern Illinois has somewhere nearly twice as much flat and coal cars as box cars.

There were put in service during the year 63 new locomotives, 10 passenger-train cars and 3,250 coal cars at a cost of $3,231,800. Ten of the new locomotives were fast passenger Atlantic engines, 30 were heavy consolidation freight, and 23 switching. There were 15 locomotives and 2,458 freight cars, mostly of small capacity, dropped from the equipment register. This throws another explanatory sidelight on the low charge for maintenance per freight car. For delivery before January 1, 1908, there have been ordered three library-baggage and three chair cars and 2,000 steel underframe National dump cars of 100,000 lbs. capacity.

Although there was an increase of 5,600,000 passengers carried one mile and 221,000,000 tons of freight moved one mile, the expense of getting and carrying the business decreased 6 per cent. This is remarkable not only because of the increased business, but also because the year was an expensive one in cost of wages, supplies and almost everything else. The decrease in conducting transportation was brought about through the changes in the items of per diem and hire of equipment. Instead of paying out $106,000 for per diem and $49,000 for equipment hire as in 1906, the company was a creditor to the extent of $402,000 under the first and $26,000 under the second head, a total decrease in these payments for the year of $583,000. There was also a large decrease in the amount paid out for injuries to persons, most of it due to smaller payments under that head but part of it to the fact that last year part of the injury payments were charged to maintenance of way and structures and part to maintenance of equipment, a new refinement in dealing with this account.

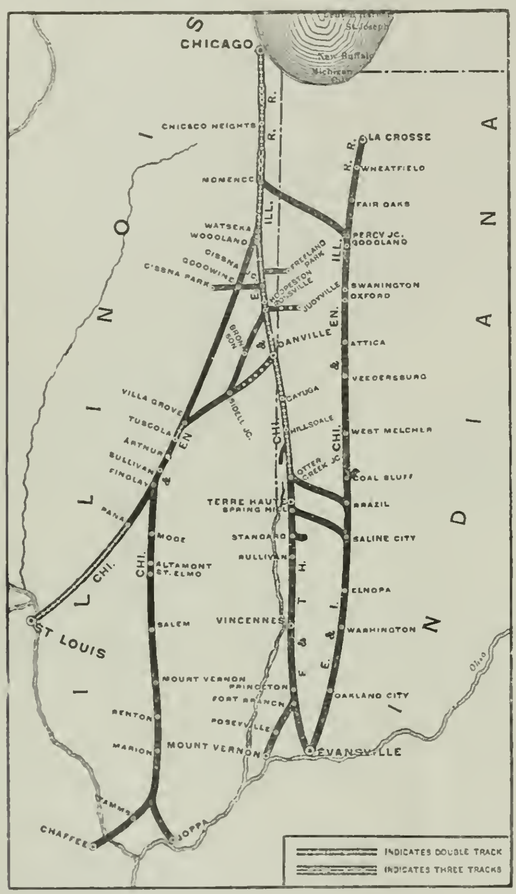
Gross earnings were $11,300,000, an increase of $1,400,000, or 14 per cent. Operating expenses increased $600,000, or 9 per cent., leaving net earnings of $4,200,000, an increase of $800,000, or 24 per cent. The net income after charges was equal to 6 per cent. on the preferred stock, which was paid, and 15.8 on the common stock, on which 10 per cent. was paid, these payments going to the St. Louis & San Francisco to pay interest on its Chicago & Eastern Illinois stock trust certificates.

The revenue trainload was 576 tons, against 565 tons in 1906, while the average trainload including company freight, was 605 tons, a high figure. This large trainload makes it all the more remarkable that more has not been spent in the past on maintenance of way. The average haul per ton of revenue freight was 163 miles, which is just about the distance from the coal fields about Terre Haute, Ind., to Chicago.

The relative changes in the operating expense accounts due to the larger amounts spent on maintenance are sharply shown in the ratios of each class of expenses to total expenses and to gross earnings. Of the total expenses, maintenance of way was 18 per cent., against 12 per cent. in 1906, while conducting transportation was 52 per cent., against 60 per cent. in that year. Of gross earnings, maintenance of way was 11 per cent., against 8 per cent. in

1906, and conducting transportation 33 per cent., against 40 per cent. in 1906.

The locomotive repair shops and engine houses at Oaklawn (Danville, Ill.) are being enlarged at an estimated cost of $560,000. Up to July 1, 1907, $286,700 had been spent there, of which $56,000 was for shop machinery and tools, $223,000 for shops, engine houses and turntables, and $7,000 for yard and other tracks. The plan of enlargement of these shops was described in the *Railroad Gazette* of November 2, 1906.



Chicago & Eastern Illinois; Evansville & Terre Haute, and Evansville & Indianapolis.

The results for the past two years are given below:

	1907.	1906.
Mileage worked	948	948
Passenger earnings	$1,684,848	$1,603,016
Freight earnings	9,320,192	8,086,593
Gross earnings	11,337,714	9,928,563
Maint. way and structures	1,286,615	818,994
Maint. of equipment	1,812,550	1,452,005
Conducting transportation	3,706,285	3,958,130
Operating expenses	7,177,309	6,570,489
Net earnings	4,160,406	3,358,074
Net income	1,670,168	1,144,958
Dividends	1,251,622	1,187,266
Year's surplus	418,546	37,692
Depreciation*	823,166	226,469

*Charged to profit and loss.

NEW PUBLICATIONS.

Substitution of the Electric Locomotive for the Steam Locomotive. By Lewis B. Stillwell and H. St. Clair Putnam. New York: American Institute of Electrical Engineers. [illegible] pages; 6 in. by 9 in.; 18 illustrations. Cloth.

This book is a reprint with the discussion, of the paper presented by the authors before the publishing association in January, 1907, from which liberal extracts were reprinted in the *Railroad Gazette* Feb. 1, 1907 together with an editorial comment on the position that had been taken. In this comment attention was called to the fact that it seemed to be assumed that the substitution of electric for steam power on all railroads is economical, and the authors and speakers went far beyond calculations for specific installations and entered the broad field of the entire railroad mileage of the United States from which they drew staggering totals. It seemed to be apparent that if the railroads would only make haste to get $2\frac{1}{2}$ billions of new capital they could save 250 millions each year in operating expenses." In short, the paper with the discussion that followed may be considered as the ultra-electric viewpoint of the situation, in which the electric locomotive is to shortly usurp the place of the steam-driven machine, provided only the railroad managers will view the case in the light of their own true economical interests. The weak point in the paper is its neglect of financial and operating requirements and conditions. It seems to have been taken for granted that all of the gains that have been found to obtain in a congested territory and short distance transmission could be secured on long distance traffic handled far from the source of supply. And in the conclusion it was claimed that on "certain railroads, trains are now so heavy and run at such high speeds, as to tax the capacity of the most powerful steam locomotives to the limit, and the headway between trains is as small as permissible. Here, then, electrification becomes an absolute necessity if the traffic capacity of the lines is to be increased without the tremendous expense of adding new lines." The conclusions then go on to advocate the use of enough electric locomotives, in multiple control at the head of the train, to produce the increased capacity, evidently forgetful of the fact that the tractive power of some of the steam locomotives already in service is greater than the capacity of drawbars to resist it; so that it becomes difficult to understand how the use of more electric locomotives will relieve the situation.

The inference should not be drawn from this, however, that the paper is superficial or that it is valueless because it contains what may appear to some to be the exaggerations of enthusiasm. This is far from being the case. It is a careful and painstaking review of the possibilities of electric traction when viewed in its most favorable light. That the utopian condition of affairs is likely to be realized at once is not claimed, for the authors must understand that it would be impossible at once to raise the capital for the expenditures required.

As this point is the one that stands most prominently forth it overshadows the question of the relative superiority of alternating and direct-current for railroad work, though the merits of each are ably set forth by the representatives of the two great electric companies that are identified with the exploitation of one or the other system.

Locomotive Breakdowns and How to Repair Them. By W. G. Wallace. Chicago: Frederick J. Drake & Co. 285 pages; $4\frac{1}{2}$ in. x 7 in.; 56 illustrations; flexible leather.

This book is a separate imprint on smaller pages, much thinner paper and a different binding, of the book on the same subject forming one of the set of seven volumes on the Art of Railroading, reviewed in the *Railroad Gazette* Oct. 11. The printed page, however, is the same and the two books bear strong evidence of having been printed from the same plates, the difference in size being made up in margin and thickness of paper. Of the two editions the single book is the more attractive though not quite so pretentious as the one in the set.

The First Steam Superheaters.

BY CHARLES R. KING.

A study of the records of drawing offices in many locomotive works brings to light the remarkable fact that steam superheaters and desiccators were designed, if not made, over half a century ago, and that some of the devices then employed would, if reconstructed experimentally with all the improvements available at the present day, answer the same purpose as many new types. The circumstance that such reheaters were abandoned sooner or later proved that the methods of construction, both of boiler and engine, with the materials formerly employed, and the lubricants available, were all unsuitable; but the principle of the superheaters was frequently good, and some of the arrangements here illustrated will be found to be very interesting.

So far as present knowledge goes the first application of a superheater to a locomotive boiler appears to be that made in 1848 by John Cockerill, of Seraing, near Liège, Belgium, and in which the steam-drying pipes were lodged in the smokebox and continued up a casing concentric with the chimney.

But the first superheaters suggestive of modern forms were, so far as is at present known, designed and patented in 1850 by M. Moncheuil, Director of the Montereau & Troyes Railroad, France. These patents belong to a series granted in 1849 for "the employment of non-saturated, superheated, steam in the boilers of stationary engines" in the name of A. de Quillacq, founder of the de Quillacq Engineering Works, who died in 1903. The additions made to these patents for locomotive boilers comprise the ordinary

types of locomotive boilers fitted with, (A) a large flue traversing the bottom of the boiler and containing superheating pipes bent backwards and forwards, (B) large flame flues between the two flue-sheets containing superheating steam-pipes also bent backwards and forwards the length of the tubes with U-caps connecting the extremities of the pipes, and (C) a superheater placed outside, on top of the boiler.

The flame-tube or fire-flue superheaters, A and B, were for

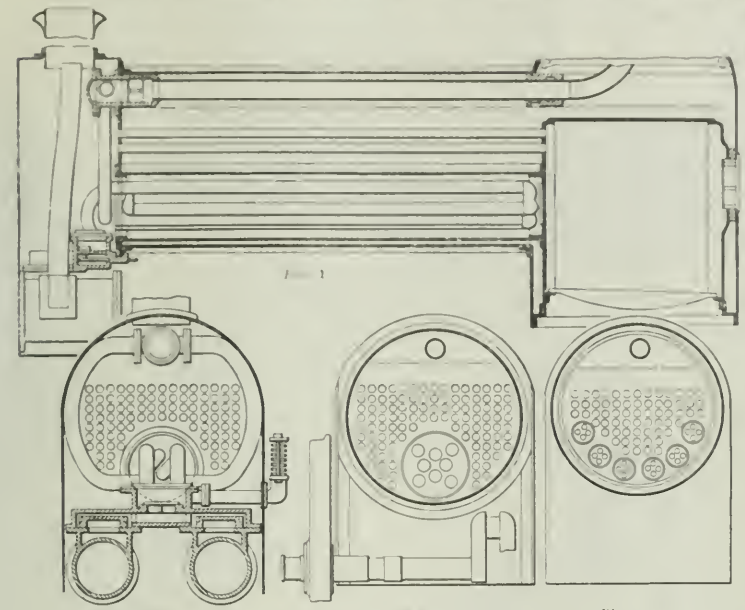


Fig. 2. Fig. 3. Fig. 4.

Fire-tube Superheater Applied in 1850 to Express Passenger Locomotive; Montereau & Troyes Railway.

highly-superheated steam and designed for application to the boilers of the 2-2-2 type express engines of the Montereau & Troyes Railroad that had been built by the firm Hallette in the year 1847. The details relating to the first form of superheater are shown in the Figs. 1, 2 and 3, but the high firebox usual to the engines of that period, and other features, are omitted from the present reproduction. The direction of the superheater pipes is as follows: From the saturated steam-pipe to the two lowest superheating pipes and back to the firebox end; forward, through the two intermediate pipes; backward, again, through the two upper

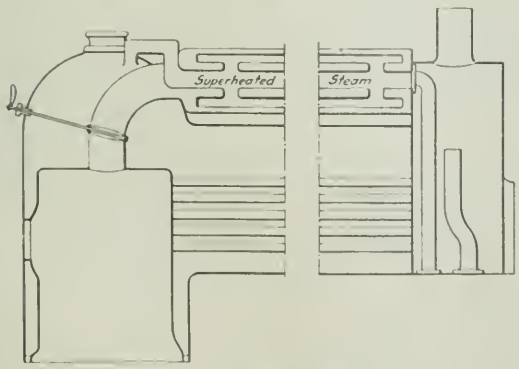


Fig. 5—Moncheuil Superheater Outside of Boiler; 1850.

pipes—the connection of their extremities with those of the lower row being by means of the two U-caps that are shown, in a diagonal position, in the smokebox section, and then forward, once more, through the two topmost pipes which are visible in both the longitudinal and cross sections of the boiler. The ends of all the pipes appear to be connected in series by means of cast U bends. No headers are shown nor any dampers for regulating the heat. It is, however, apparent that Moncheuil understood the importance of

"heated by series, in tubes of suitable dimensions fixed by ferrules as are the other tubes of locomotives. In each series one extremity of a group receives saturated steam; the other extremity of the series leads the de-saturated steam to the reservoir." (See Fig. 4.)

The third superheater, referred to previously as "C," in the Moncheuil-de Quillacq patents, is contained in a long barrel on top of the steam boiler as shown in Fig. 5. In this the heat is led upwards, through the high firebox of that period, by means of a large vertical and curved flue, thence passing into the horizontal drum and enveloping a concentric superheated-steam chamber supplied with saturated steam by means of a short pipe connecting it to the domed top of the firebox. A damper for cutting off or regulating the amount of heat to be passed to the superheater is shown in the curved flue.

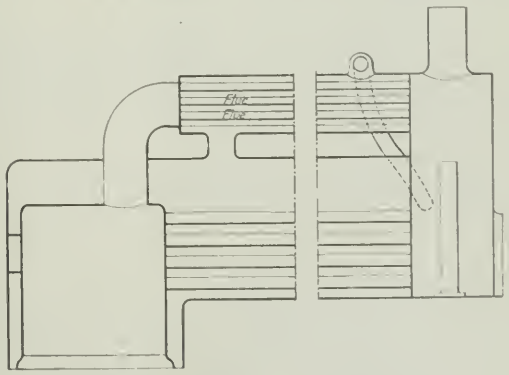


Fig. 10—Hittorf Superheater; 1869.

Next in order of priority appears the serpentine firebox-superheater of John Haswell, Director of the Vienna Locomotive Works of the Privileged State Railway Association. The first superheater of this Scotch mechanical genius is dated 1852 and the old draw-

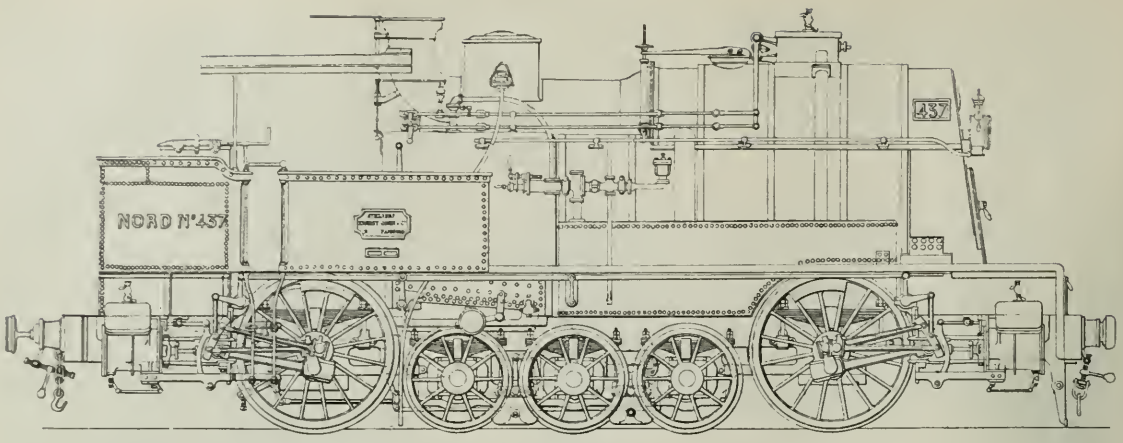
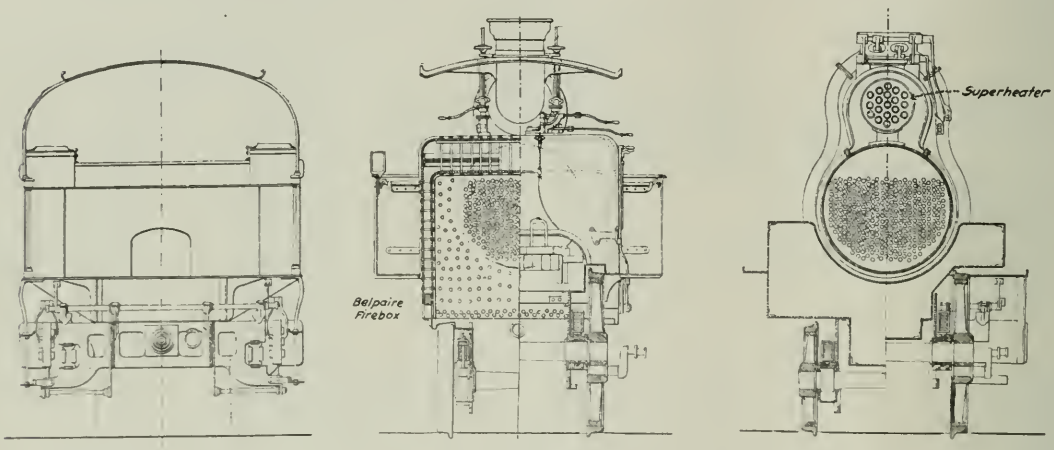


Fig. 6—Side Elevation of Double End Express Locomotive Fitted with Steam Desiccator; French Northern Railway.



Figs. 7-9—End Elevation and Cross-Section of Double End Express Locomotive with Steam Desiccator; French Northern Railway.

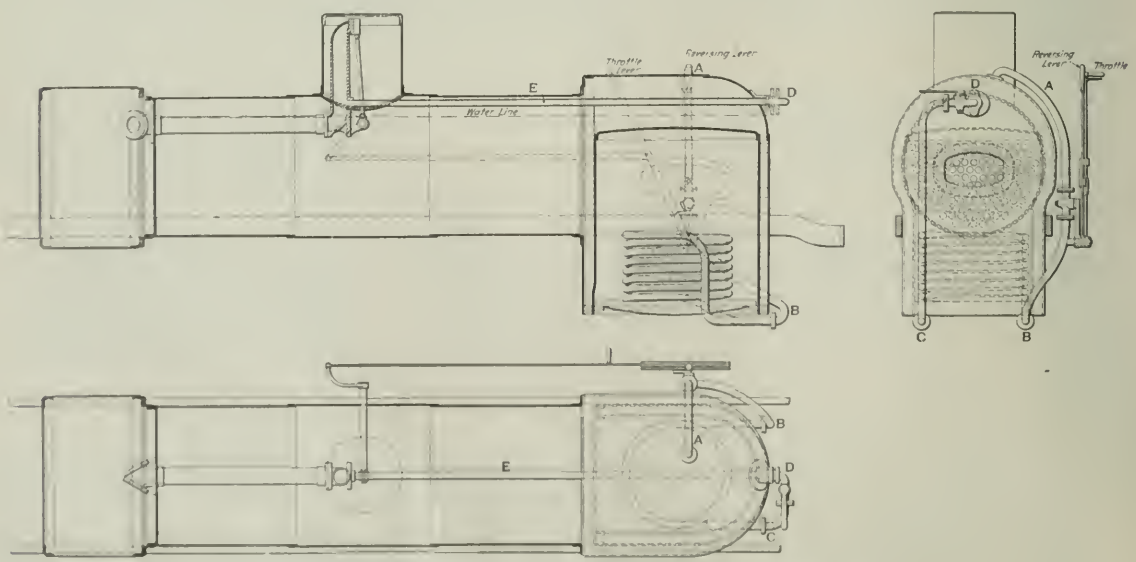


Fig. 11—Serpentine Locomotive Firebox Superheater of John Haswell; 1852.

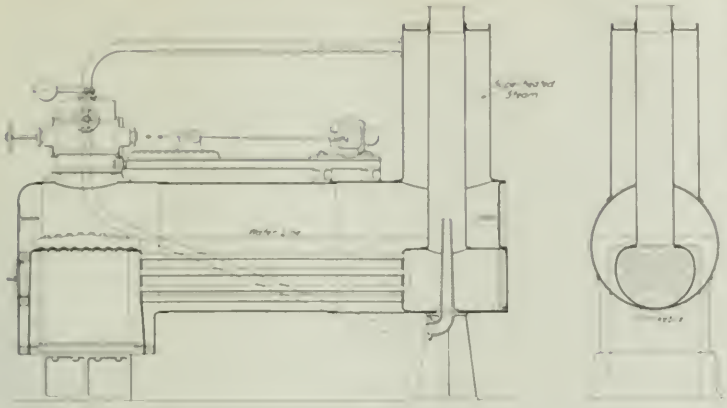


Fig. 12—Chimney Superheater or Economizer of John Haswell; 1862.

ing, recently coming to the knowledge of the writer, has been specially redrawn for reproduction in the present review. It will be seen from Fig. 11 that the Haswell superheater embodies the constructive principle of modern flash boilers although no pump or feed pipes below the water-line of the boiler are visible. Otherwise, all the other details are so fully shown as to require no description. The connection of the reversing lever to the saturated steam-inlet valve, giving automatic admission, and the stop-cock on the superheated steam pipe show the methods of control, but there is no indication as to a stop-valve being placed over the valve-

[illegible] engine. The records of the Austro-Hungarian Westbahn do not show whether this superheater was actually constructed or tried.

After Haswell, the superheater invented by M. Monroy, a French engineer, in 1855, came to attention. It comprised a large internal flue almost filling the lower part of the boiler and containing a serpentine coil precisely as set forth in the patent of Monchenil, but with this difference, that the saturated steam supply and reheated steam pipe connecting to the extremities of the double coil of serpentine, ran longitudinally along inside the coils the whole length of the large internal flue. In addition, there were steam reservoirs answering practically to the intention of "headers" in present forms of superheater. Thus, in the details, the Monroy apparatus represented a certain improvement over the Monchenil large flue-type superheater.

Between the years 1855 and 1860 steam superheaters and driers, or desiccators, were patented and made by so many persons that months rather than years would be better suited for indicating their dates. A small steam desiccator or heat economizer was applied about this time, but with no certainty as to date, by Messrs. Sharp, Stewart & Co., of Manchester, Eng., to one of several engines built for Egypt, as shown by the drawing reproduced in "Colburn's Locomotive Engineering," which work is to be consulted in most of the important engineering libraries. This was not a superheater properly so-called, and having but small heating surface its utility must have been doubtful.

After the high-temperature superheaters of Moncheuil and then

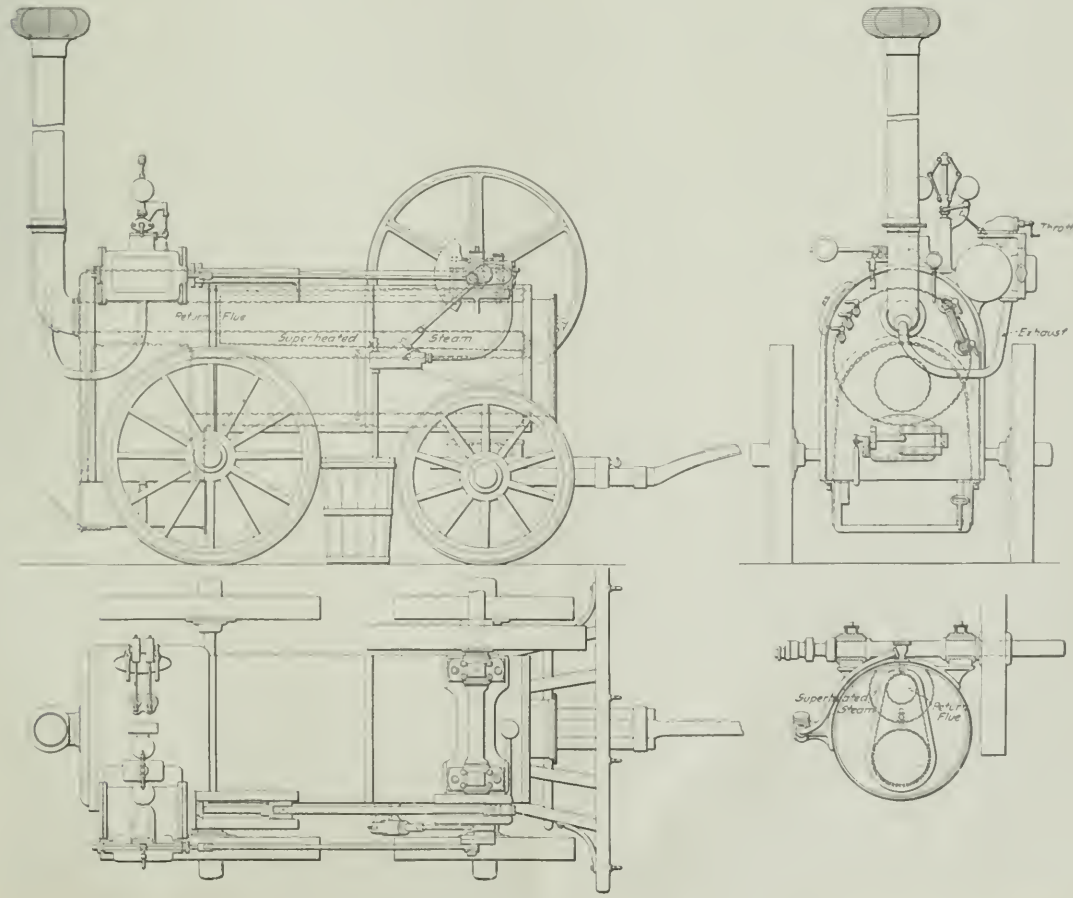


Fig. 13—Return-Flue Superheater of John Haswell; 1862.

of Montety, the experiments made in 1856—not in 1850 as sometimes stated in error—by Hirn, an Alsatian engineer, were principally of interest for the results obtained with a form of superheater better adapted for use in stationary boilers, as in the case of the de Quillacq patent of July, 1849. The Hirn cumbersome superheater in cast-iron was unsuited for regular locomotive practice, but it enabled the publication of data which his predecessors in superheating practice had neglected to record.

From 1855 onwards superheaters and steam-driers became so numerous for locomotive and fixed engines that the interesting stage in their history may be said to have passed, but a few interesting patterns will be selected for mention here. It is a significant fact that as the years progressed designers of superheaters began to place their superheating pipes farther and remoter from the action of the firebox gases.

In the year 1862 John Haswell, of the Privileged Austro-Hungarian Steel and Engineering Works of the State Railways at Vienna, designed the very simple superheater illustrated by the copy of the original drawing, Fig. 12. It will be seen that it is, in reality, a very good form of heat-economizer since even the smokebox is almost entirely surrounded by water; and the heat of the chimney, due both to the waste gases and also to the exhaust steam discharged into it, has to pass through a high steam cylinder, or dome, concentric to the chimney. For a small boiler of locomotive type this simple steam-drier has much to commend it. Incidentally the reader will remark the bed-plate carrying the crosshead and engine shaft for relieving the boiler barrel of all engine motion fatigue and for avoiding injurious expansive movements of the boiler in respect to the engine.

About the same time, though the date is not quite certain, John Haswell produced the simple return-flue superheater for small road engines shown in the Fig. 13. The details are sufficiently clear in the illustration which is made direct from the original. It comprises a 12-in. internal flue between the two flue sheets and a 6⅜-in. return flue from the smoke-chamber to the chimney, the latter flue being enveloped nearly the whole of its length in an outer casing forming a superheater within the usual steam space of the boiler. The design is extremely neat and, relatively to its steam and superheating surfaces, is suggestive of considerable efficiency. The drawings are dimensioned in English measures according to the practice that was so much observed by English industrial pioneers on the European continent.

John Haswell appears to have been the first engineer in the world to introduce, in 1862, four-cylinder balanced, non-compound, locomotives.

About the same year, in 1863, one of the most interesting forms of superheaters patented up to that time was the invention of Benjamin Crawford, United States, contrived by simply partitioning off the forward end of the boiler barrel, traversed by the fire flues, and reserving it for superheated steam, with due provision of a vertical deflector-plate or baffle in the superheater for diverting the steam to the bottom rows of tubes and thus insuring circulation around all tubes before its passing to the steam pipe at the top of the smokebox. This arrangement is probably the first of that category of moderate heat superheaters of which the best known examples are the Pielock and the Clench.

Since the creation of distinctive types of superheaters by Monchenil, one of the most frequently employed forms of superheater has been the outside barrel-type, probably for the reason that it has been so much employed, in Europe, as a steam reservoir for increasing the boiler capacity more effectively than steam domes. The example here given, Figs. 6 to 9, relates to a series of four-cylinder express and also series of four-cylinder freight locomotives designed about 1860 by M. Jules Petiet, Chief Engineer of Traction, Northern Railways of France, and built in 1862 by Gouln & Co., of Paris. Similarly to one of the Haswell superheaters, the "steam-dryer" of Petiet is of the return-flue type, but multitubular. The steam-drying tubes of the return-flue were 80 m.m. outside diameter and from 80 in. to 13 ft. in length according to the type of locomotive fitted with the apparatus. Some of these engines are still at work on the Chemins de fer du Nord, but with the outside barrel converted into a saturated steam reservoir, for this railroad, noted for its "de Glehn" engines, is largely operated with half-century old locomotives.

Another example of the reservoir superheater type is that illustrated in Fig. 10, and patented some years later, in 1869, by M. Hlittorf, a German engineer resident in Paris and author of an interesting little work on superheating at that period. Placed under the boiler in pairs, such outside superheaters are to be found in first class modern express locomotives and yield an economy, as compared to similar engines in similar service without them, of 9 per cent. on an average, and without costing a penny for repairs in the first three years of service—1901 to 1907. This latter arrangement has no nearer resemblance to the Hlittorf, the Petiet or the Monchenil superheaters, other than the external barrel for superheater pipes—but the fact shows that such dispositions are not without value.

Car Efficiency.*

Mr. Boyd's Address.

Nothing less than a determined, spontaneous effort on the part of shippers and railways will evolve a plan by which this problem of car inefficiency can be solved.

Adequate facilities, without which the most reasonable of rate adjustments is rendered more or less ineffective, must now command our attention. Car efficiency, therefore, is a leading unsolved transportation problem. No feature of transportation is so vital to the shipper as ample car supply and rapid service; no cause can be held so responsible for his loss when those facilities are denied him. He who relies on railway service cannot cease operations and view with indifference deficient transportation. There is no middle ground; he must go forward or drift backward; show a profit or take a loss. His duty to himself, and to others, is not only to refrain from unjust detention of cars, but also to demand from the carrier efficient service.

* * * Only two questions need be considered: (1) Are transportation facilities sufficient to present needs? (2) Are we obtaining from the facilities available all that they are capable of giving?

To the first question answer has already been made by those high in authority, who say that railways in their development are far behind the commercial world. Here it would seem the shipper scores the first point, for with this admission we may logically infer that commerce in its superior growth has naturally developed its own facilities correspondingly to take care of such increase. This acknowledgment is not made with respect to cars and engines solely, but as to other means of transportation as well. Here another point is scored, for in this delinquency we find one great cause of the failure to promptly move loads when tendered. As to the direct question, "Are we getting all we can from the means at hand?" we all find common ground in the negative. Who is responsible? Again we stand together. Then, what is the direct cause? This: First, unnecessary delays of cars; second, insufficient loading; third, delays in transportation; fourth, unnecessary work and consequent inefficient service at terminals, resulting from the continued use of methods long since outgrown.

In discussing the first of these features we must divide shipping interests into two classes: Those who by the investment of capital or otherwise have provided themselves with ample facilities to conduct their business; and those who by their wits and shrewdness have prevailed upon our railway friends to grant special privileges at out-of-the-way places where no means are provided for handling. This results in pressing cars into service as warehouses. With this latter class we have nothing in common; for their existence the railways are primarily responsible, and the railways must find and apply the remedy. We protest strongly against the disposition of carriers to generalize on the sins of the public in respect to car abuses. We object to their taking an incentive from the omissions and acts of this second class to saddle the responsibility for abuses on those who, having pursued a wiser course, are made to suffer in common with the carriers.

With regard to those who have warehouses of their own, it will not do to say out loud there have been no delays. There have been many and they are to some extent indefensible. Convenience often leads those possessing means for prompt unloading to prefer the use of the car instead. This is unfair not only to the carrier, but also to others awaiting equipment. The percentage of delay from abuses of this kind is small when compared with the total. * *

We often hear the expression that no one should purchase more than he can accept and handle promptly. No exception can be taken to this. But is that practice generally followed? What protection is there in so limiting purchases? The most carefully laid plans to order as facilities will permit are neutralized in times of congestion by failure of carriers to perform their duty in delivering the property promptly as ordered. No one can be expected to furnish facilities that will meet the most exacting demands, due almost entirely to slowness of others. No one expects carriers to have at any or all times a car supply equal to the greatest demand, nor in justice can the consignee be considered differently; both are subject to human limitations. What, then, is the result? Cars started in time and at regular intervals are delayed and days will pass with little or no delivery, to be followed by a deluge of deliveries and demands from carrier to accept, unload or pay the penalty. No account is taken of the loss suffered by the consignee from idleness. The answer of the carriers is that they are not bound to place freight at destination at any given time, losing sight of the fact that reasonable dispatch is imposed upon them by law. No one can object to economy in operation, since the greatest saving obtained from any given factor of transportation is a benefit to all; but economies that lean all to the railway's side at the expense of the public are false and unfair. Happily, such "economy" is on the wane.

*Addresses before the Traffic Club of Chicago, Oct. 25, by E. B. Boyd, Manager of the Transportation Department, Chicago Board of Trade, and Arthur Hale, Chairman of the Car Efficiency Committee of the American Railway Association.

Again, the shipper is often called upon to stand between carriers disputing with regard to the use of cars in times of scarcity, a practice altogether too prevalent. It has become a recognized practice for carriers to take possession of all cars in sight, regardless of ownership or from whom received, and apply them to orders for empties. Shippers availing themselves accordingly are met with a protest from the owner, the intimation being given that a repetition of the offense will prevent further deliveries from the complaining road. To ignore this protest means punishment, to comply means loss. Last winter afforded many examples—which doubtless will be repeated in the near future—in which shippers who, in their efforts to act fairly and while suffering for empties, found that as soon as a foreign car was unloaded by them it was not returned, but delivered to others, often their competitors, located on the same switch road. But this was not all. Notice to consignees on connecting lines was given by some railways that none of their cars, whether received under load or set in as empties by the line on which they were located, must be used or penalty would be inflicted, to be followed, on the other hand, by notice from switch road that failure to use cars set in would operate as a cancellation of a corresponding number of orders. Thus, "damned if you do and damned if you don't."

Inasmuch as the two interests—carrier and patron—are interdependent, is it not better to recognize that the impairment of one reacts to the detriment of the other?

There are too many cars traveling over the country under one-half or three-quarters load, even giving due consideration to conditions. It is not long since the maximum capacity of cars was 15 or 20 tons, and small dealers adjusted themselves accordingly. Units of sale as to car lots were based upon the prevailing carload minimums until it became a custom; but, as progress was made, and cars increased to 20, 25 and 30 tons capacity, the retailer and the consumer did not keep pace, nor have they caught up. The manufacturer and large distributors, on the other hand, have been alive to the conditions and stand ready to utilize to the full extent large cars, but are prevented from doing so by failure of the purchaser to co-operate. The public should realize that the carrying capacity of the railroads has been practically doubled in the last ten years, and at a great cost, to meet the rapid increase in commerce; and it is unjust and almost criminal for one portion of the public, for selfish reasons and through false ideas of economy, to deprive the other part, and the carriers, of the benefits of progressive action. If commerce has increased so rapidly, the consignee in consuming territory must have handled his business with wofully inadequate facilities, and this has been reflected in the insufficient loading of cars.

Prompt and regular service from initial point to destination must precede the quick disposition of freight at terminals, especially the larger ones. The delayed freight after arrival is thrown at the consignees in bunches, temporarily blocking not only his facilities, but also the carrier's, thus causing delays to multiply upon themselves. This is not an exceptional condition, as some would have us believe. It is common, it is here to-day; later on it will play an important part in the tabulations of the railways as to the idle time of equipment, probably finding its way eventually to the shipper's door.

In the unnecessary service at terminals we find the greatest source of our troubles and also one of the greatest fields for improvement. It can be said without exaggeration, I think, that there is wasted at terminals in money and energy from 25 to 40 per cent. through the loss of the service of cars, owing to the demand for the return of empties and to the unnecessary switching incident thereto. In consequence of misuse of cars the dreaded embargo notice appears and car inefficiency is started on its way. Freight in carloads on arrival at destination is refused delivery to owners located on connecting or switch lines. Cars accumulate until the dispute between carriers is settled, and then go forward after delays of from two to ten days. This may be justified, but it means, nevertheless, loss of utilities, and a maximum of annoyance and an expense to owner of the property, with minimum good to the carrier.

Great evils result from the enforced return of empties and the extra switching required. Every car returned empty means time wasted; and just now time is money. From two to six days is usually consumed. Within the past two weeks in a number of cases three and as many as seven days have been consumed in delivering to consignee where only the initial road was concerned. The consignee who receives also ships, and had he been permitted in the first instance to use for the outward movement the car he made empty, there would have been saved another day or two lost in supplying an empty to take its place. All this is accomplished at an expense in switching for which the carrier, as they would have us believe, is poorly paid. Very often this expense is included in the rate. It is an outlay in money or services that with improved methods would be saved.

Another source of inefficiency and of great annoyance and expense to owners of freight is found in the strict enforcement of arbitrary and exacting rules governing cars in bad order. Cases of delay from one to ten days are known, and sometimes 30 days. This condition arises from the too close enforcement of rules. Family rules as to demurrage are also responsible. To require a consignee to unload within a given time after notice of arrival imposes the obligation upon the carrier to make a proper delivery. This the carriers do not do. The latest cars are delivered first, while the earliest ones are held back. The consignee, in self-protection, exercises his right to call for the cars in the order of their arrival that he may unload within the free time and the carrier is at the expense of shifting trains backward and forward to get the cars desired. Is this not a case of waste of energy? Why make rules which in their operation must become boomerangs? Here is an opportunity for reform.

The Remedy.—We support the demand so persistently made of the railways for a number of years, namely, that those who require transportation should provide themselves with facilities adequate to their needs. Cars are built to transport, not to store, and if some of the good advice the railways have been giving the public in this respect were followed with regard to company material, especially coal, a great many more cars would be available to commerce.

To the retailer and heavier consumers: Increase the load in cars, increase your facilities, make your purchases conform to the new order of things, or expect to make your contribution in another form—increased cost of transportation.

High speed is not necessary, but regularity of service is. The feast and famine practice of delivering freight can have but one result—congestion. Avoid this and give shippers an opportunity to do their best.

Last, but not least, permit cars, without regard to ownership, to go to any place served by a railroad. Eliminate the delays that now attach to every car because of the name painted on its side. Handle cars on the line of least resistance and better results will follow. So long as a consignee unloads a required number of cars a day, why should it be any particular car first? The "average plan" of assessing car service (demurrage) would here quickly demonstrate its superiority over present methods. The cry is for uniformity, but what shall be the standard? If free time is to be determined by the needs of the smaller communities, where conditions under which traffic is handled are dissimilar to those at greater centers, then injury and injustice is done the many in the interest of the few. If, on the other hand, the needs of the larger terminals, where they receive and ship daily train loads of freight, is to determine the standard for all, then the door is open to abuse by giving those who do not require it free time in excess of their needs.

Co-operation as a means of settlement is the demand. Mutual consideration is essential. It is only by placing ourselves in the other fellow's shoes that we can properly determine our duties. But are we doing it? Is there not a disposition all too prevalent to consider as unfounded and worthy of little attention, even in advance of investigation, complaints made in good faith?

Is it not now time to recognize the palpable fact that the day of car aristocracy is passed? Whether bearing the name of the Pennsylvania Company or the Arcadia & Betsey River Railway, the effect is the same; it is but a car; it is built to carry freight and the freight should be that which could be secured the quickest and with a minimum cost in switching. Car efficiency of that character means an increase of equipment without the addition of a single car.

MR. HALE'S ADDRESS.

I understand I am to speak for the railroads. It has been so unusual for anyone to speak for the railroads in the last year or two that I fear we are all a little out of practice on this subject. We have been, however, so very pleasantly reminded to-night by Commissioner Clark that some can speak for the railroads and speak very well; and we were so pleasantly reminded in this city, not so long ago [by Mr. Mather] that we still exist, that I take up the subject with less diffidence than I might otherwise have done.

The term "car efficiency" is a new one—less than a year old. It is a good term because it needs no definition and no explanation. It was invented by our friend, Mr. Allen, secretary of the American Railway Association, the father of standard time.

As has been said before, the highest car efficiency can only be obtained by co-operation among the railroads, and between the railroads and the public. Much, however, can be done by the railroads individually, and much is being done. Many of the railroads which need cars the most are buying at an unprecedented rate. A shining example of this is the New York, New Haven & Hartford, which is doubling its equipment this year. Again, other railroads are doing better work with the equipment they have. One during the last year has increased the average movement of its cars from 29 miles to 36 miles per day—an increase of 25 per cent. This is the Chicago, Burlington & Quincy. Other roads have done almost as well in this particular.

The railroads, in conjunction with each other, have also taken action to improve the efficiency of cars. As I need not tell you, they have doubled the per diem rate between themselves, with the

objects of stimulating the building of new cars, improving the movement of cars, and of returning them to their owners. The railroads of the country have over 700,000 of their cars on each other's tracks, and the payment for the use of cars is something like $350,000 a day. Payments this year will be $60,000,000 more than last year, and we feel confident that in their efforts to gain or save, as they can, considerable parts of this $60,000,000, the railroads will improve the movement of cars. Improvements are being made as well in the relations between the Trunk Line railroads on the one side, and the Belt roads, the Switching roads and the Industrial roads on the other. Too often in the past the division of responsibility for car delay as between such roads has been ill-defined, resulting in considerable delays to cars. Problems involved in properly determining such relationships are difficult, but they are being handled with diligence, and progress is being made.

And now we come to the relations of the railroads with the public and the industries. Such concerns load and unload cars, and therefore have it in their power to affect the car efficiency of the country by their quick or slow work. If the public were to change their practice 10 per cent., for the better or worse, it would mean that there would be 100,000 or 200,000 cars affected, and the car efficiency of the country would be changed correspondingly for the better, or for the worse. The demurrage rules have been devised, not for the immediate profit of railroads by the collection of moneys, but for the reduction of car delay. As I have said in another place, every dollar collected for car service is a misfortune, and the total amounts of car service earnings are simply measures of the extent of the calamity.

From $20,000 to $25,000 are collected daily in the form of car demurrage. This means that there are from 20,000 to 25,000 cars not available for loading, which might be available. The total shortages in the country are now little more than 60,000 cars. If we could supply 25,000 cars more, daily, to be loaded with freight, these shortages would soon be wiped out. Whenever an industry handles a car inside the free time it is helping the general situation. If it handles the car in half the free time, it is helping the situation still more.

There are something like forty different sets of car demurrage rules in effect in different parts of the country. The American Railway Association has had prepared, through one of its committees—with the help of a suggestion of the Interstate Commerce Commission, and with the hearty concurrence of the Car Service Managers—a set of car service rules, which it will consider at its meeting in New York next week. This set of rules is intended to embody the best practice that can be found. It is quite possible that some of these rules are so stringent that they cannot immediately be adopted in all parts of the country. This is felt to be the case by a number of our most important shippers, and I have been asked to give my views on this subject here. I have been reminded that I have been a consistent advocate of the so-called Pittsburgh Car Service Rules and have helped to secure their adoption, not only in Pittsburgh, but also through Ohio and the various other places where there are similar industries. It is true that I have done this, and that I think the Pittsburgh rules were better adapted for such trades last year than any other rules I know of. The Pittsburgh rules are better adapted to-day, in their entirety, for such industries than any other rules I know of; but I do not mean by this that the Pittsburgh rules are the best rules than can be devised for the whole country, any more than I think the new rules are the best that can be devised for every city in the whole country. My opinion is that the new rules, approved by the Committee on Car Service of the American Railway Association, are better adapted for the larger portion of this country than any other rules I know of, and that they can be adapted—with very few modifications—for immediate use all over the country and even in Pittsburgh.

Now, gentlemen, this is all I had intended to say, but there have been some things said here that make me want to say something else. Mr. Boyd, for instance, has said a great many things about the railroads which are true, and he has given us some excellent recipes for improvement.

Two of his recipes are first, that the railroads improve their facilities, and, second, that the railroads give regular time, as I understand, to all classes of freight. Two good recipes, but they cost a great deal of money and we do not know where to get it. All of us know that improved facilities cost money, that nothing costs more money than interfering with the face of Mother Earth and buying steel rails. But the cost of regular time for all freight is more than is fully realized by the shipping public. Mr. Boyd, having said, and justly, that the good shipper must not be judged by the bad shipper, will allow me to say that the good railroad must not be judged by the bad railroad. Not all the railroads in this country do all the awful things he has spoken of. I am afraid some of us do, but all of us do not, and I think it can be justly said that high-class freight moves in this country, on most of the roads, with fairly reasonable time, and indeed, with better time than is absolutely necessary. But the low-class freight does not move regularly, and the only reason why it does not is that it would cost enormously to move it regularly. To move all your freight regularly means to clean out every yard every day, and that means to run a light train from every yard every day. There is not a railroad manager in this room that has money enough now to clean up every yard every day. Much has been said about the railroads guaranteeing time on all freight, on low-class freight. To do that will greatly increase cost. The rate per ton per mile on coal, grain and flour, on our road [B. & O.] runs mighty near three mills per ton per mile. I would not undertake to give absolutely regular time, even slow time, on freight that only pays three mills per ton per mile. When you are ready to pay more, the railroads will give you regular time on low-class freight as well as on high-class. Another thing in regard to the bunching of freight on arrival: remember how often freight is bunched in shipment. That is something that must be considered, too.

I want to thank both Mr. Bentley and Mr. Boyd for what they have said about the common use of cars. That is a question which you shippers really feel more deeply than the railroad manager does. I want to say as to our present attempts, futile as they may seem, in regard to the ownership of cars, that after a good deal of experience with railroad men in urging the common use of cars, as I have been constantly doing for the last ten months, publicly and privately, I have found such difficulties, such natural difficulties, that I look to the industries of the country, to the shippers of the country to bring that change about, if it is brought about shortly.

The common use of cars is unpopular with railroad men, and very naturally so. The railroad that has not the use of all its equipment, the railroad that owns 20,000 cars and has only got 10,000 cars on its line, does not want to go into a pool; that railroad wants the right of the owner of the car recognized. Anyone can see that. Suppose, for instance, that all of my cars are away, and in their place I have only half that number of foreign cars. I do not care about a pooling scheme; I want my rights as owner recognized.

Now, take the other fellow, using the other man's cars, the man who owns 20,000 cars and uses 30,000 cars; that man does not want a pool, because he wants the 10,000 cars that do not belong to him. When you undertake to advocate pooling to the railroad men, their individual point of view, their duty to their stockholders, makes them very careful about going into a pooling scheme. I am not opposed to car pools—they are right; Mr. Bentley is right, and Mr. Boyd is right. But it is a very difficult thing to get the railroads to agree to a pool in the first place, and it will be very much more difficult to carry out the pool afterward.

That is something I would like to speak to you about a little further. When I was with the Pennsylvania Railroad, we used to say that if you let the cars alone they would all go to Jersey City, and it looked so, because the traffic on that road practically all took an eastward course. When I was in the transportation department we were always hauling empty cars out of Jersey City—sometimes we could not haul them fast enough, and we would have a blockade there. You will find, on every road, the trend of traffic in one direction, and there has got to be some power to take the empty cars back to balance the equipment up.

Just what kind of power can do that as between the railroads, I do not very well know. I think that a very much higher per diem rate to be imposed on the roads that are using more cars than they own, would work. I think so, and the American Railway Association has said they thought so, but I have never been able to get enough roads to come into a plan for a common use of cars to make it go. The sentiment must be worked up, it seems to me, by you gentlemen who feel the pinch of it every time you have to give up a western car when you have a load for the west.

If we could devise and get adopted an equitable scheme for the common use of cars, I believe we might make enough money out of it to give more regular movement to low-class freight.

Rensselaer Polytechnic Institute.

The Rensselaer Polytechnic Institute, Troy, N. Y., has opened with the largest freshman class in its history, numbering about 270. This makes the number of students in the school about 600. Courses in mechanical engineering and in electrical engineering, leading to the degrees Mechanical Engineer and Electrical Engineer, have been inaugurated this year. These courses will be four years long and will be very general engineering courses. The first two years will be nearly identical with the course in civil engineering. This makes four different courses now given at the institution. The fourth course leads to the degree Bachelor of Science and has a great deal of chemistry in its curriculum.

Plans for the new Russell Sage Laboratory are about ready. This building will contain the mechanical and electrical engineering laboratories. It will be 244 ft. long, 80 ft. wide and five stories high. It will be finished in 1908. The boiler house, with a capacity of 800 h.p., is now being built and will be finished this year.

Opening of the Washington Union Station.

The first regular passenger train to use the new $20,000,000 Union Station at Washington, D. C. entered the station over the Baltimore & Ohio tracks early in the morning of Oct. 27. The Pennsylvania will not abandon its Sixth street station for some months. The new terminal was built by the Washington Terminal Company, owned jointly by the B. & O. and the Pennsylvania. In addition to these two roads all the roads entering Washington from the south will run trains from the present tracks on Virginia avenue through the double-track approach tunnel under Capitol Hill into the station. These include the Southern, Chesapeake & Ohio, Atlantic Coast Line, Seaboard Air Line and the Richmond, Fredericksburg & Potomac.

The station building fronts on a wide plaza and faces the Capitol and the new Senate office building. It is of white Vermont granite, 632 ft. long, 210 ft. deep and 120 ft. high in the center. The passenger concourse between the station building and the train platforms is entirely roofed over and has an area of 97,500 sq. ft. There are 33 tracks in the terminal, each 1,200 ft. long, giving a capacity of 66 trains in the station at one time. The platforms are protected by inverted umbrella sheds.

The terminal express building, north of the station, is 420 ft. long and 60 ft. wide. A large power house and a 25-stall roundhouse have also been built near the station. New freight houses are under construction at New York and Florida avenues. The house tracks will hold 200 cars and the team tracks adjoining will hold 450 cars.

The terminal has been built under the supervision of D. D. Carothers, Chief Engineer, B. & O., and W. F. Strouse, Assistant Engineer, Washington Terminal Co., representing the B. & O., and A. C. Shand, Chief Engineer, and Robert Farnham, Assistant Engineer, representing the Pennsylvania.

The New Union Station at Washington, D. C.; Opened Oct. 27, 1907.

For complete descriptions of this terminal improvement work the reader is referred to the *Railroad Gazette* of Dec. 4, 1903; Jan. 15, 1904; June 3, 1904; Nov. 11, 1904; Aug. 31, 1906, and April 5, 1907.

Maintenance of Automatic Block Signals.*

Your committee has had in mind an installation of electro-motor signals operated by the ordinary track circuit system. On a road operating under a divisional organization, there should be a Signal Supervisor on each division, reporting to the Division Superintendent and having charge of all signal maintenance matters on the division. The efficiency of signal maintenance will depend to a great extent upon the degree to which he devotes his attention to personally inspecting in detail the work of those under him. The division should be further divided into districts 100 to 150 miles in length, each in charge of a district foreman reporting to the Signal Supervisor and directing the work of maintenance and repairs on his district. * * *

The chief factor in successful maintenance then remains in intelligent inspection—daily on the part of the maintainer, and as frequently as possible on the part of his superiors. Conditions will be still further bettered by a regular inspection of details by some representative of the Signal Engineer's office. Close inspection in anticipation of trouble is the most important duty of a maintainer.

For the use of the maintainer in his daily rounds, we recommend a light motor car, not with the idea of gaining speed, but to relieve him of much of the hard labor expended in traveling against winds and ascending grades. The maintainer's fixed duties should not be so great as to preclude the possibility of his accomplishing all without undue haste, and still with a balance of at least 50 per cent of his time remaining available for patrolling and inspecting.

* * * Bond wires and other track connections frequently break apparently from no other cause than the vibration from passing trains. Inspection will discover these, and no failure will have resulted ordinarily if the construction has provided for double connections at points where breakages cannot be avoided and must even be expected.

We question the wisdom of establishing a fixed schedule of daily duties to be performed by the maintainer. Much the greater part of maintenance work is irregular, and best results will be obtained by allowing maintainers to carry out their work much on their own initiative. It is perhaps too much to expect all maintainers to become capable to take part and adjust a relay, but there is no reason why some of them should not attain proficiency and be permitted to do such a thing when necessary. In any event they should not be discouraged by peremptory orders forbidding their opening a relay.

The renewal of track batteries should not be determined entirely by the condition of the battery, and should not be at the end of an arbitrarily fixed period, as it will vary at different times depending on the cross resistance of the track circuit and other local conditions. The battery will require an inspection about once a week to insure that all connections are tight and that the general condition of the battery is good. Zincs weighing less than 1¾ lbs. and coppers weighing more than 2 lbs. should be scrapped. With glass jars there is a difficulty in preventing breakages by temperature changes and this has suggested the use of one glass and one earthenware jar in a battery. The earthenware jar will not break and will hold the track circuit alone should the glass jar break. The glass jar will serve as an index to the condition of the battery, but probably this indication should be checked by a Baume hydrometer test of the earthenware cell. The prevention of freezing should not be a maintenance matter at all but should be provided for in construction.

Bond wires and other track connections should be closely inspected at least twice a month. At road crossings and station platforms the character of construction should be such as to make this necessary less often—probably not oftener than twice a year. Switch boxes should be adjusted to close the circuit when the switch has been opened ¼ in. and throughout the remainder of the stroke. They should be closely inspected at least once each week and tested first by slowly opening the switch noting at what point the box operates, then opening and slowly closing the switch to note at what point the box ceases to operate. Next by closing the switch with moderate pressure against a stop ¼ in. in thickness, placed between the point and stock rails, to test for lost motion.

Experiments to determine the effect of Burnettized ties on track circuits are not quite complete, but it is probable that the result will be to make it necessary to reduce the length of track circuits. A form of ballast section which will leave the rails entirely clear of the ballast should be adopted within block signal limits to avoid circuit troubles during wet weather.

Modern glass-enclosed relays very seldom require adjusting. They should be kept sealed by the district foreman, and when necessary to break the seal for repairs of any description, all facts in connection with the matter should be given to the district foreman for transmittal to the Signal Supervisor. Comparatively inexperienced maintainers should not attempt to make such adjustments, but should replace the relay with a spare one provided for that purpose and notify the district foreman. Each maintainer should be provided with one spare relay of each type used on his section.

Within the experiences of the members of this committee it has not appeared necessary to use an additional relay of high resist-

*Extracts from report of Committee No. 2, Railway Signal Association.

ance at the battery end of a track circuit. Under ordinary conditions and where a substantial type of insulated joint is used, the increased cost and complication of wiring would not appear to be warranted.

Line Circuits.—The maintenance of line circuits free from interference with other circuits, such as telegraph and telephone lines, is of extreme importance since such interference might easily result in a false clear indication. Yet the maintainers can do little to prevent such trouble unless the signal line circuits have been properly guarded when constructed. A separate pole line for signal wires, and the erection of guard wires at the intersection of other lines greatly reduce the liability of trouble and make possible the maintenance of signal lines with a fair degree of certainty through watchfulness on the part of the maintainer to insure that all foreign lines are maintained in good condition where they cross above signal lines, and that no new lines are strung at any point without the necessary guard. Aside from this little should be required in the maintenance of a well constructed line except the replacing of an occasional broken insulator.

Operating Battery.—We strongly recommend the use of storage battery in the operation of signal motors, on the score of economy and reliability of maintenance. Where a power line for charging the cells in place is not practicable, they should be of the portable type. One battery may with entire satisfaction be used for the joint operation of signal motors and line circuits. With portable cells there should be a charging plant of two or three horse-power for each 100 miles of continuous block system. At isolated points this building is made large enough to include two or three rooms as living quarters. Where electric power is not available for a mercury arc rectifier or motor generator set a small gasolene engine is used. Each individual cell is numbered and a complete record kept of its performance while under charge and also of any unusual occurrence while in service or in transit. Ordinarily circuits are so arranged that a battery will require recharging but once a month. Where grade will permit, cells are transported one way by small gravity cars, returning by freight train. An experiment is being made with distributing cells from the charging plant by means of a small flat motor car capable of carrying 60 cells. Another experiment on different lines is being made with a portable charging plant, consisting of a complete charging outfit erected in a box car. One end of the car is made suitable for living quarters for the attendant. This outfit is set out at each successive way station, and from it the maintainer distributes cells for three or four miles in each direction by means of his velocipede or small motor car. The means most generally adopted for distributing cells from the charging station, however, is by way freight train, and with this object in view the plant is usually located at some way freight terminal. Shipments are made in lots of about 50 cells to some point on each section where the maintainer may pick them up and distribute with his car. Shipments by way freight should always be accompanied by the district foreman or an assistant to insure careful treatment of the cells while in transit.

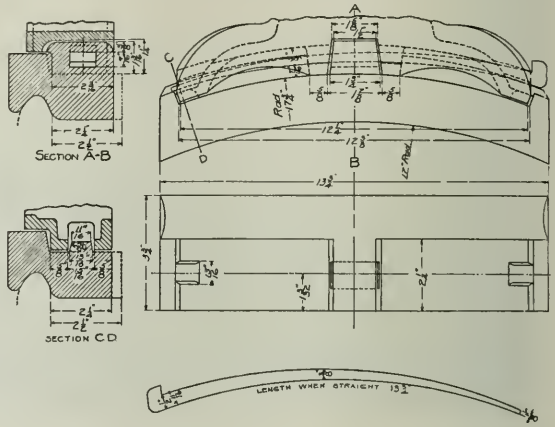
During the 30 days in which the cells are in active service the only attention required will be a little watchfulness on the part of the maintainer to insure that all connections are kept tight and free from corrosion and that evaporation does not expose the tops of the plates. This is prevented, of course, by the addition of pure water as often as may be necessary. The voltage of each individual cell should be taken twice each week to insure that none are failing. Each maintainer should have a low reading voltmeter for this purpose.

Signal Mechanism.—* * * Neatness should always be insisted upon and daily inspection and observance of the mechanism in operation should be made. If oil lamps are used use long burning founts with reflectors. These lamps require attention only once in seven days, but daily inspection of lamps and colored roundels should not be neglected.

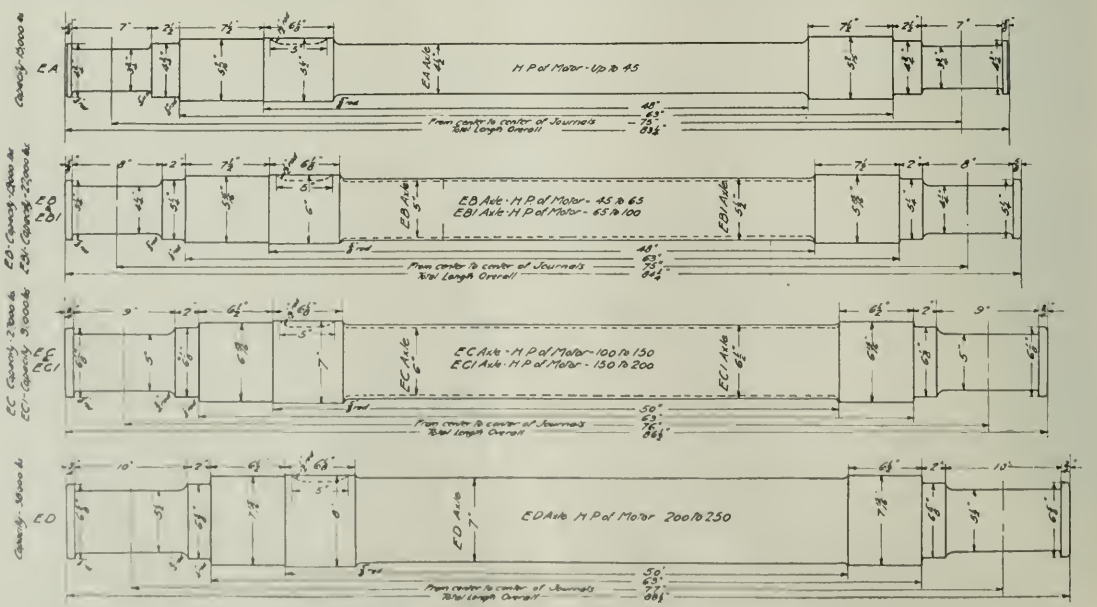
W. W. Slater, Chairman; J. C. Young, A. H. McKeen, E. M. Cutting, F. F. Pflegling, E. W. Newcomb, W. E. Boland, C. S. Pflasterer.

Standards of the American Street and Interurban Railway Engineering Association.

The report of the Committee on Standardization, of the American Street and Interurban Railway Engineering Association, which was presented at the recent convention of that association at Atlantic City, was unanimously adopted and later ratified by the American Street and Interurban Railway Association. The report represents



Standard Brake Head and Flanged Shoe for Narrow Treads.



Standard Axles for Electric Motor Trucks.

two years' work on the part of the committee and the standards recommended are a general compromise of as many as possible of the widely varied existing designs. They are not, however, experimental and they met with entire approval by the manufacturers, who were freely consulted and who aided materially by advice in their preparation. The following is an abstract of the committee report, which is signed by W. H. Evans (International Ry. Co., Buffalo, N. Y.), Chairman, J. M. Larned (Pittsburg Railways Co.); H. B. Fleming (Chicago City Ry.); R. C. Taylor (Indiana Union Traction Co., Anderson, Ind.); H. A. Benedict (United Traction Co., Albany, N. Y.), H. W. Blake (Street Railway Journal, New York); C. B. Fairchild (Cleveland Electric Ry.); H. Wallerstedt.

This committee appointed to investigate the subject of standardization of electric traction equipment considered the following topics: (a) Standard axles, journals, journal bearings and journal boxes; (b) Standard brake-shoes, brake-shoe heads and keys; (c) Standard section of tread and flange of wheel; (d) Standard rails.

It was decided to have the subject of rails considered by the Way committee, and all the information received on this subject was turned over to that committee, which submits a separate report. This committee has considered the subject of rails and special work only as affecting the recommendation of a standard wheel tread and flange.

Table 1.—*Summary of Axle and Gear Data.*

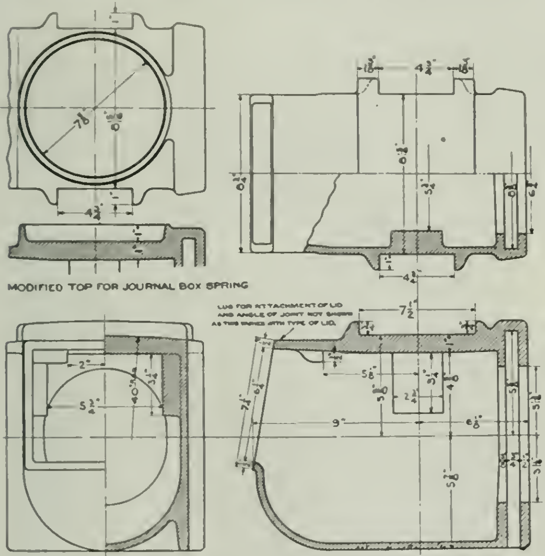
Type	Journals, ins.	Motor fit, in.	Gear fit, in.	Wheel fit, in.	Distance Centers between hubs	Distance Centers of journals	Maximum capacity, lbs.	H.p.	Length of gear seat	Gear pitch	Gear face, in.	Diameter of gear hub and motor bearing flange	Proposed width gear hub — Wheel side	Proposed width gear hub — Motor side
EA	3¾ x 7	4½	5½	5 [illegible]/16	48	75	15,000	45	6¼	3	5	8	1	[illegible]
EB	4¼ x 8	5	6	5 [illegible]/16	48	75	19,000	45 to 65	6¼	3	5	8	1	[illegible]
EB-1	4¼ x 8	5½	6	5 [illegible]/16	48	75	22,000	65 to 100	6¼	3	5	8	1	[illegible]
EC	5 x 9	6	7	6 [illegible]/16	50	76	27,000	100 to 150	6¼	2½	5¼	9[illegible]	[illegible]	¾
EC-1	5 x 9	6½	7	6 [illegible]/16	50	76	31,000	150 to 200	6¼	2½	5¼	9½	[illegible]	¾
ED	5½ x 10	7	8	7 [illegible]/16	50	77	28,000	200 to 250	6¼	2½	5¼	10½	[illegible]	¾

Standard Axles.

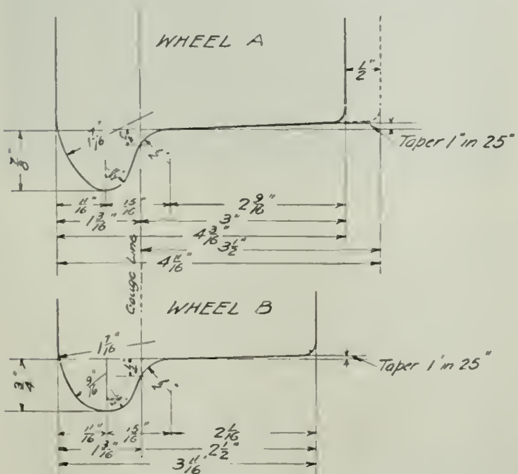
It was early found that it would be very difficult to adopt standard designs of these parts which would accommodate, to any general extent, the equipments already in service. After a thorough discussion by the representatives of all the interests involved, the committee decided to recommend arbitrary dimensions which conform to what is believed to be the best recommended practice, at the same time meeting as nearly as possible the requirements of the existing conditions. The dimensions proposed very nearly approach the standards adopted by many of the important electric railways.

The committee recommends the axles shown in Fig. 1 and designated as EA, EB, EB-1, EC, EC-1 and ED. A general summary of the axle and gear data is given in Table 1.

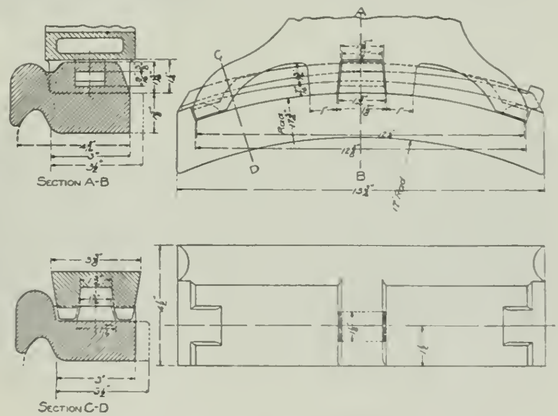
Particular attention is directed to the diameter and length of



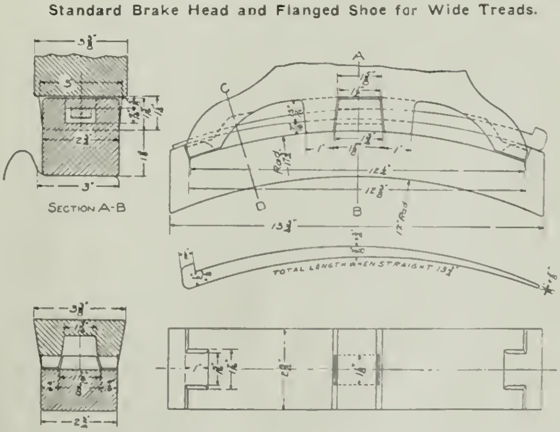
Standard 5-in. x 9-in. Journal Box.



Standard Contours of Wheel Tread and Flange.



Standard Brake Head and Flanged Shoe for Wide Treads.



Standard Brake Head and Unflanged Shoe for Wide Treads.

wheel-fit, diameter and length of gear-fit, the gear keys and the diameter of the motor-fits. The dimensions recommended by the committee are desirable and acceptable to the manufacturers of the different parts of the equipment. Their adoption will result in eliminating a great variety of dimensions of these parts. This lack of uniformity in the past has worked a particular hardship, not only on the manufacturers, but also upon the companies operating the equipment. The motor builders will now be able to arrive at a uniform gear practice.

It is further recommended that for motors not to exceed 100 h.p., a 3-in. pitch gear with 5-in. face be adopted as standard; and that motors exceeding 100 h.p. should have a 2.5-in. pitch gear with a 5.25-in. face.

Journals and Journal Bearings.

For journals and journal bearing keys the committee recommends the use of the four sizes adopted by the Master Car Builders' Association as standards. These are the result of years of experience in equipments of similar character and generally familiar, and are specified in reports of the proceedings of that association.

Journal Box.

In connection with the axles already recommended, the committee recommends the adoption of standard journal boxes for each of the different journals recommended, with two designs for the tops of the boxes to accommodate the two styles of trucks generally used in electric traction equipment. The interiors of these boxes are arranged to accommodate the journal bearing keys referred to above and will be subject to the test gages in common use for journal boxes of this character. (The proposed 5-in. x 9-in. box only is shown.—Ed.)

Brake-Shoes, Brake-Shoe Heads and Keys.

This feature of the equipment most readily permits of standardization and the results obtained therefrom, both mechanically and commercially, will be most desirable. At the present time there are innumerable styles and patterns of brake-shoes and brake-heads in use throughout the country, many of which vary but slightly from the recommendations which the committee herewith submits.

For wheels having a tread 3 in. wide and over, the committee recommends a design of brake-head and shoe (see Figs. 3 and 4), both of which are interchangeable with those in general use in steam railroad practice. The brake-head recommended is adapted to both the flanged and unflanged shoes. The unflanged shoes to go with this head are reversible on their own wheels, and the flanged shoes may be reversed by changing the shoe from end to end on the brake-beam.

To accommodate wheels in service, with treads narrower than 3 in., the committee recommends the brake-head and shoe illustrated in Fig. 5. This head is adapted for use on any of the narrower tread wheels, viz., those less than 3 in. wide. The brake-shoe can be used either flanged or unflanged, the unflanged shoe being reversible upon the same wheel and the flanged shoe reversible by changing it to the other end of the brake-beam, thus requiring but one pattern of brake-shoe for all equipment which will be standardized with this brake-head.

No attempt has been made at this time to suggest a standard for the brake-head hanger arrangement, as the patterns submitted are simply for the brake-shoe attachment. For the brake-head shown in Figs. 3 and 4, it is intended to use the brake-shoe key now in general use.

Standard Section of Tread and Flange of Wheel.

The investigation by this committee of the various types of wheels in service on electric roads throughout the country showed that there is a very wide variation of wheel sections in use, especially as regards flanges and treads, and it was almost impossible to select one wheel which would meet all the varying conditions. It also showed conclusively that wheels of a considerably narrower tread than the increased weight of the equipment requires, are being operated. The committee, therefore, recommends as standard for street and interurban railways as far as it can be applied, a wheel tread and flange contour which conforms to that shown in Fig. 6 and indicated as wheel A, this wheel to have a tread 3 in. wide and a flange $\frac{7}{8}$ in. high and $1^{3}/_{16}$ in. thick at the throat. It is the opinion of the committee that this wheel tread and flange can be applied with little difficulty to a great majority of the roads forming the association.

A number of roads are using wheels with a tread 3.5 in. wide for combined city and interurban work, and there is a decided tendency in this direction. This wide tread assists in carrying the load across special work without running on the flange, and avoids the necessity for flange bearing on the special work. The committee therefore also recommends wheel A with the width of tread increased to 3.5 in. for interurban work, and also for city work where it can be used. It is especially desirable to work toward the general adoption of wheels having this tread.

The committee recognizes the fact that local conditions on many roads are such that it will be difficult for a number of years to operate a wheel of the dimensions represented by wheel A. To meet these conditions the committee recommends wheel B (Fig. 6), with a tread of 2.5 in. wide and a flange 0.75 in. high, this flange to have the same general dimensions as wheel A with the exception of the height above the tread line.

In mounting and gaging wheels it is understood that the gage line is at a point on the flange 0.25 in. above the wheel tread, and the committee recommends that the wheels be gaged 0.25 in. narrower than the gage of the track, the track gage being measured between points 0.25 in. below the tops of the rails.

Union Pacific All-Steel Fireproof Passenger Car.

The accompanying photographs show the new all-steel passenger coach which has just been completed at the Omaha shops of the Union Pacific. It is quite similar in general appearance to the gasoline motor cars of this company and it is therefore a wide departure from conventional designs. The length over vestibule diaphragms, 68 ft., is the same as the present standard 60-ft. coach, and only in this respect does it bear any similarity to equipment now in service. A decrease in height from rail to roof of 24 in. is a noticeable change from the dimensions of the regular equipment.

The underframing is composed of two 12-in. I-beam center sills, spaced 16 in. apart, and 6-in. x 3-in. x $\frac{1}{2}$-in. angle-iron side sills, all securely fastened by cross-ties, needle-beams and diagonal bracing. The 12-in. center sills are intended chiefly to transmit the

End View of Union Pacific Steel Passenger Car.

buffing and pulling stresses, and in reality do not carry any load, as they themselves are carried by the sides of the car, which are of girder construction. The double body bolster, sills and end bracing of the underframe are made of a one-piece steel casting, 11 ft. long by 9 ft. 9 in. wide, weighing 3,700 lbs. This cast-steel end construction greatly reduces the number of parts.

To the top of the underframing is riveted a bottom floor of $^{1}/_{16}$-in. sheet steel, forming a fire protection from below. On these steel sheets is a layer of $\frac{3}{4}$-in. hair-felt and on top of this is a flooring of fireproof composition in pressed sheets, 3 ft. by 4 ft. and $\frac{1}{2}$ in. thick, laid on nailing strips $\frac{3}{4}$ in. by 2 in., embedded in the hair-felt. The whole floor construction is securely bolted together by small stove bolts, the heads being let in flush with the top of the floor.

The side posts and carlines are integral, being one continuous piece of 3-in. channel iron, bent to a U form, inverted, extending

from side sill to side plate and forming the contour of the half oval roof. To these channel-iron posts, which are formed with the flat side outward, is riveted the ⅛ in. steel side sheathing, which together with the posts is riveted to the angle-iron side sills. The steel sheathing extends from the bottom of the side sills to the top of the 4 in. channel side plate, forming a deep, substantial girder, which is stiffened additionally by diagonal braces below the windows and riveted to the sheathing. Holes 25 in. in diameter are cut out of the sheathing for the windows.

Interior of Union Pacific Steel Passenger Car.

ceiling is ⅛ in. thick. All are of the same fireproof composition as the floor.

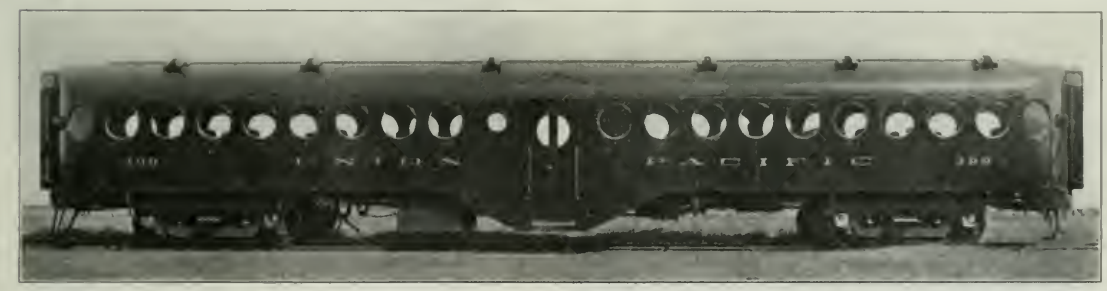
The walls of the car are only 2 in. thick from outside sheathing to the finished surface of the interior wall, a reduction of 3½ in. from present designs. This allows an increase of 7 in. in the width of the aisle.

Comparatively little wood is used in the construction of the car, there being about 200 lbs. of small filling blocks only. All mouldings, etc., are made of fireproof material.

Particular attention was given to the ventilation and fresh air supply. Cottier suction ventilators of an improved design are placed along each side of the center line of the car. Fresh air is admitted at the ends of the car, about 5 ft. from the rail, at each side of the door, through intakes 12 in. in diameter, covered with a fine brass netting. It passes downward to an air-tight galvanized sheet-iron box beneath the car containing two sets of removable dust-collecting screens set vertically. The purified air passes upward to the inside of car through a galvanized sheet-iron duct which runs along the sides of the car with perforations at each seat for discharging the air. The steam heating pipes are placed outside of this air duct to heat the incoming fresh air to the desired temperature. The "Vapor" heating system of the Chicago Car Heating Co. is used. The amount of fresh air admitted to the car is regulated by dampers in the intakes.

The car has an axle-light electric system. There is an 8 c.p. lamp, with frosted globe at the side of the car at each seat just above a sealed passenger's head.

The drinking water is contained in a large, flat, galvanized iron tank, set vertically, back of a removable partition at the center of the car. From this tank, which is filled by a hose fastened to a connection at



New Steel Passenger Car; Union Pacific.

The usual form of square wooden window sash, and the gothic sash above, have been discarded for a circular aluminum sash with a 24-in. glass. This metal sash is provided with a half-round rubber gasket and forms a weather and dust proof window, far surpassing the best type of double sash now in general use. These circular windows are similar to ship porthole windows, being hinged at the top. They are opened by swinging upward toward the ceiling, where they are secured by a special catch.

The oval form of roof does away with an upper deck. It has been a success on the gasolene motor cars, affording extreme lightness, strength and low cost of construction, with simplicity and beauty of design.

The interior arrangement likewise differs considerably from present designs. The four entrances, steps and end vestibules, found in the ordinary coach, have been discarded and a single vestibule at the center of car, with an entrance on each side, has been used instead. This style of entrance proved very satisfactory on the motor cars. Both ends of the car are rounded to eliminate the danger of telescoping and to decrease air resistance. The usual end doors have been retained in order to allow a continuous passage through the train.

The toilets, two in number, are placed at diagonally opposite sides of the steps, at the center of car, and have an efficient system of ventilation and fresh air supply. Standard reversible plush coach seats have been placed in the car temporarily. Fireproof seats are to be used, however, as soon as they can be secured from the makers. All partitions and inside walls of the car are ¼ in. thick and the side sill of the car, the water flows through a coil of pipe in an ice box below the car, to the water alcove at the center vestibule.

The principal dimensions are:

Total weight	80,250 lbs.
Length over vestibule diaphragms	68 ft.
Height, rail to roof	12 ft. 1¾ in.
Height, floor to ceiling	7 " 8¼ "
Width, inside at wainscot	9 " 5⅝ "
" of aisle between seats	2 " 5⅝ "
" of car over side sills	9 " 9⅝ "
Roof sheets, galvanized iron	[illegible] in. thick
Side and end sheathing, steel	⅛ in. thick
Seating capacity	78
Trucks	Four wheel cast steel

The car was designed and built under the supervision of W. R. McKeen, Jr., Superintendent of Motive Power and Machinery of the Union Pacific.

It is reported that the Siemens-Halske Co., after consultation with the railroad administration, has submitted plans for a new underground electric railway through Berlin. It is to connect the Potsdam station with the Stettin station, thus furnishing communication between the southwest and the north of the city. The road is to be double track and standard gage, and of such construction that it can be used by the standard rolling stock of the steam railroads. Besides furnishing through connection for trains from the south to the north and vice versa, the local passenger traffic of the city is to be taken care of by trains running with 2½ minutes headway. The diameter of the tunnel in the clear is to be 27.9 ft.; height, 14.4 ft. No curves are to have less than 482 ft. radius.

Causes of Defects and Failures of Steel Tires.*

BY GEORGE L. NORRIS, M.E.
Chemist, Standard Steel Works.

(*Continued from page 500.*)

The heat treatment of any piece of steel, as shown by its microstructure, is important. On the proper heat treatment depends, first, the ability to produce the steel, and second the quality of the steel. The phrase "improper heat treatment," however, has of recent years been much abused to explain "mysterious" failures. In the manufacture of tires, it is practically impossible to make a tire from an overheated or underheated ingot, as such an ingot would not withstand blooming under the hammer without failure.

Fig. 29.

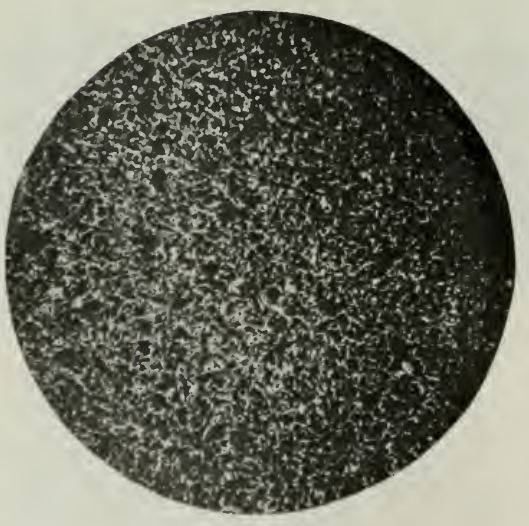


Fig. 30.

The examination of the microstructure of hundreds of discarded tires which have given good service shows what would usually be considered large grain structure. The natural micrograin of steels of the carbon percentage used for tires is quite large. To obtain a fine microstructure it is necessary to anneal the tires. This treatment, however, has no effect in preventing shelliness. It is conceivable that under the heaviest wheel loads the annealed tire with the fine microstructure and large amount of isolated ferrite, or pure iron, would not give mileage results equal to the unannealed tire from the same steel, with its larger area of pearlite and greater resistance to distortion under compression. In the case of the comparatively large, natural grain of the tire as rolled, a greater area of pearlite is presented for wear than in the case of the annealed steel, as is shown in the illustrations, Figs. 29 and 30. Pearlite is the eutectic or saturated steel. It is composed of an intimate mixture of cementite (carbide of iron) and ferrite, (pure iron)

Fig. 31.

Fig. 32.

Fig. 33.

*A paper read at the October meeting of the Western Railway Club.

usually in a lamellar structure (Fig. 31). An ideal steel would be one whose structure is entirely made up of pearlite. Such a steel would contain about .85 per cent. carbon, and would be too hard for most conditions of service.

The macro, or visible structure, rather than the microstructure, plays the most important part in the life of the tire. Unlike rails, and blooms, it is not possible to roll tires direct from the initial casting heat of the ingot, consequently the ingot solidifies undisturbed by work under the hammers or in the rolling mill, and pra-

Fig. 34.

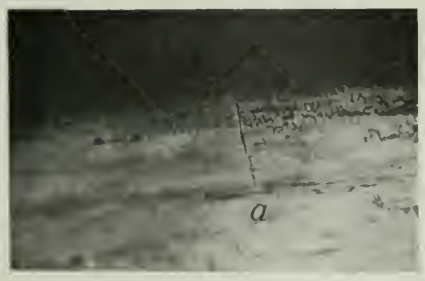


Fig. 35.

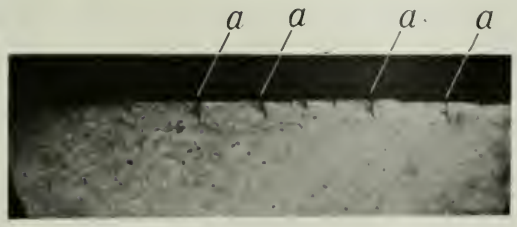


Fig. 36.

tically never shows the pronounced porosity so common in the center of the rail head. Working from a cold ingot which has solidified undisturbed, the maximum effect of the work under the hammer and in the rolls is obtained, increasing the density and homogeneity of the macro, or visible structure.

The causes producing broken tires are: excessive shrinkage, inherent defects in the steel, transverse fracture of the flange, and loose tires.

Failures from excessive shrinkage take place soon after application of the tire to the center and always before the tire has had any appreciable service. After the tire has been in service a short time, molecular readjustment has been completed in the form of motional annealing. This increases the density of the steel, as shown by increased elongation and reduction of area of comparative test pieces from tires from the same heat before and after service.

Inherent defects in the steel are usually due to piping. In some cases the pipe is present as a cavity (Figs. 32 and 33), which causes the tire to burst with a sharp transverse fracture. In other cases the pipe is present as in Fig. 10 and then a piece of the flange or tread is broken off. Tire failures from these defects are practically eliminated by the method of manufacture from long ingots.

Transverse fractures of the flanges are detailed fractures originating on the point of the flange from heat cracks produced by the action of the overlapping brake-shoe. Most of the failures of this kind have been tender and coach wheels in service over long heavy grades where the brake applications are especially severe. It has been observed that wheels which have so failed are generally

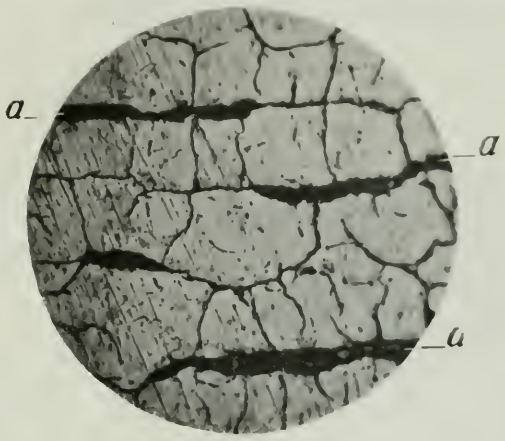


Fig. 37.

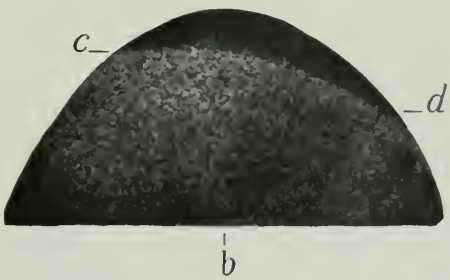


Fig. 38.

equipped with brake-shoes without inserts. Such brake-shoes generate much more heat on the flange than those with inserts, and are not so effective in scouring off the heat cracks formed by long continued brake application. In the case of the brake-shoe with inserts in the flange groove, there is quite an effectual cutting or scouring out of the heat cracks and they are therefore less liable to start a fracture.

The illustrations, Figs. 34 to 40 show plainly the origin of the flange fracture from the heat cracks, and its development into a full fracture of the tire. Fig. 34 is a view of a tire showing several small flange fractures, *a*, *b*, *c*, and their relation to the heat cracks on either side is obvious. Fig. 35 shows a portion of the flange, full size, showing more clearly than Fig. 34 the heat cracks with a fully developed fracture (*a*) in the midst of them. Fig. 36 is a longitudinal section through the flange, line *a*—*b* on Fig. 38, and magnified four diameters. This shows the depth to which pronounced heat cracks *a*—*a*—*a* will penetrate before developing a flange crack. Fig. 37 is a portion of the flange which has been polished and magnified 50 diameters and shows how the surface of the steel is broken up by heat cracks, like sun-dried clay. The

large cracks *a—a—a* are the transverse cracks from which the flange fractures originated, and correspond to those shown in Fig. 36. Fig. 38 is a cross-section through the flange, magnified about two diameters, and lightly etched to show the depth to which the heating effect of the shoe has hardened the steel. This is shown on the illustration by the line *c—d*. Figs. 39 and 40 show the

Fig. 39.

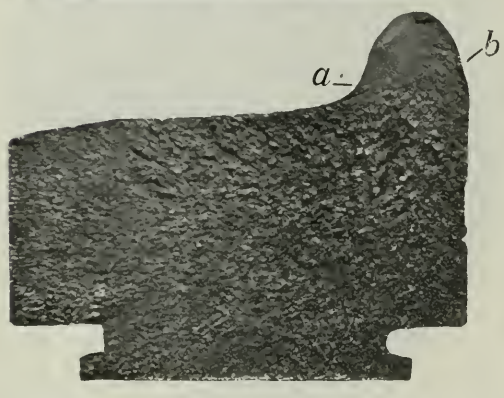


Fig. 40.

fractured surfaces of two tires and the origin of the fractures is clearly traceable to a detailed flange crack. The extent of the crack before the tires broke is plainly shown on the lines *a—b*.

Broken driving wheel tires are found to have usually closely approached or passed the limit of road wear. In addition to failures from flange fractures originating from heat cracks, there have been quite a number of failures due to the lightness of design of cast-steel driving wheel centers. On account of this lightness of design, the tire has not a sufficiently rigid backing, and when it begins to approach or reaches the usual limit of road wear the strains due to flexion of the tire are likely to cause failures.

Fig. 41.

Breakages from loose tires are confined usually to thin tires, and are due to detailed fractures, originating in the bore from repeated bending stresses. Fig. 41 shows the fracture of such a tire and how the fracture progressed by detail until only the light colored area remained when the break took place. Failures of this kind are not common as the tires are readily detected and are generally removed by the inspectors on account of being loose.

Concrete Building Construction.*

Concrete building construction can be divided into four classes: Solid heavy walls; solid light walls reinforced with rods; building blocks made with machines for that purpose, having hollow spaces at intervals throughout the wall; metal lath plastered with a Portland cement mortar.

The objections to solid walls for building purposes are: Liability to crack; expense on account of forms, and dampness seeping through the wall. The last two of these objections are found also in reinforced concrete walls.

These objections may be overcome if proper precautions are taken in the construction. The dampness of the walls may be prevented by painting the exterior surface with a waterproofing compound. There are many of these on the market to-day which answer the purpose admirably and give the surface of the building a nice and even appearance.

In making buildings of solid concrete, pilasters should be built separately as columns with anchor rods projecting from them, and the intervening wall built after the pilasters have hardened so as to make a joint at intervals in the concrete. Where reinforced concrete is used, these joints are not necessary, and, in fact, not desirable as the wall should be built as a unit. The forms are an expensive item in both kinds of construction, but their cost can be largely reduced by making a standard section which can be used many times during the construction of the building. As the appearance of the building is one of the essentials, forms should be constructed so that a tier of the building may be completed in one day and the forms from that tier moved after 24 hours and used for each succeeding tier. In this way the face of the concrete can be treated or patched successfully while green without marring the outside face.

To overcome the objections to the above, many advocate the use of the concrete building block, and there are a large number of different makes of machines on the market for molding them. These blocks have a hollow space to prevent the moisture from reaching the inside of the building. The objections to these blocks are:

It is difficult to form them without some blemish on the surface, which it is impossible to properly remedy. The molded blocks never have the sharp outlines necessary for good appearance.

The construction of blocks must be very carefully watched, otherwise, through the incompetence of the workmen or dishonesty of the maker, a very small amount of cement is used in their composition, with the result that they are very fragile and readily broken. Several cases have occurred where buildings built of blocks have fallen down of their own weight on account of the "lean" mixture used in the make-up of the blocks. Most of these blocks are very porous because they have to be made with a dry mixture. Only those blocks should be used that can be made with a wet mixture and pressed with great power. Blocks made by hand tamping with dry mixture should never be used.

The last form of construction named—plaster on expanded metal—is cheap and answers the purpose satisfactorily for all kinds of shop buildings and for cheap small buildings. This construction, however, has been used with success for elaborate buildings in California and the Southern states, and many beautiful residences are being built to-day by this method. It consists of a framework of wood or steel, with metal lath attached to the outside surface, which is coated with mortar on both sides, forming an exterior wall over 1½ in. thick. On the interior framework, metal lath may also be attached and plastered on the inside. A hollow wall is thus formed with an air space which affords perfect protection against dampness and is a good insulator for heat and cold. The outer face of the exterior wall is usually coated with a waterproofing compound. This form of construction permits of elaborate details at small expense.

Foreign Railroad Notes.

According to Russian official statistics the railroad mileage of the Russian empire at the end of 1906 was:

State railroads in Europe	20,086 miles.
State railroads in Asia	6,735 "
Private railroads	11,426 "
Branch lines	1,436 "
Railroads of the Grand Duchy of Finland	2,058 "
Total	41,741 miles.

In the Portuguese possession of West Africa 37 miles of the Lobito Railroad, from the bay of Lobito into the interior, have been completed and 15 miles have been opened for traffic. To avoid driving a tunnel, as had been originally planned, a part of the road, 6,960 ft., has been built as a rack road with 6 per cent. grade. The road has six locomotives, four passenger cars, 90 freight cars and two water cars.

*From a committee report to the Milwaukee convention of the Superintendents of Bridges and Buildings. A. O. Cunningham, T. J. Fullem, M. Riney, Committee.

GENERAL NEWS SECTION

NOTES.

The aggregate excavations on the Panama canal in the month of September amounted to 1,517,412 cu. yds., the largest month's record since the United States took control.

The Erie Railroad proposes to contest in the courts the law of New York state limiting the working hours of telegraphers, but, pending the outcome of the suit, will observe the provisions of the law.

After November 4 there will be only three five-hour trains each way between New York and Boston. The fourth, which was the last train put on, the one leaving either city at 8 a.m., has not proved profitable and is to be taken off. The train has been running 14 months. The five-hour trains run daily except Sunday.

A press despatch from the City of Mexico says that after a long investigation by a special commission, appointed by the President of Mexico, the government has decided to authorize a general increase in railroad rates, amounting to about 12 per cent. The officers of the railroad desired to make the increase 20 per cent.

The New York State Public Service Commission, First district, has issued an order requiring railroads to file their tariffs with the Commission. Until further orders these may be in any suitable form, but companies for whom a form has been prescribed by the Commission for the Second district are to follow the Second district form, so far as it is applicable.

At Toronto October 25 the Michigan Central was fined $25,000 for neglecting to take reasonable precautions in the handling of dynamite. At Essex, Ont., an explosion occurred while a car containing the explosive was being switched (next to the engine), and evidence showed that the car had been treated like an ordinary car of freight. Two men were killed and 40 injured.

The New York, Chicago & St. Louis has now been in operation 25 years, and 75 officers and employees who have worked for the company throughout that time met in Cleveland last week and formed a Veterans' Association. Among these veterans are: B. F. Horner, General Passenger Agent; S. K. Blair, Division Superintendent; E. A. Miller, George James and R. S. Miller.

At Charleston, Ill., October 28, the Grand Jury, after spending several days investigating the collision of electric cars, which occurred near that place last August, killing 15 persons, returned indictments against both motormen, the President, the Treasurer and other officers of the company, and also against Judge Peter S. Grosscup, Judge of the United States Circuit Court in Illinois, who is a director of the railway company.

Vice-President Thornwell Fay, of the Southern Pacific Lines in Texas, has written to the President of the Agricultural College of the state, asking for the names of graduates or students who want to learn railroading. Students coming to the road will be placed first in the accounting department, and then in district superintendents' offices; then with section crews, under road masters and engineers, and so on through every department necessary to a thorough education in railroading.

The New York State Public Service Commission, First district, has ordered the Brooklyn Rapid Transit Co. to hold westbound elevated trains at the Brooklyn terminal of the Brooklyn Bridge on Saturday afternoons until they can be taken care of at the Manhattan end. The commission's inspectors have reported that it is the practice of the company, despite the larger terminal facilities at the Brooklyn end of the bridge, to send on the trains to Manhattan faster than they can be received.

The attorneys for the Standard Oil Company will ask the United States Circuit Court of Appeals to reverse the decision in which Judge Landis fined the company $29,240,000, alleging that the government attorneys failed to inform the defense of the Alton immunity agreement; that as the Hepburn act was passed before indictments were returned, prosecution under the provisions of the Elkins law was illegal; that Judge Landis did not compute the number of violations correctly, and 22 other points.

Locomotive Fireman C. H. Rutledge, of the Philadelphia, Baltimore & Washington, lately risked his life to save that of a little child, and has been commended by General Superintendent E. F. Brooks, President McCrea and General Manager Atterbury. While firing the engine of a work train rumbling along the track near Port Deposit, Maryland, Rutledge saw a small child playing between the rails a short distance ahead. The brakes could not be applied in time to avert a catastrophe, for the approaching train had scared the little one, and instead of getting out of the way he fell on the track. He made his way along the running board, and, with a flying start from the front of the engine, reached the child and grabbed it out of harm's way before the train passed, using less time than it takes to tell about it.

The New York State Public Service Commission, First district, has ordered an increase in service on the Broadway (surface) line of the New York City Railway consisting of an extension southward of the runs of certain cars heretofore terminating their runs at Houston street. In the same order the Commission requires better destination signs on the cars. Another order requires an important increase in the number of cars on the Fourth and Madison avenue lines. The order gives in detail the number of cars which must be run at different portions of the day.

Consolidated Steamship Lines.

Some of the constituent companies of the Consolidated Steamship Lines have resumed management of their lines, and it is said that ultimately the Consolidated Steamship Lines will cease to be an operating company and be only a holding company. The changes in officers, so far, include the resignation of Calvin Austin as President of the Ward Line and the Mallory Lines. Mr. Austin has heretofore been President of all the companies except the New York & Porto Rico Steamship Company. He has been succeeded by H. P. Booth on the Ward Line and by H. R. Mallory on the Mallory Line. F. B. Mooney has been elected President of the New York & Porto Rico Steamship Company, succeeding J. E. Berwind. Other changes in these companies have been also made. The management of the Eastern Steamship Company and the Metropolitan Steamship Company remains as before. It is said that the Santo Domingo service of the Clyde Line will be consolidated with the New York & Porto Rico Steamship Company, and that the rest of the Clyde Line will be consolidated with the Mallory Line.

Good Safety Records Broken.

Press despatches from London, October 26, report a rear collision at West Hampstead, on the Metropolitan Underground, killing three persons. The second train had run past a signal in a fog. It is said that this is the first accident that ever occurred on the road resulting in fatal injury to passengers, and it is the first rear collision of passenger trains since this line was electrified. On the same day a collision near Dallas, Texas, on the Missouri, Kansas & Texas, caused the death of two passengers and one trainman and the serious injury of a large number of other passengers; and this is said to be the first fatal accident to a passenger, in a train accident, on that railroad. The road is over 35 years old.

That Awful Engineering Mistake.

Vice-President Samuel Rea, of the Pennsylvania Railroad Company, referring to recent sensational newspaper articles says:

"It was originally intended to change from steam to electric locomotives near the Hackensack portal of the New York tunnels, and the alinement of track from Harrison to this portal was made accordingly. It having been decided, however, to change locomotives at Harrison, this short section of track is being improved by reducing the curvature at a very moderate expenditure. The report that this revision of line is due to an engineering mistake, and involves a million dollar expenditure, is incorrect and grossly exaggerated."

Chicago Track Elevation to Date.

Steam railroads have 1,600 lineal miles of tracks in use within the city limits of Chicago, 188 square miles, and the amount of road elevated would make a single track line 700 miles long. This work has included 3,000 subways. The cost has been $35,000,000, divided among the larger roads as follows: Pennsylvania, $11,000,000; Rock Island & Lake Shore, $7,000,000; Northwestern, $6,500,000; St. Paul, $2,500,000; Illinois Central, $2,000,000; Burlington, $1,100,000; Chicago Terminal, $1,150,000. The work yet to be done is in the south and southwest sections of the city. For elevation of the tracks between Englewood and Beverly and as far as South Chicago, the Rock Island and allied roads have accepted city ordinances providing for the expenditure of $5,000,000. The Burlington will spend in the next year or so $1,125,000.—*Wall Street Journal.*

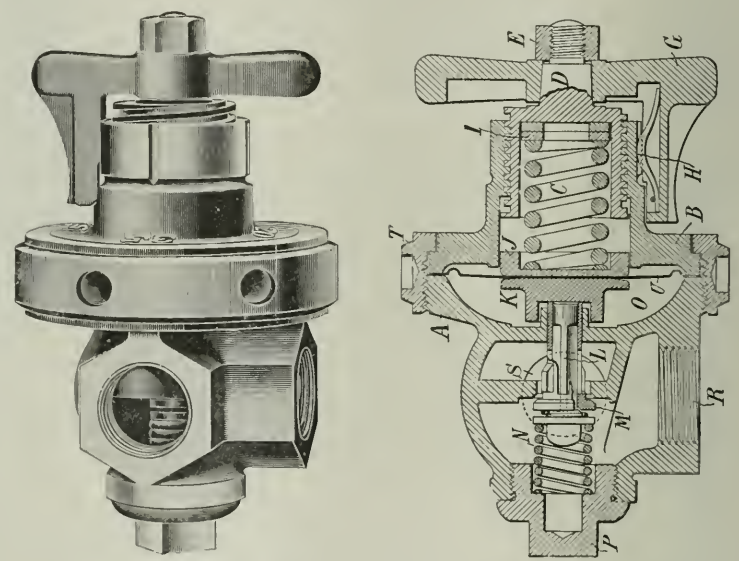
United States Steel Corporation.

The report of the United States Steel Corporation for the quarter ending September 30, 1907, shows net earnings of $43,804,285, the largest in the history of the corporation with the exception of the

June 30 quarter of the present year, when the net earnings were $45,503,705. The amount of unfilled orders on hand, 6,425,008 tons, is the smallest for the end of any quarter since that of September 30, 1905, when they were 5,865,377 tons. The present total of unfilled orders is 1,178,870 tons below the amount on the books on June 30, 1907, and 2,064,710 tons below the high record point, which was on December 31, 1906. While there has been a decrease in the orders booked for various products of the mills, the falling off in the orders for rails is presumably responsible for most of the decrease. The surplus for the September quarter, after all charges and dividends, was $4,911,711, which compares with $3,497,080 in the quarter ended June 30, and $14,697,318 for the corresponding quarter in 1906. There has been, so far, reserved and set aside for the Gary plant $49,000,000. Of this amount $18,539,000 has already been spent.

Gold's Improved Temperature Regulator.

The Gold Car Heating & Lighting Co., 17 Battery place, New York, has recently perfected an improved form of temperature regulator for railroad car heating systems which is shown in the accompanying illustrations. It is smaller than the regulator formerly made by this company and is designed to be applied under the seat in the main supply pipe in place of the angle valve heretofore used, without disturbing any of the other equipment already installed in the car. The dial on top of the regulator is calibrated to show 5, 10, 20, 35 and 50 lbs. pressure in the radiator and by turning the handle any of these pressures desired may be obtained and automatically retained in the radiators as long as the train pipe pressure is in excess of the desired radiator pressure. Variation in train pipe pressure and in radiator condensation are taken care of equally well. When the regulator handle is in the closed position a minimum pressure of 2 lbs. is admitted to the radiator, and this is sufficient to keep the condensed water always moving to the blow-off trap. In case the supply needs to be shut off entirely a globe valve under the seat in the pipe connecting the regulator with the radiator may be closed tight.



Gold's Improved Temperature Regulator for Car Heating.

The principle of the device is that steam at any given pressure has a corresponding temperature. At atmospheric pressure its temperature is 212 deg. Fahr. and at 2 lbs. it is 219 deg. The temperatures corresponding to the pressures obtainable with this improved regulator are 219 deg., 227 deg., 240 deg., 258 deg., 279 deg. and 297 deg. Referring to the sectional drawing, steam from the train line enters at R. As handle G is turned from left to right spring C is compressed and acting through the diaphragm U and the plate K, the valves L and M are opened, admitting steam through the outlet S to the radiator and into the chamber O under the diaphragm U. After the required pressure has been obtained in the radiator any increase will lift the diaphragm U and overcome the pressure of spring C. The valves L and M are perfectly balanced and when the pressure of spring C is overcome the lower spring N will immediately lift them to their seats and stop further admission of steam. As pressure decreases in the radiator it also relaxes under the diaphragm, allowing the spring C to again force L and M off their seats until enough steam has been admitted to compensate for the condensation due to radiation. A friction lock for the handle is provided by the spring H, which engages in grooves cut in the dome casting corresponding to the several positions of the handle to give the required pressures.

Advantages claimed for the device are that it will maintain practically an atmospheric pressure if desired for moderate temperatures or any degree of high pressure heating for extreme weather. It admits only enough steam from the train pipe to maintain the desired temperature and any excess pressure is directed to the rear of the train. A minimum pressure of 2 lbs. gives the required force to expel condensed water and air from the radiators when heating up a car. The device can be applied to any system of direct steam or hot water heating.

Richard Bell, M.P., Labor Leader.

Almost exactly $26 a week is the salary of Richard Bell, General Secretary of the [British] Amalgamated Society of Railway Servants, and, by virtue of his position, a more prominent figure in the public eye for the time being than the Prime Minister or the King himself. He is two years on the right side of 50. He is just a trifle over the average height, deep-chested, powerfully built, and straight as a pine tree. When I called to see him at the London headquarters of the society a batch of English reporters were interviewing him on the developments of the day; and I had to wait until they had done pumping him. Now, around the American headquarters of a powerful labor organization, when there is a crisis at hand, one always finds a lot of hangers-on, eager to load up the journalist with tales of grievances and fight talk. But there were no agitators of that sort here. The staff were all busy earning their pay. As the door of Mr. Bell's office opened to admit me I caught his last words to the representatives of the London papers: "Bear in mind that we want to get this thing settled without a strike if possible. Don't write anything that is going to stir up strife and ill feeling, and make it harder for a policy of conciliation to prevail."

Speaking of strikes he said: "A strike is a form of war—industrial war—and war, as your General Sherman said, is hell. It is only to be thought of when all other means of settling a dispute fail. But just as there comes a time when a nation feels compelled to submit its cause to the arbitrament of the sword, so in the struggle between capital and labor a crisis may be reached when the workers have to appeal to the only weapon they can command to which the other side is vulnerable—a strike."

"Do you consider that a strike is inevitable?"

"If the railroad companies persist in refusing to recognize the union—yes. For two years the men have been pressing the executive committee to sanction this movement. Last November we formulated our programme of grievances. To them was attached a demand that deputations to the employers should be accompanied by their official representatives. Three times we have made overtures to the companies, and each time the companies have replied, in effect, with a point blank refusal to discuss the affairs of their employees 'with a third party.' In other words, they refuse to recognize our union."

"Why do you regard that as the one point of vital importance?"

"Because it is vital to the men's own interests and the principle of trade unionism. It lies at the root of collective bargaining. The railroad companies of England are really composed of some 100,000 or 500,000 shareholders. They make their bargains and conduct their negotiations with their 400,000 or 500,000 employees by means of their official representatives—experts. The employees have an equal right to be represented on their side by experts of their own choice.

"Industrial history proves conclusively that trades unions have been a powerful factor in securing improved conditions for the workers. But to be of material benefit to their members they must be 'recognized.' It is in those industries in which labor is best organized and is afforded the fullest recognition that conditions are most stable and profitable and strikes least frequent. Of that the great cotton industry and the coal mining industry are shining examples.

"Yet the directors of several of the railroad companies say that the recognition of our union means transferring the management of the roads to the men, chaos and bankruptcy. Such state-

ments are insults to public intelligence. The Northeastern—the one great railroad company which recognizes our union—has suffered no diminution of dividends or decrease of efficiency in consequence. The post-office employs more labor than any concern in England. That now recognizes the unions of its employees, with the result, as the Postmaster-General has acknowledged, that there is much less friction than formerly."—*Springfield Republican*

Brilliant Plan of Two Irish Gentlemen for Saving a Lady.
—*Sketch.*

MANUFACTURING AND BUSINESS.

The Central Inspection Bureau, New York, has an order from the Newburg & South Shore for inspecting a number of trucks to be built at the Middletown Car Works.

The Northern Electrical Manufacturing Co., Madison, Wis., has established a district office at Pittsburgh, Pa., in charge of C. A. Poe, formerly of C. A. Poe & Bro. The office is at 618 Park building. Mr. Poe has represented the company in the Pittsburgh district in conjunction with other lines for several years, but his entire attention is now devoted to this company.

The town of Lachine, Que., has, it is said, voted a bonus of $50,000 as well as exemption from local taxes for 20 years to the Imperial Locomotive & Machine Company. This company, a subsidiary of Beyer, Peacock & Co., Manchester, England, is to build locomotive works at Lachine, as mentioned in this column last week. The cost of the plant is estimated at $2,250,000.

The Willard Storage Battery Co., Cleveland, Ohio, is occupying its new factory, on Marquette road and Lakeside avenue. It is much larger than the old factory. There is a large three-story brick building, and a one-story frame building. The total floor space of the two is 80,000 sq. ft. Power is supplied by three Crocker-Wheeler generators, driven by two Bruce-Merlam-Abbott gas engines and a steam engine. Rolling, cutting, forming, lead-burning, assembling, etc., is done on the ground floor, and the assembling department and offices are on the second floor. The third floor has the carpentering and painting departments. The company makes storage batteries for all purposes, particularly train lighting, automobile, signal, telephone and stationary.

H. B. Ayres, Manager of the Locomotive & Machine Company of Montreal, has resigned to become General Manager of the H. K. Porter Company, Pittsburgh, Pa. A. W. Wheatley, General Inspector of the American Locomotive Company at Schenectady, N. Y., succeeds Mr. Ayres. Forrest M. Titus, Resident Inspector at Schenectady, succeeds Mr. Wheatley. Mr. Titus began railroad work on the New York, Chicago & St. Louis as a machinist in the fall of 1903. He later went to the Union Pacific, where he worked in the same position until he was put on the staff of the Superintendent of Motive Power as shop demonstrator. He was later appointed inspector for the Harriman Lines at the Baldwin Locomotive Works. He has been with the American Locomotive Co. only since October 1 of the present year.

A statement made by the Receivers of the Westinghouse Machine Company is to the effect that the company is entirely solvent, that the receivership was simply a logical measure for conserving the interests of customers, creditors and stockholders, that there has been no pause in the operations of the company, and that the personnel remains the same as before. George Westinghouse said that both the Westinghouse Electric & Manufacturing Company and the Westinghouse Machine Company are solvent and doing the largest and most satisfactory business in their history. Each is earning liberal dividends and has quick assets about equal to its liabilities. The loans made to the Securities Investment Company and to Mr. Westinghouse are secured by stocks of the Westinghouse operating companies, and he strongly advises holders of these loans to hold their collateral until its market value is restored to its normal figure. The sacrifice of collateral at present can benefit no one. It is understood that the property of the Westinghouse Machine Company will probably be returned to the stockholders in three or four months. A plan is under way to extend for three years loans amounting to about $8,000,000 negotiated personally by Mr. Westinghouse. Most of this money was used to help the different companies, including the foreign ones. Three trustees have been appointed in whose hands the collateral securing the loans has been placed. The par value of the collateral amounts, it is said, to $20,000,000. The idea in appointing the trustees was to keep the collateral intact until the loans can be met without losing the collateral. T. W. Selman, E. W. Childs and C. B. Hill have been appointed Receivers in New York for the Westinghouse Lamp Company. Mr. Selman and D. W. Cooper have been appointed Receivers of the company's property in New Jersey. William McConway and W. D. Updegraff are the Receivers of the Nernst Lamp Company.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad conventions and engineering societies, etc., see advertising page 24.)

American Society of Mechanical Engineers.

The fifty-fourth annual meeting of this society is to be held in the Engineering Societies building at 29 West 39th street, New York, December 3-6, 1907. There will be symposiums on foundry practice. Other subjects are: The specific heat of superheated steam, with a paper by a Professor of Engineering at Cornell; the utilization of low grade fuels in gas producers; industrial education; power transmission by friction driving, and cylinder port velocities.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Chesapeake & Ohio.—Martin Erdmann has been elected a Director, succeeding J. B. Thayer.

Chicago & Eastern Illinois.—The office of W. H. Lyford, General Counsel, has been moved from New York to Chicago.

Lehigh Valley.—L. D. Smith, Assistant Secretary, has been appointed Assistant to the President, with offices at New York and at Philadelphia, in charge of finance and accounting and such other duties as may be assigned to him. The General Auditor, the Treasurer and the Secretary will report to him.

F. L. Blendinger, Purchasing Agent and Superintendent of Telegraph, has been appointed Assistant to the Vice-President, with office at New York, in charge of the purchasing and fuel departments and such other duties as may be assigned to him.

Union Pacific.—The authority of A. L. Mohler, Vice-President and General Manager of the Lines East of Green River, has been extended to cover the lines and branches from Green River, Wyo., to the east switch of the Ogden, Utah, yards.

Operating Officers.

Atchison, Topeka & Santa Fe.—G. E. Ayer, Superintendent at Dodge City, Kan., has been appointed Superintendent at Newton, Kan.,

succeeding F. J. Easley, resigned to go to the Chicago, Rock Island & Pacific. H. A. Tice, Superintendent at Arkansas City, Kan., succeeds Mr. Ayer. W. K. Etter, Superintendent at San Marcial, N. Mex., succeeds Mr. Tice. F. L. Myers, Trainmaster at Wellington, Kan., succeeds Mr. Etter. Payson Ripley, Trainmaster at San Marcial, succeeds Mr. Myers. Daniel Orr, general traveling roadmaster of the Rio Grande division, succeeds Mr. Ripley.

Canadian Pacific.—J. K. McNeillie has been appointed Assistant Superintendent of Terminals at Toronto, Ont., succeeding F. S. Martyn, transferred.

Chicago & North-Western.—T. A. Lawson, Assistant General Superintendent, has resigned.

Colorado Southern, New Orleans & Pacific.—W. H. De France, Superintendent of the Southern division of the Kansas City Southern, has been appointed Superintendent of the Colorado Southern, New Orleans & Pacific, with office at Baton Rouge, La., with jurisdiction over the line from Baton Rouge, La., to De Quincy, which, it is expected, will be open to traffic by January 1.

Denver & Rio Grande.—R. R. Sutherland, Assistant Superintendent of the Rio Grande Western at Helper, Utah, has been appointed Superintendent of the Second and Third divisions of the Denver & Rio Grande, with office at Salida, Colo., succeeding I. H. Luke, resigned. See Kansas City Southern; also Rio Grande Junction.

Great Northern.—J. M. Gruber, General Manager of the Chicago, Burlington & Quincy Lines East of the Missouri River, has been appointed General Manager of the Great Northern, succeeding F. E. Ward, who took Mr. Gruber's place on the Burlington. Mr. Gruber will have charge of operation and maintenance.

E. L. Brown, General Superintendent of the Eastern district, has been appointed General Superintendent of the Western district, with office at Spokane, Wash., succeeding F. S. Forest, resigned. W. B. Scott, Superintendent at Everett, Wash., succeeds Mr. Brown, with office at St. Paul, Minn. J. H. O'Neill, Superintendent at Whitefish, Mont., succeeds Mr. Scott. W. B. Smith, Assistant Superintendent at that place, succeeds Mr. O'Neill.

Kansas City Southern.—I. H. Luke, Superintendent of the Second and Third divisions of the Denver & Rio Grande, has been appointed Superintendent of the Southern division of the Kansas City Southern, with office at Texarkana, Tex., succeeding W. H. De France, resigned. See Colorado Southern, New Orleans & Pacific.

Louisville & Nashville.—J. D. Patterson, formerly Superintendent of the Mobile, Jackson & Kansas City at Laurel, Miss., has been appointed Superintendent of the joint terminals at Atlanta, Ga., acting also as Superintendent of the Louisville & Nashville lines south and east of Hills Park, Ga.

New York Central & Hudson River.—J. P. Leahy and M. E. Welsh have been appointed Assistant Trainmasters at East Rochester, N. Y. W. D. Lawson has been appointed Assistant Trainmaster at Batavia, N. Y. C. H. Calkins, Trainmaster at Oswego, N. Y., has been appointed Trainmaster of the Watertown district. F. L. Whitney has been appointed Assistant Trainmaster of that district. J. A. Ashe succeeds Mr. Calkins at Oswego. W. H. Hartney has been appointed Assistant Trainmaster at Oswego. C. F. Moyer has been appointed Assistant Trainmaster at Richland, N. Y. H. J. Avery has been appointed Assistant Trainmaster of the Auburn branch, with office at Rochester, N. Y.

New York, Chicago & St. Louis.—G. C. Todd has been appointed Trainmaster of the Eastern division, with office at Conneaut, Ohio, succeeding F. T. Deahl, deceased.

Northern Pacific.—I. B. Richards, Superintendent of Transportation, has been appointed Acting General Superintendent of the Yellowstone, Montana and Rocky Mountain divisions, with office at Livingston, Mont.

Rio Grande Junction.—J. H. Brinkerhoff, Assistant Superintendent of the Fourth division of the Denver & Rio Grande, has been appointed Superintendent of the Rio Grande Junction, with office at Grande Junction, Colo.

Rio Grande Western.—See Denver & Rio Grande.

Seaboard Air Line.—J. J. Puller, division passenger agent at Philadelphia, Pa., has been appointed Assistant General Passenger Agent at Atlanta, Ga.

Traffic Officers.

Annapolis, Washington & Baltimore.—W. E. Slaughter, General Superintendent and Traffic Manager, has resigned to go to the Washington, Baltimore & Annapolis Electric as General Passenger Agent.

St. Louis, Brownsville & Mexico.—William Doherty, who was recently appointed Traffic Manager, with office at Corpus Christi, Tex., was born in Ireland. His first railroad work was in 1887 as weighing clerk of the Texas Traffic Association. The next year he went to the Gulf, Colorado & Santa Fe as a clerk in a local freight office. He remained with this company until 1897, serving as assistant city ticket agent, then passenger agent, and finally as traveling passenger agent, with headquarters at Fort Worth, Tex. He then went to the Houston East & West Texas as traveling freight agent. In 1900 he was appointed Assistant General Passenger Agent of this company, having also the same title on the Houston & Texas Central. In 1904 he was appointed General Passenger Agent of the St. Louis, Brownsville & Mexico, which office he held until his recent promotion. Mr. Doherty is also Editor of the *Gulf Coast Magazine.*

William Doherty.

Engineering and Rolling Stock Officers.

Beaumont, Sour Lake & Western.—See Colorado Southern, New Orleans & Pacific.

Boston & Albany.—Everett Stone, who was recently appointed Engineer of Maintenance of Way and Construction, with office at Springfield, Mass., was born in 1865 at Leicester, Mass. After graduating from Worcester Academy he began work in 1887 in a survey on the Boston & Albany. After a few months he was appointed assistant division roadmaster and in 1890 was made division roadmaster. Four years later he was appointed Assistant Chief Engineer, where he remained until his recent promotion.

Buffalo, Rochester & Pittsburgh.—E. F. Robinson, Assistant Engineer of Track, has been appointed Acting Chief Engineer, succeeding to the duties of J. M. Floesch, Chief Engineer, resigned.

Central Vermont.—William Kennedy, Master Mechanic of the Grand Trunk at Toronto, Ont., has been appointed Superintendent of Motive Power of the Central Vermont, with office at St. Albans, Vt., succeeding Archibald Buchanan, Jr., resigned to go to the New York Public Service Commission.

Chicago, Burlington & Quincy.—I. N. Wilber, Master Mechanic at Hannibal, Mo., has resigned, effective January 1, after 50 years of railroad service with the Burlington and its predecessors.

Chicago, Rock Island & Pacific.—E. J. Harris, general foreman at Valley Junction, Iowa, has been appointed Master Mechanic at that place, succeeding B. W. Cunningham, resigned to go to the Missouri Pacific.

Colorado Southern, New Orleans & Pacific.—A. L. Moler has been appointed Master Mechanic of this company and of the Beaumont, Sour Lake & Western and the Orange & Northwestern, with office at Beaumont, Tex., succeeding J. A. Baker, resigned.

Erie.—E. A. Wescott, Assistant Mechanical Superintendent, has been appointed to the new office of Superintendent of the car department, and his former office has been abolished. E. I. Dodds, Assistant to the Mechanical Superintendent, and Thomas Tracy, Assistant Master Car Builder, have been appointed to the new offices of Assistant Superintendents of the car department, and their former titles have been abolished. The headquarters of all are at Meadville, Pa.

Grand Trunk.—See Central Vermont.

New York Public Service Commission.—Henry B. Seaman, Consulting Engineer of the Bridge Department of New York City, has been appointed Chief Engineer of the Public Service Commission, First district, effective December 1. George S. Rice, heretofore Chief Engineer, has been appointed Assistant Chief Engineer in charge of construction work now under way. Mr. Seaman graduated from Swarthmore College in 1881. He worked for three years on the Erie and then went to the Kings County Elevated in Brooklyn. After working in the bridge

department of the Pennsylvania Railroad, he was for three years Principal Assistant Engineer of Wilson Bros., Philadelphia. He was then appointed Bridge Engineer of the Erie and two years later went to the New York, New Haven & Hartford in active charge of the physical improvements inaugurated by President Mellen. He was in direct charge of the four-track bridge work on the New York division and had supervision over the New Haven cut. He then went to New York as Consulting Engineer of the Bridge department of the city.

Orange & Northwestern.—See Colorado Southern, New Orleans & Pacific.

Tonopah & Goldfield.—E. F. Van Hoesen has been appointed Chief Engineer, with office at Tonopah, Nev., succeeding W. B. Chapin, who resigned last spring.

Purchasing Agents.

Lehigh Valley.—See this company under executive, financial and legal officers.

LOCOMOTIVE BUILDING.

The Denver & Rio Grande is said to have ordered 28 locomotives for January delivery.

The New York, New Haven & Hartford, it is said, is figuring on electric locomotives.

The Northern Pacific is said to have ordered 26 oil burning locomotives from the American Locomotive Co.

The Laramie, Hahn's Peak & Pacific has ordered one consolidation locomotive from the Hicks Locomotive & Car Works.

The Fresno Valley Lumber Company, Davenport, Iowa, has ordered one locomotive from the Davenport Locomotive Works.

The Toronto, Hamilton & Buffalo is said to have ordered four locomotives from the Locomotive & Machine Co. of Montreal.

The Baltimore & Ohio has not yet authorized the purchase of the locomotives for which the mechanical department has asked.

The Kansas City Southern, as reported in the *Railroad Gazette* of October 25, has ordered 21 simple consolidation (2-8-0) locomotives and nine simple switching (0-6-0) locomotives from the Baldwin Locomotive Works, for December and January delivery.

General Dimensions.

	Consolidation.	Switching.
Types of locomotives	Consolidation.	Switching.
Weight, total	324,680 lbs.	213,600 lbs.
Weight on drivers	185,000 "	128,800 "
Diameter of drivers	55 in.	51 in.
Cylinders	22 in. x 30 in.	19 in. x 26 in.
Boiler, type	Straight.	Straight; radial stayed.
" working stm. press.	200 lbs.	180 lbs.
" number of tubes	376	276
" material of tubes	Tyler charcoal iron.	
" diameter of tubes	2 in.	
" length of tubes	14 ft. 6 in.	11 ft.
Firebox, length	120 in.	108 in.
" width	40¾ in.	41⅞ in.
" grate area	33.5 sq. ft.	31.4 sq. ft.
Tank capacity	6,000. gals.	4,000 gals.
Coal capacity	10 tons.	8 tons.

Special Equipment.

Air brakes	Westinghouse
Axles	(for consolidation) Taylor iron; (switching) Otis
Bell ringer	Western Railway Equipment Co.
Boiler lagging	Keasbey & Mattison
Brake-beams	Simplex
Brake-shoes	"Perfecto"
Couplers	Climax
Headlights (for consolidation)	Pyle-National electric
Injector	Ohio
Piston rod packings	Sullivan metallic
Valve rod packings (for switching)	Sullivan metallic
Safety valve	Consolidation
Sanding devices	Kansas City Southern standard
Sight feed lubricators	Nathan
Springs	Railway Steel-Spring Co.
Steam gages	Ashcroft
Tires, driving wheel	Latrobe
Tires, truck wheel (for consolidation)	Latrobe
Tires, tender wheel (for consolidation)	Latrobe
Wheel centers, drivers (for consolidation)	Cast steel; Davis counterbalanced

The Boston & Maine, as reported in the *Railroad Gazette* of October 25, has ordered 15 simple six-wheel switching (0-6-0) locomotives for January, February and June, 1908, delivery.

General Dimensions.

Type of locomotive	6-wheel switching
Weight, total	114,000 lbs.
Weight on drivers	114,000 "
Cylinders	19 in. x 24 in.
Diameter of drivers	51 in.
Boiler, type	Straight top; radial stay
" working steam pressure	160 lbs.
" number of tubes	259
" material of tubes	National Tube Co.; Spellerized steel
" diameter of tubes	2 in.
" length of tubes	11 ft.
Firebox, length	102 5/16 in.
" width	32⅛ "
" material	Worth steel
" grate area	22.8 sq. ft.
Heating surface, total	1,635.7 "
Tank capacity	4,000 gals.
Coal capacity	7 tons

Special Equipment.

Air brakes	Westinghouse
Axles	Carnegie
Boiler lagging	Franklin Mfg. Co.
Brake-beams	Buffalo
Brake-shoes	Ibberson & Major standard
Couplers	Tower
Headlights	Dewey
Injector	Hancock
Journal bearings	Hardy, bronze
Piston rod packings	Hayden
Valve rod packings	Hayden
Safety valve	Ashton
Sanding devices	Hanson
Springs	Railway Steel Spring Co.
Steam gage	American
Tires—driving wheel	Midvale
Tires—tender wheel	Chilled cast iron

CAR BUILDING.

The Barnett Manufacturing Company, Chicago, is in the market for 15 tank cars.

The Boston & Maine is understood to have ordered 1,000 freight cars from the Laconia Car Company.

The Lehigh Valley has not yet ordered the 1,000 freight cars for which it was in the market some time ago.

The Nashville, Chattanooga & St. Louis is in the market for 100 hopper bottom gondola cars of 100,000 lbs. capacity.

J. G. White & Co., New York, are in the market for combination parlor and first class passenger coaches for the Philippine Railways.

The Norwood & St. Lawrence has ordered one first class combination baggage and passenger car from the Hicks Locomotive & Car Works.

The Buffalo, Rochester & Pittsburgh, as reported in the *Railroad Gazette* of October 25, has prepared specifications for freight cars, but no action will be taken for some weeks at least.

The Erie, as reported in the *Railroad Gazette* of October 18, is converting fifty 20-ton box cars into cabooses; half the cars are being rebuilt at the Buffalo shops and half at the Kent shops.

The City of Chicago, as reported in the *Railroad Gazette* of August 23, has made requisition for about 50 gondola cars, either new or second-hand, for which bids will be asked this fall and appropriation made next spring.

The Harriman Lines are asking bids on a number of passenger coaches, baggage cars, combination passenger and baggage cars and dining cars. Comparative bids on both steel and woden cars in each class are asked. It is denied that 26 cars have been already bought, as reported in the *Railroad Gazette* of October 25, 1907.

The South & Western, as reported in the *Railroad Gazette* of October 18, has ordered 100 self-cleaning hopper cars of 100,000 lbs. capacity from the Pressed Steel Car Company. These cars will weigh 29,583 lbs. and will measure 30 ft. 2½ in. long, and 9 ft. 5⅝ in. wide, inside measurements, and 31 ft. 11 in. long, 10 ft. wide and 10 ft. high, over all. Bodies and underframes will be of steel. The special equipment includes:

Bolsters	Simplex
Brake-beams	Simplex
Brake-shoes	Congdon
Couplers	Janney
Draft rigging	Miner
Journal boxes	Symington
Trucks	Diamond

The Philippine Railways, through J. G. White & Co., New York, has ordered 40 20-ton box cars, 40 10-ton box cars, for December, 1907, delivery, and 15 second class passenger cars for February, 1907, delivery from the American Car & Foundry Company. The 20-ton box cars will measure 31 ft. ¾ in. long, 7 ft. 6¾ in. wide and 7 ft. high, inside measurements, and 32 ft. 9⅝ in. long and 8 ft. 1⅜ in. wide over all. The 10-ton box cars will measure 17 ft. ¾ in. long, 7 ft. 6¾ in. wide and 7 ft. high, inside measurements, and 18 ft. 9⅝ in. long and 8 ft. 1⅜ in. wide, over all. The passenger cars will measure 41 ft. 11½ in. long, 7 ft. 8½ in. wide and 6 ft. 9 in. high, inside measurements, and 43 ft. long and 8 ft. 4½ in. wide, over all. The bodies of all cars will be of wood and the underframes of steel. The special equipment for all cars includes:

Axles	Philippine Railway standard
Brake-beams	Buffalo
Brake-shoes	Congdon
Brakes	Westinghouse
Brasses	Brady
Couplers	Major
Draft rigging	Miner
Platforms	Passenger cars, Standard Coupler Co.
Roofs	Box cars, Murphy galvanized iron
Springs	Philippine Railway standard

The Central of New Jersey, as reported in the *Railroad Gazette* of October 18, has ordered 12 passenger coaches and eight combination passenger and baggage cars from Harlan & Hollingsworth. The coaches will seat 81 and the combination cars 58 persons. These cars will weigh 89,000 lbs. and will measure 65 ft. 3½ in. long and 8 ft. 10 in. wide, inside measurements, and 74 ft. long, 10 ft. ½ in.

wide and 13 ft. 11 in. high, over all. Bodies and underframes will be of wood. The special equipment includes:

Bolsters	Commonwealth
Brake-beams	Simplex
Brake-shoes	Diamond S
Brakes	Westinghouse
Brasses	Magnus
Couplers	Buhoup; 3-stem
Curtain fixtures	National
Curtain material	Pantasote
Draft rigging	Miner
Dust guards	Symington
Heating system	Gold direct
Journal boxes	Symington
Light	Pintsch
Platforms	Standard Coupler Co.
Springs	Simplex
Trucks	Commonwealth, steel frames
Vestibules	Pullman
Wheels, make of	Taylor

RAILROAD STRUCTURES.

Alexandria, La.—The St. Louis, Iron Mountain & Southern, it is said, will build a brick passenger station 200 ft. long, and a frame freight house on land between Elliott and Jackson streets, and also make other improvements to cost $70,000.

Buffalo, N. Y.—Contract is reported let by the Erie to Mosier & Summers for rebuilding its freighthouse recently destroyed by fire. The proposed structure will be of brick 32 ft. x 200 ft. and two stories high.

Defiance, Ohio.—The announcement is reported made by the Baltimore & Ohio that the company will spend $53,000 putting up a passenger station and freight house here.

East Buffalo, N. Y.—The Delaware, Lackawanna & Western has made plans for a new coal trestle to be built entirely of concrete, 1,000 ft. long and with a capacity of 4,000 tons.

Eugene, Ore.—Contracts are reported let by the Southern Pacific for a new freighthouse, train sheds and additional tracks. The cost of the improvements will be about $25,000.

Kingsville, Tex.—The shops of the St. Louis, Brownsville & Mexico Railroad at this place are being enlarged and other improvements of the terminal facilities are being made.

Lafayette, La.—The Southern Pacific, it is said, has bought a large plot of land here as a site for shops, a roundhouse and large switching yards.

Matamoros, Mex.—The Interoceanic is making many improvements, rebuilding a number of bridges, and erecting a new station here.

Minneapolis, Minn.—The Wisconsin Central has given contracts for putting up a reinforced concrete freight station 66 ft. wide at the north end and 98 ft. at the south end, 417 ft. long and four stories high. A viaduct is also to be build leading from the second floor at the south end to First avenue. These improvements will cost about $180,000.

Nuevo Laredo, Mex.—The National of Mexico is erecting machine shops, boiler shops, a foundry, blacksmith shops and other buildings here. It is also building roundhouses at Venegas and Nuevo Laredo.

Ottawa, Ont.—A contract is reported let to John Quinlan & Co., of Montreal, at $60,000 for the excavation work for the new Grand Trunk hotel and station.

Port Arthur, Ont.—The Canadian Northern, it is said, is planning to put up car shops here, providing concessions are granted by the town.

Poughkeepsie, N. Y.—Announcement is made that repairs on the bridge over the Hudson river, which have cost the New York, New Haven & Hartford about $1,500,000, will be finished about December 1.

Reading, Pa.—The Board of Public Works has given to Hawman Bros. a contract for the Spring street subway at $110,480. The next lowest bidder was David B. Peoples, who offered to do the work for $110,945. The contract will have to be ratified by the Council and approved by the Mayor.

Sabinas, Mex.—The Mexican International is constructing steel bridges across the Sabinas and Tepehuanes rivers. The Sabinas bridge will be 826 ft. long and will consist of 10 steel girders. The Tepehuanes structure will have six steel girders. The large shops of this road at Durango were recently finished. The roundhouse at Monclova has just been rebuilt, and the additions to the shops of the road at that place will soon be finished.

Sharon Springs, Kan.—The Union Pacific has work under way putting up roundhouses, making a new yard and putting in tracks. It has been decided to make this place a division point in place of Cheyenne Wells, Colo.

Vancouver, B. C.—Arrangements have almost been finished for building the second Narrows bridge, and it is expected that bids will shortly be asked for.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

Bangor & Aroostook.—The report of this company for the year ended June 30, 1907, shows that work on the Medford extension from South La Grange north through Medford to a junction with the main line about four miles north of Seboois is about ready for operation. The line has low grades and is shorter than the line via Milo Junction, Brownville and Schoodic. No mention beyond indicating it on the map is made in the report of the line projected north from the main line at Seboois along the east bank of the Allagash river to St. Francis, 140 miles.

Beaumont & Great Northern.—This company expects to let contracts this year for an extension from Livingston, Tex., southeast to Beaumont, 70 miles. Surveys made. (Oct. 18, p. 472.)

Big Fork & International Falls.—See Northern Pacific.

Buffalo & Susquehanna.—Estimates of the cost of rebuilding portions of this road south from Juneau junction southwest to Sagamore, 23 miles, are being prepared. When the road was built from Juneau junction to Sagamore, light rails were used, and many curves and grades prevent the hauling of heavy traffic. The company owns sufficient right of way to rebuild the line and the work is to be rushed. No action has been taken on the proposed extension south from Sagamore toward Pittsburgh.

Cananea, Yaqui River & Pacific.—See Southern Pacific.

Canadian Pacific.—An officer writes concerning the proposed line from Killam, Alb., northwest to Strathcona, about 80 miles, that although this company has made a reconnoissance, no authority to build the line has yet been asked for. (Oct. 18, p. 472.)

Surveys, it is reported, have been made by this company for a branch from Michel, B. C., to the company's coal mines in the upper Elk valley. Grading is to be started at once.

Charleston & Paris Interurban.—Grading is reported under way by this company on its proposed electric line from Charleston, Ill., northeast via Ashmore, Kansas, Dudley and Conlogue to Paris, 28 miles. W. R. Patton, of Charleston, is President.

Chicago & North-Western.—The new steel bridge over the Missouri river between Pierre and Fort Pierre, S. Dak., connecting this company's line with its new line, the Pierre, Rapid City & North-Western, from Pierre, S. Dak., west to Rapid City, has been opened for traffic. Plans are being made by the company to run trains between Chicago and Rapid City via Pierre.

Chicago, Burlington & Quincy.—During the year ended June 30, 1907, this company finished work on its line from Frannie, Wyo., south to Worland, 91 miles, and the line is now open for traffic. The extension from Worland south to Kirby, 20.45 miles, is expected to be finished this year. The line from Centralia, Ill., south to Herrin, 53 miles, was also finished and placed in operation. A new line is being built to reduce the grades from Lincoln, Neb., including a new yard at that place, west to Milford. A line is projected from Newark, Neb., west to Bridgeport, about 240 miles.

Chicago, Indianapolis & Evansville.—The initial construction work on this line projected from Evansville, Ind., north to Indianapolis and Indiana Harbor, 346 miles, with a branch from Logansport, Ind., north to South Bend, 70 miles, will be the building of a bridge across White river, 10 miles below Petersburg, Ind. The first rails on the road will be laid in Vanderburg county in a few days, the contracts for the rails having been let in Chicago. It is believed the line from Evansville north to White River, 45 miles, will be finished by the time the bridge is in place. (July 5, p. 27.)

Chicago, Weatherford & Brazos Valley.—This company, organized to build a line from Weatherford, Texas, to Bridgeport, 38 miles, it is said, has made arrangements for financing the project, and construction is to begin within 90 days. G. R. Turner, of New Orleans, is interested. (March 15, p. 381.)

Coffeyville & Memphis.—This company, which was incorporated about a year ago with a capital of $1,000,000, has surveys made for its proposed line from Coffeyville, Kan., southeast through Centralia, Vinita and Afton, Okla., to Little Rock, Ark., about 300 miles. Work on the line is to be begun this year. (March 15, p. 382.)

Decatur, Sullivan & Mattoon (Electric).—Work, it is said, is soon to be begun on an electric line from Mattoon, Ill., northwest to Sullivan, 15 miles. R. D. Starbuck, President, Mattoon.

GOTEBO & SOUTHWESTERN.—This company, chartered to build a line from Gotebo, Kiowa county, Oklahoma, south to Frederick, Tillman county, 45 miles, has filed an amendment providing for the construction of 125 miles of railroad from Clinton, Custer county, south via Gotebo to Frederick, and increasing the capital stock to $1,000,000. (May 17, p. 695.)

GRAND TRUNK.—The annual report of this company says that the line between St. Lambert, Que., at the east end of the Victoria bridge and St. Rosalie, 31 miles, used jointly by this company and the Intercolonial, is being double tracked. The work is expected to be finished this year. The double-track work between Lynden, Ont., and Brantford, and London and Hyde Park Junction gives a continuous double-track from Montreal to Chicago, 850 miles, with the exception of the St. Clair tunnel, which is single-track, and about five miles at Valparaiso, Ind., where work has been delayed owing to arrangements yet to be made to cross the tracks of other companies.

HOUSTON & BRAZOS VALLEY.—Vice-President Felix Jackson is quoted as saying that the present plans only include building the extension from Anchor, Tex., north to a connection with the Gulf, Colorado & Santa Fe, at Duke, 25 miles. It has not yet been decided whether a line will be built from Duke north to Houston, or traffic arrangements made over some existing road. About four miles of the extension from Anchor has been built. (July 5, p. 27.)

IOWA & NORTHWESTERN.—This company, incorporated about a year ago to build a line from Waterloo, Iowa, east for about 75 miles, it is said, has secured money from the Carnegie Trust Company and the work will soon be begun. (March 15, p. 385.)

KANSAS & TEXAS.—Incorporated in Oklahoma to build a line from Garden City, Kan., on the Atchison, Topeka & Santa Fe, south via Guymon, Okla., to Amarillo, Tex., and thence southeast to Houston, 800 miles. The estimated cost of the proposed line is $5,000,000. The incorporators include J. H. Barnard, of Boston, Mass.; J. L. Gilson, W. C. Crow, G. W. Gilson, C. M. Funk and E. Gilson, of Guymon.

KENTUCKY ROADS (ELECTRIC).—Residents of Carlisle, Sharpsburg and Salt Lick recently held a meeting at Owingsville, Ky., to raise a bonus of $80,000 to build an electric line from Salt Lick northwest via Owingsville and Sharpsburg to Carlisle, 36 miles. The Kaufman-Shaw Construction Company, of Dayton, Ohio, is expected to build the line.

LAWTON, WICHITA FALLS & NORTHWESTERN.—J. M. Bellamy, of Lawton, President of this company, is asking for bids, and it is said that contracts will shortly be let for grading this proposed line, projected from Lawton, Okla., south to Wichita Falls, Tex., 49 miles. A. J. Robinson, Chief Engineer, Frederick, Okla. (May 24, p. 727.)

LOUISVILLE & NASHVILLE.—The report of this company for the year ended June 30, 1907, shows that the reduction of grades from Corbin, Ky., south to Saxton, has been finished. Work has been started reducing the grades and putting in double-track from Corbin north to Livingston. When this work is finished, the company will have double-track between Sinks and Corbin, 35 miles.

The Morganfield & Atlanta from Providence, Ky., to Morganfield, 25.33 miles, has been finished and placed in operation.

MEXICAN CENTRAL.—The report of this company for the year ended June 30, 1907, shows that work is progressing rapidly on the extension of the Guadalajara division from Tuxpan to Manzanillo on the Pacific coast. It is expected to have the line finished by July of next year. During the year the branch from Ocotlan to Atotonilco, 22.22 miles, was finished and opened for traffic. The extension from Marfil northeast, five miles, giving an entrance into the city of Guanajuato, will be finished this year. Contracts have been let and work is under way on the first 31 miles of the short line from Tampico to the City of Mexico.

MEXICAN ROADS.—Construction work, it is said, has not been suspended on the Mineral Belt line in the Guanajuato district. Interests closely identified with the Guanajuato Development Company are building the line, which is to be about 40 miles long. The construction work is in charge of E. J. White.

MIDLAND VALLEY.—Plans, it is said, are being made to extend this road from Arkansas City, Kan., northwest to Wichita, 55 miles.

MISSOURI, OKLAHOMA & GULF.—Announcement has been made by President William Kenefick that $6,000,000 will be spent for extensions. This includes work on the main line from Dustin, Okla., the present southern terminus, south to Denison, Texas, 128 miles, and probably a branch from Wapanucka on this extension northwest, via Connersville and Pontotoc to Sulphur. (June 14, p. 878.)

MISSOURI PACIFIC.—Passenger service over the St. Louis, Iron Mountain & Southern, it is said, is to be extended. This is to be accomplished by connecting the St. L., I. M. & S. with the Coal Belt Electric road at No. 7 mines near Herrin, Ill., and from that point trains are to be run to Marion over the electric road, which is owned and controlled by the Gould interests. The electric service is not to be abandoned. By this extension the Missouri Pacific system will be in shape to compete with the Illinois Central for the passenger traffic to and from St. Louis of a great section in Southern Illinois.

MORGANFIELD & ATLANTA.—See Louisville & Nashville.

NEWBURG & NORMAN.—Incorporated in South Dakota with $50,000 capital and office at Pierre. The company proposes to build a line from Douglas county, S. Dak., southwest to a point in Rock county, Neb., 75 miles. The incorporators include E. Benning, T. C. McPhillon, P. M. Banning and O. W. Boyd, of Chicago; C. A. Miller of Minneapolis, Minn.; I. W. Goodner and M. P. Goodner, of Pierre, S. Dak.

NORTHERN PACIFIC.—The report of this company for the year ended June 30, 1907, shows that the Big Fork & International Falls, building from the terminus of the Big Fork & Northern, at Big Falls, Minn., northeast to International Falls on the Rainy Lake river, 34 miles, is to be finished and put in operation this year. Work on the Oregon, Washington & Idaho, which is being built jointly by this company and the Union Pacific from Texas Ferry, Wash., on the Snake river east to Grangeville, Idaho, is under way. The part of the line between Texas Ferry and Lewiston, Idaho, 72.3 miles, is being built under the direction of the Union Pacific and is almost finished. The work includes a bridge over the Snake river at Lewiston, which is to be finished this year. The extension from Culdesac, Idaho, southeast to Grangeville, 55 miles, has 80 per cent. of the work finished and is expected to be put in operation this year.

The Portland & Seattle, which is being built jointly by this company and the Great Northern from Portland, Ore., east to Spokane, Wash., with a branch to Texas Ferry, where connection is to be made with the line owned jointly by the Northern Pacific and the Union Pacific, is nearing completion between Kennewick and Vancouver, 220.6 miles. Work is under way on the large bridges over the Columbia and Willamette rivers, and is expected to be finished by June, 1908. The line between Pasco and Spokane, 145.1 miles, and the branch to Texas Ferry, 40.6 miles, is expected to be finished next summer. The total mileage from the connection with the Northern Pacific in Spokane to the connection with the same road near Portland and the branch to Texas Ferry will be 415.1 miles. A new line is being built from Alta, N. Dak., to Berea, 9.4 miles north of Valley City, to give an alternate line for heavy freight and fast passenger trains. A new track on revised grade is being built for westbound trains from Wheatland, N. Dak., to Buffalo, 11.2 miles; the present line will be used for eastbound trains. The surplus material taken from cut is being used as filling for double-track work between Casselton and Wheatland, which is to be finished next year. Work is under way, which it is expected will be finished this year from Livingston, Mont., west to Muir, 11.5 miles, to provide a double-track between Livingston and the east end of the tunnel on the Bozeman mountain. The distance will be reduced 1,142 ft. and the curvature 642 deg. Second main track is now under construction from the west end of the tunnel to Bozeman, 11.8 miles. This work is expected to be finished and put in operation next year. Work is under way changing the line and grades in connection with the second track between Garrison, Mont., and Missoula, 69.1 miles. When finished the new line will be 5.2 miles shorter than the existing line. There will also be an alternate line to eliminate mountain grades from St. Regis, Mont., to Paradise, 21.8 miles; this in connection with the proposed line and grade revision between De Smeth and St. Regis, now operated as a branch line, will reduce the eastbound grade to 0.3 per cent. and westbound grade to level between Tunah and Paradise. It is expected to have this work finished next year.

On the White Pine Hill line, 28.4 miles, work is under way on a change of line to reduce grades; the distance will be increased 1.3 miles. In Washington between Kalama and Vancouver second main track work and improving line and grades on 29.9 miles is under way, and is expected to be finished in the fall of 1908. This work will reduce the distance 358 ft. curvature, 329 deg., and rise and fall 98 ft.

OREGON, WASHINGTON & IDAHO.—See Northern Pacific.

PECOS, SARAGOSA & BALMORHEA.—This company is being organized to build a line from Pecos, Texas, southwest, 40 miles, down the valley of Toyah creek. The headquarters of the company is at Pecos.

PENNSYLVANIA LINES WEST.—This company has under consideration the question of shortly making improvements on the Waynesburg & Washington. This line, which is 28.15 miles long, is narrow gage, and is to be made standard. It is said that a line is now building from a point near Ellsworth, Pa., south to Zollarsville, under the name of the Pennsylvania Southern, to relieve the freight congestion in that section. The line is eventually to be extended

from Zollarsville west via Bissel to Hackneys on the Waynesburg & Washington.

Pennsylvania Southern.—See Pennsylvania Lines West.

Portland & Seattle.—See Northern Pacific.

St. Louis, Bartlesville & Pacific.—This company, it is said, is building its proposed line from Bartlesville, Okla., west to Pond Creek, Okla., and has filed an amendment to its charter authorizing it to extend its line from Pond Creek west to a connection with the Kansas City, Mexico & Orient, about 40 miles. (Oct. 11, p. 435.)

St. Louis, Brownsville & Mexico.—It is announced that this company will begin to operate its passenger trains into Galveston and Houston this year. Trackage rights over the Gulf, Colorado & Santa Fe have been obtained from Algoa into Houston and south into Galveston. This arrangement will go into effect as soon as the Santa Fe completes the work of enlarging its terminal facilities at these places to accommodate the additional traffic.

St. Louis, Iron Mountain & Southern.—See Missouri Pacific.

Southern Pacific.—According to Vice-Consul A. W. Brickwood, of Nogales, the Cananea, Yaqui River & Pacific has let the contract for its line in the state of Sonora, from a point on its Naco-Cananea line northwest to Nogales, 100 miles. The entire line must be built within 18 months. Surveys are made and grading has already been done from the east end of the new line from Verde for 10 miles, and rails are being laid on this portion. A large force is also to be started grading from the west end at Nogales. The line will connect important mineral regions. (Oct. 4, p. 403.)

It is stated by J. H. Cashion, General Manager of the Grant Brothers Construction Company, of Los Angeles, Cal., which has the contract for the construction of the greater part of the Cananea, Yaqui River & Pacific, in Mexico, that more than 6,000 men and 2,000 teams are now at work. The laborers are divided into four large camps. The largest gang is working on the main line from Guaymas, southeast to Mazatlan, 600 miles. About 300 miles of this division is finished. Another gang is working from Mazatlan southeast to Tepic, 200 miles; another on the branch from Corral north to Nacozari, and another between Nogales and Del Rio. The main line is to run from Guaymas southeast to Orendain, 25 miles from Guadalajara, where connection is to be made with the Mexican Central. A branch line is also being built from Del Rio on the north, south to Nogales. The Mexican Engineering and Construction Company, of Mexico City, has the contract to build the first division out of Orendain toward Tepic. Many Yaqui Indians are employed in the work.

Texas Central.—This road, it is said, is to be extended from its present western terminus, in Fisher county, Texas, northwest, traversing the upper part of the Brazos river valley for some distance to Emma, about 90 miles. The construction work is to be started as soon as the survey is finished.

Union Pacific.—See Northern Pacific.

Vancouver Island & Eastern.—Application is being made to the Dominion Parliament to incorporate this company. The company proposes to build a line from a point near Victoria, B. C., northeast via Yellow Head Pass to Edmonton, Alb., 500 miles. Connection would be made with Vancouver Island either by ferry or a bridge across the strait. R. Chowe, Victoria, is the attorney.

Vera Cruz Terminal.—It is authoritatively announced that this company, now organizing in London, with a capital of $6,000,000, will let contracts for the construction of the new terminals at Vera Cruz within seventy days. The company is to be composed of representatives of the Mexican (Vera Cruz), the Interoceanic, the Vera Cruz & Pacific and the Alvarado railroads, all of which enter the port of Vera Cruz. The proposed improvements, according to the plans and estimates, will cost $6,000,000. The work includes customs warehouses and a union station.

Washington, Frederick & Gettysburg (Electric).—Rights of way have been secured for about 12 miles by this company for its proposed electric line through Montgomery county, Maryland. The company is now building 16 miles in Frederick county, on a line which is eventually to be extended to Emmittsburg and to Gettysburg. D. C. Kemp, President, Frederick.

Waynesburg & Washington.—See Pennsylvania Lines West.

Wisconsin Central.—Contract is reported let by this company to the Lantry Construction Company of Kansas City, for piercing a tunnel 2,000 ft. long at Duluth, Minn.

RAILROAD CORPORATION NEWS.

Central of Georgia.—See Norfolk & Southern.

Central Vermont.—Gross earnings for the year ended June 30, 1907, were $3,833,088, a decrease of $3,888, net earnings, after taxes, $688,381, an increase of $1,753. The net income was $1,813, a decrease of $2,703.

Chesapeake & Ohio.—The President is quoted as having said, at the annual meeting on October 22, that, judging from the earnings for the last few months, the net earnings for the present year would be the largest in the history of the company, and that the stockholders might expect an increased dividend.

Kanawha & Michigan.—Gross earnings for the year ended June 30, 1907, were $2,377,662, an increase of $224,899; net earnings, $515,695, a decrease of $20,434. The net income was $267,076, and $384,869 was spent for additions and betterments and for retiring equipment trust obligations, leaving a deficit to be carried to profit and loss account of $117,793.

Louisiana & Aarkansas.—Gross earnings for the year ended June 30, 1907, were $1,216,837, an increase of $159,312; net earnings, after taxes, $368,078, a decrease of $3,266. The surplus after charges was $225,484, a decrease of $13,175.

Millbrook Company.—See New York, New Haven & Hartford.

New York & Portchester (Electric).—See New York, New Haven & Hartford.

New York, New Haven & Hartford.—The Millbrook Company, which owns all the stock of the New York & Portchester and a majority of the stock of the New York, Westchester & Boston, has been sold by Oakleigh Thorne and Marsden J. Perry to the New York, New Haven & Hartford. The routes of the projected electric lines of the Westchester and Portchester companies were parallel and close together. They were to run from the northern part of New York City to White Plains, N. Y., and to points on the north shore of Long Island Sound. The companies opposed each other for some time until last November, when Messrs. Thorne and Perry bought control of both. It is said that the two companies have spent between $4,000,000 and $5,000,000, most of the actual construction work having been done by the New York, Westchester & Boston, which has graded most of its four-track line from 177th street, New York, to Mount Vernon, and has erected many steel bridges. The New Haven, it is now learned, has been financing this work for the past year. The Harlem branch of the New York, New Haven & Hartford runs close to the 177th street terminus. (See New York, Westchester & Boston; November 23, 1906, p. 146.)

New York, Westchester & Boston (Electric).—See New York, New Haven & Hartford.

Norfolk & Southern.—It is said that this company is ultimately to acquire the stock of the Central of Georgia, all of which was bought last June by Oakley Thorne and Marsden J. Perry. Mr. Thorne was quoted last week as saying that he had already sold his share. Mr. Perry is Chairman of the Board of the Norfolk & Southern.

Pennsylvania.—About $37,000,000 of the $50,000,000 4½ per cent. notes maturing on November 1 were redeemed in advance by Kuhn, Loeb & Co., New York, up to October 30. The remaining $13,000,000 are to be redeemed by the railroad company to-day.

Pere Marquette.—The special meeting of stockholders called for October 28 to approve the reorganization plan has been postponed for two weeks.

Toledo & Ohio Central.—Gross earnings for the year ended June 30, 1907, were $4,866,661, an increase of $794,499; net earnings, after taxes, $1,547,031, an increase of $542,757. Net income was $1,185,295, and out of this $826,765 was appropriated for additions and betterments, new equipment, payment of equipment notes and for retiring a special equipment and betterment loan, leaving $358,530 surplus for profit and loss.

Union Pacific.—At a meeting of the Directors, held on October 30, a committee was appointed to consider plans for forming a holding company to take over the Union Pacific's interests in other companies. The committee consists of E. H. Harriman, Henry C. Frick, Marvin Hughitt, R. S. Lovett, James Stillman, Oliver Ames, P. A. Valentine and Robert W. Goelet. The par value of the securities of other companies held by the Union Pacific amounts to about $300,000,000, yielding about $15,000,000 annual income; none of these securities are pledged as collateral for loans, except $108,000,000 of the Southern Pacific stock, which is part security for an authorized issue of $100,000,000 refunding mortgage Oregon Short Line bonds, of which $45,000,000 have been issued.

Wichita Falls & Northwestern.—A morigage has been filed with the Commonwealth Trust Company, of St. Louis, securing an issue of, it is said, $640,000 bonds.

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EDITORIAL ANNOUNCEMENTS.

THE BRITISH AND EASTERN CONTINENTS edition of the Railroad Gazette is published each Friday at Queen Anne's Chambers, Westminster, London. It contains selected reading pages from the Railroad Gazette, together with additional British and foreign matter, and is issued under the name Railway Gazette.

CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.

ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

OFFICERS.—In accordance with the law of the state of New York, the following announcement is made of the office of publication, at 83 Fulton St., New York, N.Y., and the names of the officers and editors of The Railroad Gazette:

OFFICERS:

W. H. Boardman, *Pres. and Editor*
E. A. Simmons, *Vice-President*
Ray Morris, *Secretary*
R. S. Chisolm, *Treas.*
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Ray Morris, *Man'g Editor*
Braman B. Adams
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George L. Fowler
Frank W. Kraeger
Hugh Rankin
Bradford Boardman

CONTENTS

Vol. XLIII., No. 19. Friday, November 8, 1907.

The long-expected crisis in British railroad labor troubles was reached last Sunday when Richard Bell, M.P., Secretary of the Amalgamated Society of Railway Servants, the strongest of the British railroad labor unions, announced that the recent balloting in the Society had resulted in a vote of 76,925 in favor of a general strike and 8,773 against. The Executive Committee of the Society was empowered to declare the strike at any time, but it expressed a desire to meet with Mr. Lloyd-George, President of the Board of Trade, and a committee of railroad directors and arrange, if possible, a compromise or truce. This meeting was held on Wednesday, and it is reported that the railroads agreed to accept the principle of arbitration of disputes through representative committees of their employees without openly recognizing the existence of the union. The strike was for recognition of the Society and the right of its officers to treat with the railroads on behalf of its members. This claim of recognition arose primarily from the passage last year of the Trades Dispute Act which in effect reversed the famous Taff Vale decision which held any trade union and its treasury funds responsible for acts done by its officers within the scope of their authority. The railroads were unanimous in resisting the demand because if recognition of the union were granted, the directors would be compelled to meet representatives of the union and agree on a settlement of disputes between the company and its employees. The directors would then be bound by law to make good their promises and the stockholders would be liable to pay any damages awarded for failure to carry out the promises. The union, on the other hand, is not responsible in money, and the members could repudiate at will any of the agreements made by their officers. The A. S. R. S. has over 100,000 members in all of the lower grades, or one-sixth of the total number of employees. These include trainmen, switchmen, trackmen, porters and signalmen. The engine drivers and firemen are not in sympathy with the idea of a strike.

FAILURES OF STEEL TIRES.

The discussion of the paper on "Causes of Failures of Steel Tires*" by G. L. Norris, at the October meeting of the Western Railway Club, developed wide differences of opinion as to the cause of shelling out, the most common defect of steel tires. The author of the paper attributed most of the failures in service from shelling out to conditions over which the maker had no control, such as brake burns and bad mating of wheels on the same axle, causing eccentricity and pounding. Some of the members who took part in the discussion believed the trouble to be due to inherent defects of the steel for which the maker was responsible, basing this belief largely on the absence of any other explanation so far advanced which would cover all of the peculiar circumstances under which such failures usually occur. While Mr. Norris may be right in his contention that the maker is not responsible, the fact remains that tires are failing in service from this cause, and, as in many other details of railroad equipment, it devolves on the maker to produce tires which will not fail under the conditions as they exist. Heavy wheel loads must be used in building locomotives powerful enough to haul long trains at high speed, and powerful brakes must be used on the wheels to stop such trains. These may be conditions over which the tire maker has no control, but they are conditions which his product must be made to meet.

The careful methods of mechanical and heat treatment in use to-day have undoubtedly reduced to a minimum the inherent defects in the steel used for tires, but they cannot eliminate the inherent ductile properties of steel. The trouble from shelled out spots in steel tires can be explained in almost every case by going back to the inherent property of steel to stretch or flow under pressure. A steel tire on a locomotive in road service revolves in one direction probably 95 per cent. of the time. This long-continued rolling action causes the metal in the tire to gradually flow back around the wheel in the opposite direction to the normal direction of rotation, and the metal near the surface of the tire becomes more or less laminated. Eccentricity of wear due to weak centers or eccentricity of mounting on the axle produce hammer blows which intensify the rolling action and tend to break up the flowing metal into layers. When the brakes are applied the drag of the brake shoes tends to force the metal back to its normal condition, and if the applications are moderate and frequent, they may almost entirely counteract the rolling action. However, when the brakes are applied hard enough to lock the wheels and cause skidding, the small area of overlapping metal in contact with the rail is suddenly heated to a high temperature, and at the same time is torn partially or wholly away from the layer underneath, with the result that a piece shells out. The size of the shelled out spot will depend on the extent to which the lamination of the metal has progressed, the length of the skidding and the friction between the sliding

*This paper was reprinted in full in the *Railroad Gazette*, Oct. 25 and Nov. 1, pages 495 and 532.

wheel and the rail. Only slight differences in the relative ductility of two tires mounted on one axle, accompanied by a difference in brake shoe friction, will result in different degrees of flowing and lamination. It will also be seen that any difference in the wheel loads due to imperfect equalization or in the character of the surface of the two rails over which the wheels slide, would affect the force tending to tear away the laminated metal in the tire. This explains in most part the curious cases of shelled out wheels sometimes cited in defence of the theory of inherent defects in the steel in which only one wheel out of a set of eight will develop such spots.

Chilled cast-iron wheels under the same conditions develop cracks along the cleavage lines of the crystals of chilled iron, that is, at right angles to the surface of the tread. The intense heat generated by the skidding wheel breaks down the adhesion between the grains, and the drag of the rail opens up the cracks.

The tendency of truck and tender wheel tires to shell out quicker and more frequently than driving wheel tires can be explained by their smaller diameter and the fact that they skid more often. The area of contact between the wheel and rail is less with a small wheel than with a large wheel, and the intensity of unit pressure is correspondingly greater for the same loads. Truck wheels often carry loads as great as driving wheels carry. This increased unit pressure has more effect in producing a deeper rolling action and a pronounced flow of metal. For the same reason, when the wheel skids the adhesion is localized and tends to tear loose the laminated metal deeper down into the tire, thus producing larger shelled out pieces. Other causes which tend to intensify the rolling action are slight eccentricity in the tire and the pounding action of the wheels when running with a light load carried on stiff springs. It is also true that truck and tender wheels are often braked with a higher percentage of brake shoe pressure than driving wheels. As they are not coupled with other pairs of wheels and are frequently imperfectly equalized, local conditions of excessive brake shoe friction or instantaneous reduction of pressure on the rail may produce skidding.

If this theory is true, the remedy is obviously to use steel with a higher carbon content and having less ductility. But another cause of tire failures, heat cracks in the flange, is probably due to a lack of sufficient ductility. When a tire expands from the heating action of the brake shoe the flange stretches more than the tread, and if the ductility is low, small cracks appear at the point of the flange and gradually work in. What can be done to produce a steel of mean ductility to meet both of these conditions is a problem for the tire maker to solve. If it was possible to make a tire with a deeply case-hardened tread and annealed flange, the trouble from both causes might disappear. That the tire makers are bending every effort toward producing satisfactory tires is shown by the statement made during the discussion of the paper by Samuel M. Vauclain: "The question of cost has not the slightest influence on the quality of the material which goes into a tire. We are determined that if a better tire can be made and if these defects which are found in service can be eliminated, they will be eliminated." How different from the attitude of the rail makers!

COMPETITION AND CONFISCATION UNDER THE ANTI-TRUST LAW.

There have been a good many indications in the last few months that the crudely drawn and ill-defined portions of the Sherman Anti-Trust Law which make it impossible for any two or three gathered together in one place to know whether they are malefactors or not, might be the subject of revision by Congress this winter. We have always maintained that the language of the Sherman law was little short of ridiculous, and that it was so sweeping in its interdictions that only the courts knew what it meant, and then only in cases that had come before them.

The whole fabric of American railroad legislation rests on two principles which are all but irreconcilable with each other; first, that carriers serving the same or adjacent territory must compete with each other; second, that rates for like and contemporaneous service under substantially similar circumstances and conditions must be the same to all comers; that is to say, not competitive, and that one city or territory must not be built up at the expense of another (long-and-short haul clause), a process which is fundamentally and naturally the result of competition. The Act to Regulate Commerce prohibits pooling, and the Anti-Trust law apparently makes every kind of agreement between persons engaged in the same kind of business an act of conspiracy, so that Congress has thus strongly affirmed the competitive principle. Yet the 1906 revision of the Commerce act makes it specifically impossible for a carrier to change its rates without giving 30 days prior notice to the Interstate Commerce Commission, unless the commission exempts it by special action. This provision is, of course, along lines the reverse of competitive, since a 30-day-notice cut rate is not an effective competitive device. In a word, the railroads are told with blunt plainness that they must compete and are then immediately reminded that they must not.

The Sherman Anti-Trust Act of 1890 says definitely that every person who shall make a contract or engage in any combination in the form of a trust or otherwise, in restraint of trade or commerce, shall be guilty of misdemeanor and subject to severe penalties, which have been made cumulative by subsequent court decisions, and eminent corporation counsel have expressed the opinion that it is technically impossible for two grocers in the same block to walk down the street together and agree on the price at which they will sell eggs without rendering themselves liable to fine, imprisonment and three-fold damages payable to any other grocer whose business had been injured by the reduction in prices upon which they had agreed. Thus the doctrine of individual competition is upheld with tremendous vigor, while trade agreement or collective competition, is strongly repressed.

What unrestricted competition means in the transportation field need to be told no one who has in mind the history of the years when the trunk line territory was aroused by new comers, or of the period prior to the formation of the Southern Railway & Steamship Association, in the South. Albert Fink estimated that the rate wars of this period reduced gross earnings of the southern railroads about 42 per cent. below what regular rates would have allowed, a sum equal in many cases to the entire net earnings which could have been derived from the competitive business at the regular rates, and in 1876 a committee of stockholders of the Central Railroad & Banking Company of Georgia reported, "it is conceded that the property of your stockholders is on the brink of being sunk forever, and the bankruptcy of a number of your roads is imminent if not even now a fact." It is, of course, familiar history how the association stopped this era of frightful waste and how the rate committee of the association divided business between competitive points, established differentials betwen different towns and made classifications of freight. The roads were assigned a percentage which they could carry, similar to the coal agreements of recent years, and these percentages were determined with the greatest care and were at all times subject to revision under protest. To facilitate payments, a deposit of 20 per cent. of the receipts from pooled business was made by each road, and weekly and monthly balances were cleared with great precision.

The passage of the original Interstate Commerce Law of 1887 stopped the pooling feature of this agreement, the 20 per cent. payments, and the payment by one road to another of whatever excess that road may have earned above its due allotment, but reports of business and earnings were continued daily, and through rates were still very largely under the influence of the rate committee of the Southern Railway & Steamship Association, although each road tried to conform to the requirements and decisions of the newly formed Interstate Commerce Commission. The association thus maintained its usefulness as a guarantor of harmony and used its power to fine roads which attempted to make trouble. But even this was stopped by the passage of the Sherman act. The associations are now become only conferences, and destructive and long-drawn-out competition has been in the main prevented probably not so much by the strength of these conferences as by the fact that the roads of which they are formed realize that they have all to lose and nothing to gain by contests of this kind.

But a stronger reason than this for harmony has been the fact that the Sherman law, in its earlier days, was construed loosely. It was well known that the law was not aimed at railroads, and only the Roosevelt administration has sought to apply it to railroads with any real show of vigor; consequently, in the last period when railroad facilities really exceeded the demands upon them—for about 18 months, in 1897 and 1898—the railroads throughout the country did not have the same fear of maintaining rates by agreements that they have now, while since that time traffic everywhere has been so much in excess of facilities that it has not much mattered whether agreements were in effect or not. With the exception of a few sporadic struggles for grain traffic, and especially Gulf-bound grain traffic, it may be said that there has been no rate war of consequence since the passage of the Sherman act.

The extremely interesting question of the present day is, what

will be the effect of the government's heroic efforts to require competition between carriers if we are to go through a year or so of diminished business activity, and if the facilities of the carriers overtake and really pass by the traffic offered them. Are we then to maintain rates by that strangest of phenomena—an agreement entirely unenforceable,—are we to have the destructive competition of the sixties and the seventies, or are the peculiarly childish and uneconomic features of the Anti-Trust law that forbid combination to prevent wasteful competition, to be abolished?

It is well known that in the days of highly unrestricted competition the general public did not gain thereby. Henry S. Haines believes* that much of the present hostility towards corporations, and especially towards railroads, is the outgrowth of the rather barbarous efforts of lines suffering from unrestricted competition to recoup themselves from non-competitive territory, until the manner in which service should be performed in non-competitive regions became a political issue, while all through the latter part of the strongly competitive period (1870 to 1880) the railroads were busy making enemies and competing themselves into bankruptcy. Charles Francis Adams, Jr., in reviewing the history of railroad traffic in England, called attention 20 years ago to George Stephenson's remark that where combination is possible, competition is impossible, and pointed out that in the face of all the legislation designed to require competition in Great Britain the lines obstinately refused to compete. In 1872 a British Committee on Railroad Amalgamation was appointed including in its number two very able men, the Marquis of Salisbury and the Earl of Derby, and this committee showed with great precision how, in 40 years of railroading, English railroad legislation had never accomplished anything which it sought to bring about nor prevented anything which it sought to hinder, while the cost to the companies of the useless mass of legislative enactments (3,300 of them) was placed at £80,000,000. The conclusion of the committee at that time was that competition between railroads existed only to a limited extent and could not be maintained by legislation. The committee showed further that the North-Eastern Railway was composed of 37 independent companies, several of which had formerly competed with each other, and that prior to their consolidation these lines had, generally speaking, charged higher rates and been able to pay small dividends. But now (1872) the North-Eastern was the most complete monopoly in the United Kingdom. From the Tyne to the Humber it held the whole country to itself, and it charged the lowest rates and paid the highest dividends of all the great English combinations. It was not vexed by litigation, and while numerous complaints were heard from Lancashire and Yorkshire, where railroad competition existed, no one had appeared before the committee to prefer any complaints against the North-Eastern.

In view of such facts as these, the committee reported that amalgamation had not brought out the evils that had been anticipated, but, in any event, long and varied experience had fully demonstrated the fact that while Parliament might hinder and thwart, it could not prevent it, and it was equally powerless to lay down any general rules determining its limits or character.

This report is so excellent a document on the subject of legislative prevention of competition that we have quoted freely from Mr. Adams, who refers to it in his Railroad Problems (1886). It now remains to be seen whether this country has learned the lesson as well as England did or whether there must be more harsh and futile law making before we reach the state of legislative intelligence which England arrived at 35 years ago. As if to give special point and appropriateness to the urgency of a wiser law at this time, it is not yet a month since the Department of Justice, acting under section 6 of the Sherman law, directed the seizure of some $7,000 worth of tobacco in transit from factories of the British-American Tobacco Company Limited, located at Petersburg, Va., and at Durham, S. C., to New York and foreign countries, on the ground that the property was owned under a contract entered into by two American tobacco companies and three English concerns to limit competition. This is the first time that the seizure clause of the Sherman law has been employed. Its practical effect, of course, is to make the owners of the tobacco come into court and prove their own innocence, in reversal of the established common law principle; and its indirect effect is to make substantially every corporation within the length and breadth of the United States realize that it exists and does business only because it has not as yet been the whim of the government to attack it. We pointed out in reviewing the Northern Securities' decisions that the language used by the court would apply equally well to a very large number of other great railroad combinations in this country, and this was brought home so strongly to the government that it felt compelled to announce at that time that it did not intend to "run amuck." The tobacco seizure under the Sherman law only brings new force to the contention that the prosperity of the country and the stability of its great and law-abiding corporations, railroad and other, should be entrenched a long way beyond the powers of the government or of any officer of it to "run amuck."

*Railway Corporations as Public Servants.

Reading Company.

The Reading Company controls the operations of two principal subsidiaries, the Philadelphia & Reading Railway and the Philadelphia & Reading Coal & Iron Company. In addition it owns all the capital stock of the Reading Iron Company, but the operations of this company are not made public. Under the arrangement which is in force between the two subsidiaries, the Coal & Iron Company usually shows a deficit and the income of the Reading Company which goes to pay dividends on its stocks comes from the Railway company. The Reading Company's report includes a great deal of information about the different companies, but, on account of the bookkeeping involved in the relations between the three, and because considerable necessary information is not given, it is not easy to get a clear and complete view from it of the operation and standing of the railroad and coal companies.

The year's production of anthracite coal from lands owned, leased and controlled by the Coal & Iron Company, was 11,655,100 long tons, an increase of 996,000 tons, or 9 per cent. over the previous year. The company's coal sales increased 12 per cent. over the previous year. The cost of coal mined and purchased was 14½ cents less per ton than in 1906 and the price realized 3.1 cents a ton more, making an increase in the net amount received of 4.6 cents per ton. Receipts from the sale of anthracite were $4,500,000 larger than in 1906, and receipts from the sale of bituminous and from other sources $200,000 larger, so that there was an increase of $4,700,000 in the Coal & Iron Company's gross receipts. Its expenses, however, rose $4,400,000, so that the net earnings of the year were only $300,000 larger than in 1906. The principal increases in expenses were $1,800,000 in cost of mining and repairs (there were 900,000 more tons mined by the company) and $1,600,000 in cost of transportation by rail and water (there were 1,200,000 more tons sold). The net earnings were $3,500,000, from which $1,300,000 was appropriated for new work at collieries; $1,600,000 paid to the Reading Company as interest at 2 per cent. on money advanced, and $500,000, being 5 cents a ton on coal mined from the company's lands during the year, put in the Depletion of Lands fund. In addition there were fixed charges and taxes amounting to $115,000, leaving a final deficit for the year of $71,000.

The Philadelphia & Reading Railway, on the other hand, had a net income of $7,900,000 for the year. Out of this, $1,800,000 was appropriated for improvements and $6,000,000 paid in dividends to the Reading Company, leaving a small surplus. The increase in gross earnings was just under $3,000,000. Operating expenses however, increased $3,800,000, leaving net earnings smaller than in the previous year. Both because of this increase in net earnings and because there was a special call for funds in the 1906 year to complete unusually extensive work which had been in progress for some time, the improvement appropriation was $1,700,000 less than in 1906. No new work of any importance was undertaken last year, so that the improvement expenditures could be reduced. The principal item of the $1,800,000 spent for improvements was $990,000 for main, second, third, fourth, yard and station tracks.

Earnings from coal and from merchandise traffic both increased, the former by $1,500,000, the latter by $1,100,000. The anthracite tonnage carried was 13,200,000 tons, an increase of 1,400,000 tons, or 12 per cent. over 1906. The bituminous tonnage was 11,200,000 tons, a gain of 700,000 tons, or 7 per cent.. The revenue from coal traffic increased 9 per cent. The merchandise traffic increased 9 per cent. and the merchandise earnings 7 per cent. There was an increase of 3 per cent. in the passenger earnings.

Operating expenses were 17 per cent. larger than in 1906. Maintenance of way increased 13 per cent., maintenance of equipment 26 per cent. and conducting transportation 14 per cent. A statement that these increases were in general due to "the increased volume of business handled, the increase of wages and the higher price of materials" sums up succinctly the increased costs which most railroad companies have been facing during the year.

Maintenance of way cost $3,610 per mile owned and leased, against $3,195 in 1906. Repairs and renewals cost $3,245 per locomotive, against $2,228 in 1906, a very large increase, due apparently to specially large expenditures necessary to keep the locomotives owned under equipment trusts at their original value and efficiency as provided in the leases. The passenger car figure was $591, against $610 in 1906, and the freight car, $73, against $62 in 1906.

The report records that on November 1, 1906, one-way passenger fares were reduced to 2½ cents a mile over the whole system with-

out disturbing commutation or excursion rates. On May 25, 1907, fares in the suburban district of Philadelphia were advanced to make them correspond with rates in force on other parts of the system. On November 1, 1906, there was also an increase of 10 per cent made in the wages of all employees receiving less than $200 a month. An increase in the same proportion had been made in November, 1902.

The Reading's tidewater terminal is at Port Richmond, near Philadelphia. Tables are given showing the outbound ocean business to foreign and domestic ports during the past six years and also the shipments from Port Richmond to rail points, mostly on the line of the Philadelphia & Reading. The merchandise shipments last year outbound were 1,130,000 short tons, the anthracite coal shipments 1,900,000 long tons and the bituminous coal shipments 1,800,000 long tons, this last an increase from 1,400,000 tons in 1906. The rail shipments from Port Richmond have increased from 850,000 short tons of merchandise and iron ore in 1905 to 1,400,000 tons last year.

No table of commodity tonnage figures is given, so that it is impossible to form an accurate idea of the extent and character of the road's traffic. The ton-mile rate for coal traffic is not given, but works out at 0.691 cents. The rate on merchandise was 0.946 cents. The passenger-rate reduction seems to have affected the passenger-mile rate only slightly. The decrease is less than 1 per cent.

The only information published about the Reading Iron Company is a few facts about its balance sheet. The assets stand at $13,400,000, an increase of $1,000,000 during the year. The capital stock remains at $1,000,000, all owned by the Reading Company, and the outstanding mortgage bonds have been reduced during the year; at the same time current liabilities, accrued interest and dividends are less. It is evident that there is a profitable equity.

The accompanying map shows the Reading Company's system, including the Central Railroad of New Jersey, whose report is reviewed below, and the Lehigh & Hudson River, which gives the system an outlet to the Campbell Hall gateway and thence by the New Haven system over the Poughkeepsie Bridge to New England.

The results of the last two years' operation of the Philadelphia & Reading Railway are summed up in the following table:

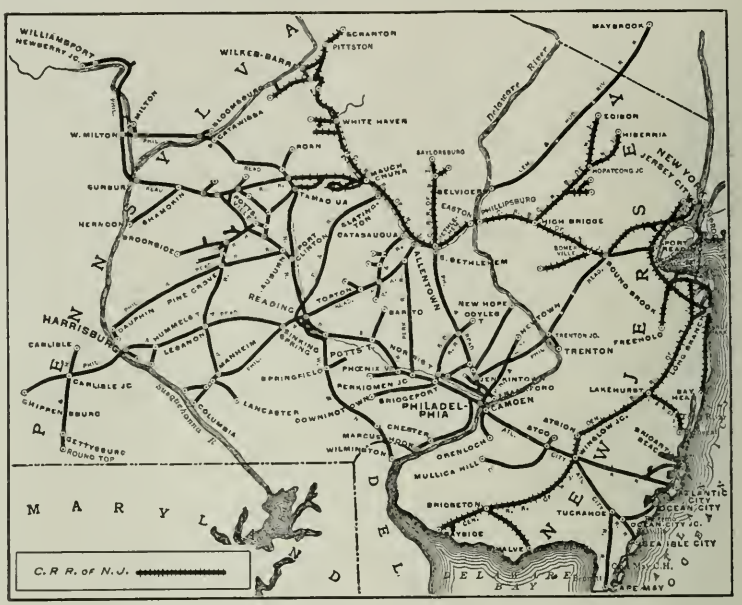
	1907.	1906.
Mileage worked	999	1,000
Passenger earnings	$6,399,173	$6,216,316
Mdse. freight earnings	16,360,170	15,220,441
Coal freight earnings	18,730,190	17,198,247
Gross earnings	42,676,278	39,658,041
Maint. way and structures	3,606,192	3,195,152
Maint. of equipment	7,971,544	6,330,882
Conducting transportation	13,564,854	11,896,376
Operating expenses	25,889,331	22,137,172
Net earnings	16,786,947	17,520,869
Net income	7,892,359	8,923,824
Dividends	6,000,000	6,000,000
Improvement appropriations	1,847,934	3,539,352
Year's surplus	44,425	615,528*

*Deficit.

Central Railroad of New Jersey.

The Central Railroad of New Jersey is a splendid railroad, but its annual reports are among the most unsatisfactory of any issued. They are exceedingly incomplete and also are not clear in all of the facts which they do give. For instance, the operations are divided into two groups, "rail lines" and "other operations including New York & Long Branch Railroad." The first group includes the bulk of the operations, but the second is by no means unimportant, for it adds nearly $3,000,000 to gross earnings. Yet the operating expenses of the whole property are lumped in one figure. For the rail lines to be sure, the four operating expense accounts are given separately, but even these do not go into details. Owing to these and many other lacks, it is difficult to review the operations of the road with any accuracy. The best that can be done is to give certain results; some of them stated in the report; some a matter of opinion.

In spite of the fact that only a nominal surplus for the year is shown, it is certain both from the few figures given in the report and from acquaintance with the property that the road is unusually strong both financially and physically. On the "rail lines" there was spent, as nearly as one can tell when no figures of mileage operated are given, $2,961 per mile for maintenance of way. In 1906 this expense was $2,683. Besides this on the whole property $2,362,062 was charged against income for renewals and improvements made or to be made, making a total charge against income for maintenance of way of at least $4,280,680, or $6,606 per mile of line. It is a prosperous railroad which can spend anything like this sum, when most roads get along with from $1,000 to $2,000 a mile. Of course the fact that the Central of New Jersey has 263 miles of second and 71 miles of third and fourth tracks—these figures gleaned from the Reading Company's report—must be taken into consideration, but, even so, the expenditures on the line are very high. For lack of the detailed figures of repairs and renewals, it is not possible to work out the unit figures for equipment maintenance. However, including $1,150,000 appropriated out of income to the equipment fund, the maintenance of equipment expenditures were enough to provide $3,000 per locomotive, $800 per passenger car and $93 per freight car. These also are high figures. It is evident, therefore, that during the past year the road has been lavishly maintained. And not only last year but for years before has this general policy been followed out.



Reading Company's System.

Gross earnings, including all operations, were $25,700,000 against $23,100,000 in 1906, a gain of $2,600,000, or 12 per cent. Operating expenses increased $1,400,000, leaving a gain of $1,200,000 in net earnings. Freight earnings were $19,400,000, a gain of 12 per cent. over 1906, and passenger earnings $5,500,000, an increase of 9 per cent. The revenue trainload was 520 tons, about the same as in 1906.

There were 81 miles of track relaid with 90-lb. rails during the year and 61 miles relaid with second-hand rails, chiefly of 70, 80 and 85-lb. section. The improvement of the ferry facilities at the foot of Liberty street, New York, is well under way. Up to July 1 there had been $172,565 thus spent. In August the Newark Warehouse Company, a subsidiary corporation, opened a large new freight warehouse at Newark, N. J., which was described in the *Railroad Gazette* of August 30, 1907.

One four-wheel switching locomotive, 15 unvestibuled passenger cars, five combination cars, 50 special ore cars, 2,000 steel underframe box cars, 1,000 steel hopper bottom coal cars and 1,000 steel underframe gondola cars were bought during the year. Another 1,000 steel hopper bottom coal cars, these of 100,000 lbs. capacity, and 20 passenger train cars have been ordered for delivery during the present fiscal year.

As the New York passenger entrance of the Philadelphia & Reading and the Baltimore & Ohio, the Central of New Jersey has been brought to a high standard of efficiency. It has the unusual distinction of being popular with its commuting patrons. This is all the more remarkable because their loud praises of its service have followed a period of the bitterest complaint against the suburban working of the road. There could probably be no more sincere tribute to the success of its present managing head. It would be more in accord with the high standard of the road to issue an annual report which really described the operations of the year and the condition of the property.

The mileage of the road is shown in the map of the Reading

Company's system above. The results of the last two years compare as follows:

	1907	1906
Mileage worked	618*	618*
Passenger earnings	[illegible]	[illegible]
Merchandise freight earnings	[illegible]	[illegible]
Coal freight earnings	[illegible]	[illegible]
Gross earnings	[illegible]	[illegible]
Maint. of way and struct.	[illegible]	[illegible]
Maint. of equipment	[illegible]	[illegible]
Conducting transportation	[illegible]	[illegible]
Operating expenses	14,161,118	12,779,867
Net earnings	[illegible]	10,321,223
Income from investments	[illegible]	1,151,197
Fixed charges	[illegible]	[illegible]
Net income	[illegible]	[illegible]
Improvement appropriations	[illegible]	[illegible]
Year's surplus	[illegible]	91,482

*Not including New York & Long Branch Railroad, which is controlled by the Central of New Jersey and the Pennsylvania jointly, and some other operations.

Missouri Pacific.

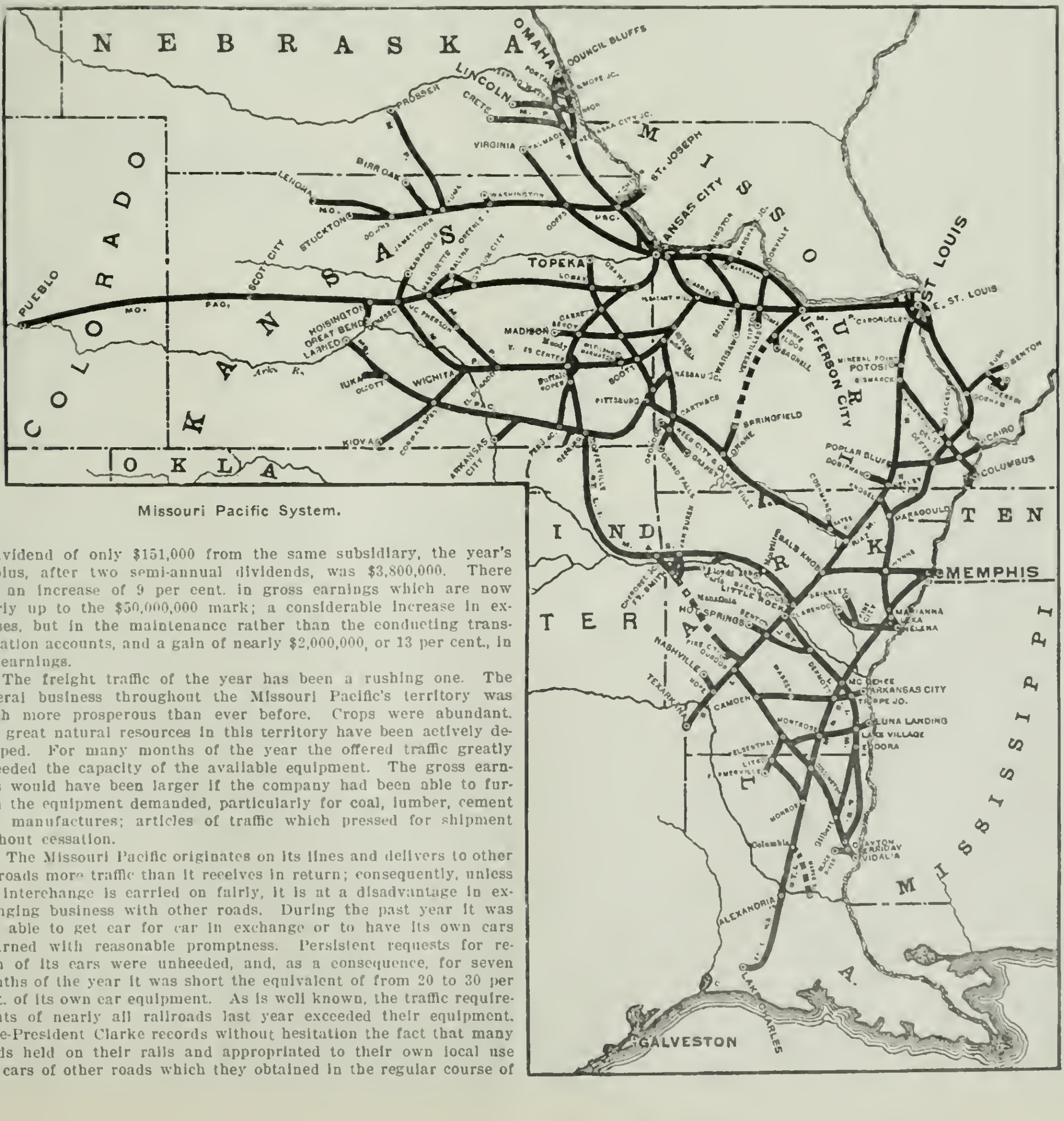
The Missouri Pacific has had a very prosperous year. In 1906, even after calling on its subsidiary, the Central Branch Railway, for over $1,000,000 in dividends, it showed a surplus for the year of less than $500,000. This, however, was largely due to the fact that owing to a change in the fiscal period three semi-annual dividends were charged to the year's income. If only two had been so charged, the 1906 surplus would have stood at nearly $2,500,000. Last year, with a dividend of only $151,000 from the same subsidiary, the year's surplus, after two semi-annual dividends, was $3,800,000. There was an increase of 9 per cent. in gross earnings which are now nearly up to the $30,000,000 mark; a considerable increase in expenses, but in the maintenance rather than the conducting transportation accounts, and a gain of nearly $2,000,000, or 13 per cent., in net earnings.

The freight traffic of the year has been a rushing one. The general business throughout the Missouri Pacific's territory was much more prosperous than ever before. Crops were abundant. The great natural resources in this territory have been actively developed. For many months of the year the offered traffic greatly exceeded the capacity of the available equipment. The gross earnings would have been larger if the company had been able to furnish the equipment demanded, particularly for coal, lumber, cement and manufactures; articles of traffic which pressed for shipment without cessation.

The Missouri Pacific originates on its lines and delivers to other railroads more traffic than it receives in return; consequently, unless car interchange is carried on fairly, it is at a disadvantage in exchanging business with other roads. During the past year it was not able to get car for car in exchange or to have its own cars returned with reasonable promptness. Persistent requests for return of its cars were unheeded, and, as a consequence, for seven months of the year it was short the equivalent of from 20 to 30 per cent. of its own car equipment. As is well known, the traffic requirements of nearly all railroads last year exceeded their equipment. Vice-President Clarke records without hesitation the fact that many roads held on their rails and appropriated to their own local use the cars of other roads which they obtained in the regular course of business as [illegible] from which the Missouri Pacific seems to have been one of the worst sufferers. He hopes, however, that the per diem charge of [illegible] a day per car and other [illegible] taken will prevent a repetition of this abuse.

Attention is called to the fact that the Missouri Pacific should no longer be considered as depending on the products of the farm. It is true that at least [illegible] per cent. of its lines run through the prairie country, but with last year's crops increasing on the [illegible] and a full measure of traffic derived from these agricultural and animal products contributed only [illegible] per cent. of the total freight revenue, while products of mines, forests and manufactures furnished [illegible] per cent. There were established on the lines during the year [illegible] new industries, employing nearly $[illegible] of capital. These include 166 lumber plants, 14 coal mines, 19 lead and zinc mines and 43 cement, brick, stone and other plants for manufacturing building material. Cement in particular is an important and growing article of traffic. The whole country's consumption in 1906 was 45,600,000 barrels, against only one-tenth as much ten years earlier. It is not possible to tell how much of this product the Missouri Pacific carries, but it is evident that it is one of its valuable assets from a traffic standpoint.

The passenger revenue was reduced during the last four months of the fiscal year by legislative rate reductions. Two-cent fare laws took effect in Nebraska in March; in Arkansas in April; in Kansas in May, and in Missouri in June, besides in Illinois later. The number of passengers increased 21 per cent., the number of passengers



Missouri Pacific System.

carried one mile, 9 per cent. and the passenger earnings, 11 per cent. As the increase in passenger earnings is greater than the increase in passenger miles, it would hardly seem that the result of the lower rates had been severely felt. The report, however, makes the comparison between the passenger earnings and the number of passengers, which increased nearly twice as fast, and implies that this came as a result of the rate reductions. In spite of a large movement of home-seekers to the Southwest, there was a reduction of 10 per cent. in the length of the average passenger trip, which now stands at 46 miles.

Operating expenses as a whole increased 7 per cent. The increase in maintenance of way and structures was 10 per cent., in maintenance of equipment 21 per cent. and in conducting transportation 3 per cent. The small increase in this last group of expenses is notable. In December last a concerted movement of the various organizations in the train service was made for a decrease in hours and an increase in wages. After a protracted conference at Chicago between representatives of the railroads of the West and Southwest and of these various labor organizations, during which both the Chairman of the Interstate Commerce Commission and the Commissioner of Labor intervened to bring about a settlement, a general wage increase of about 10 per cent. was made, taking effect in February and in April. An increase in the wages of yardmen on the Missouri Pacific had been made in November. As a result of these various increases, the wage payments to employees of the transportation department have been increased by about $625,000 a year. About one-third of this expense only, however, fell on the expenses of the year ended June 30, 1907.

The maintenance of way expenditures per mile operated were $926, against $857 in 1906. This figure has of late years shown a steady increase and is now high enough so that it should be about sufficient for maintaining the lines. Whether it provides anything to make up for the smaller expenditures of previous years is not so certain. Part of the larger unit charge represents merely increased cost of material or labor rather than any additional improvement of the lines. The cost of ties, for example, has increased 22 per cent. during the year. The wages of section hands were increased about 20 per cent. during the latter half of the year. As a further fact in this connection, it should be remembered that about half of the Missouri Pacific's track is still unballasted.

The great increase in expenses during the year came in maintenance of equipment. This was partly due to an average increase of 9 per cent. in the wages of employees of the machinery department in force from six to seven months of the year, and partly to a large advance in the cost of materials for repairs. Repairs cost $3,008 per locomotive, against $2,840 in 1906; $746 per freight car, against $625 in 1906, and $68 per passenger car, against $51 in 1906.

The operated mileage was increased by 135 miles, all on the St. Louis, Iron Mountain & Southern's lines. Of this, 34 miles on the Springfield (Mo.) branch was opened April 20, 1907, and 37 miles of the branch from Eudora, Ark., south to Gilbert, La., was opened June 1, 1907. The rest of the increase was made up of new trackage rights over the St. Louis Southwestern from Dexter, Mo., to Paragould, Ark. The Eudora-Gilbert branch, when completed, is to be part of the Gould low-grade line from St. Louis to New Orleans.

President Gould sums up the rate reductions of the year and the general railroad financial situation as follows:

> While the passenger business of the year shows an increase of $942,923, the marked general prosperity in the territory traversed by your lines of railroad would have contributed a larger increase to the revenue from passenger traffic had it not been for the 2 cent a mile passenger legislation, enacted early this year, by the states of Illinois, Missouri, Arkansas, Kansas, and Nebraska. This low rate by its application to state business, affects the interstate business as well, and its effects are far reaching. With the limited volume of local travel in those states, a 2 cent rate is not deemed compensatory for the service rendered.
>
> Adverse legislation affecting train and station operations in Arkansas, Missouri and Kansas, coupled with the general advance in wages of employees and the increased cost of materials and supplies, tends to enlarge cost of operation. Freight rates on certain commodities were reduced in Arkansas, Missouri, Kansas and Nebraska by legislative act and orders of state railroad commissioners, which will have the effect of limiting net revenues. Litigation is now pending in the courts to test the validity of these enactments and orders.
>
> Railroads cannot meet the requirements of the public so long as the adverse wave of sentiment now prevalent throughout the land is directed against them and given concrete expression in the form of drastic laws, which increase their expenses, reduce their revenues and render them incapable of improving their service and enlarging their facilities. It is essential to the industrial progress of the country that the transportation facilities shall not only be maintained, but improved and enlarged. To accomplish this, the railroads must receive remunerative returns for the services rendered. In this way only can they maintain their credit and that degree of confidence in the financial world that will enable them to command capital for additional facilities to meet the increasing requirements of the great business development now taking place throughout the country. Time will surely show that it is only through fair and reasonable treatment by the state, that the railroad will be enabled to best subserve the public interest.

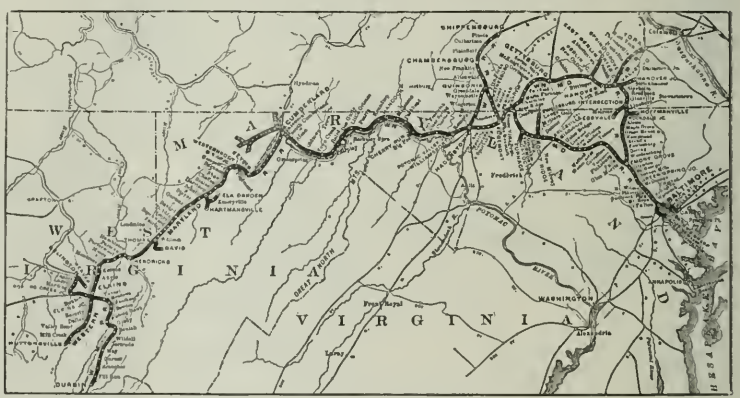
The following table gives the results of operation of the Missouri Pacific, St. Louis, Iron Mountain & Southern and Central Branch for the last two fiscal years:

	1907.	1906.
Mileage worked	6,375	6,276
Passenger earnings	$9,696,064	$8,753,141
Freight earnings	35,500,580	32,563,507
Gross earnings	48,703,343	44,566,821
Maint. way and structures	5,906,121	5,378,125
Maint. of equipment	6,998,863	5,781,532
Conducting transportation	17,595,101	17,141,984
Operating expenses	32,515,070	30,282,405
Net earnings	16,188,272	14,284,416
Dividend from Cent. Branch Ry	1,061,900	151,700
Net income	7,698,103	6,329,015
Year's surplus	3,807,228	2,438,140*

*The actual reported surplus was $492,740, because a third semi-annual dividend of 2½ per cent., amounting to $1,945,430, was charged to the 1906 income. This was on account of a change in the fiscal year.

Western Maryland.

The first full year of operation of the united lines of this road ended June 30, 1907. During this whole year the connection between the original Western Maryland and the West Virginia Central & Pittsburgh was in operation. The filling in of this gap between Big Pool on the east and Cumberland on the west was of vital importance to the success of the Western Maryland, for the lines



Western Maryland.

west of Cumberland originate large quantities of coal, which find a ready tidewater market at Baltimore. Before the connection was built this traffic had to be sent from one road to the other over the Baltimore & Ohio at large expense. The connecting line, which had to make many crossings of the Potomac river in mountainous country, was costly. It has many tunnels and a large amount of cutting and filling was necessary. On one part of the line whole hillsides were blown out and across the river at one blast to make a place for the grade. Yet in spite of the difficult nature of the country the road was built for economical operation. The connection is 59 miles long, of which 37 miles are tangent, and has maximum gradients of 26.4 feet to the mile westbound, and 15.8 ft. eastbound, which is the important direction of traffic, with a maximum curvature of 6 degrees. It has been in operation for both passenger and freight since June 17, 1906, so that the present report of the Western Maryland covers almost exactly the first full year of its operation.

This new line was financed by a first mortgage bond issue of the expanded Western Maryland. During the past year the fixed charges resulting from the large capital expenditures for this and other improvements were in full operation, while the advantages of these improvements were only beginning to show. In the first half of the fiscal year the net earnings did not keep pace with the rapid increase of fixed charges, though they did overtake these charges in the latter part of the year. As a result, the net income was only $11,000, against $252,000 in the previous year. During the first quarter of the present fiscal year, however, there has been no further advance in fixed charges, while earnings have continued to grow, so that for the three months ended September 30, 1907, the estimated net income over the proportion of fixed charges applicable to that quarter was $82,000.

There was an increase of 17 per cent. in gross earnings, though the increase in gross per mile was only 8 per cent. Net earnings, however, increased only 10 per cent., and per mile, 4 per cent. This

relatively smaller increase in net is a result of a number of different causes, particularly the increased costs and traffic congestion resulting both from difficult weather conditions and from the disturbances and interruptions caused by the various physical improvements which were under way in the first half of the fiscal year. At the beginning of the year these disadvantages were particularly strong because of the company's inability to secure free interchange of equipment with connecting lines. By the close of the year, however, most of the construction work was finished and there was in general a marked improvement in these operating features.

As the plan of the Gould interests to connect the Western Maryland with the Wabash-Pittsburgh Terminal or the Wheeling & Lake Erie, so as to make it the eastern end and Atlantic tidewater outlet of the various Gould railroads throughout the country, appears to be for the time being in abeyance, the Western Maryland must for the present be considered purely on its own merits as a local road. As such, its prosperity depends largely on coal traffic. Last year, with the two parts of the system united, there was a much larger volume of coal and coke tonnage. The total handled at the Port Covington (Baltimore) piers was just under 500,000 tons. During the present year there are to be, based on existing contracts, 900,000 tons thus shipped. The total bituminous coal tonnage carried was 2,941,847 tons, against 1,681,171 tons in 1906. Coal and coke together contributed 58 per cent. of the total tonnage, as against 47 per cent. last year; and 41 per cent. of the 1907 gross earnings. The company is now securing a longer haul on its coal traffic, fuller use of its large terminal facilities, and more active and profitable movement of its equipment. The number of miles run daily by the average system car on the home road increased from 15 to 19 miles, or 27 per cent., during the year. Between June 30, 1907, and October 16, 1907, there was a further increase of 3 miles. This makes an increase of 47 per cent. in car movement during the 15 months. The train load, which is not given in the report, was 371 tons, against 354 tons in 1906. Owing in particular to the increased coal traffic, total freight earnings increased 22 per cent.

There was a total of $4,691,957 of capital expenditure during the year. Of this amount $1,400,000 was for main line improvements, $1,300,000 for new equipment, and $214,000 for the coal department. Under the first item $556,000 was spent in double-tracking between Baltimore and Emory Grove. The main line between Big Pool and North Williamsport, 13 miles, which adjoins the Cumberland extension on the east, has been revised. There have also been considerable improvements on the Gettysburg line, which has lower eastbound grades than the main line via Rocky Ridge, and over which most of the tidewater coal is to be handled. When the double-tracking from Emory Grove to Baltimore is finished there will be what amounts to a double track from Baltimore to the junction of the Gettysburg and the main lines at Highfield.

The average weight of rail in main and second track (34 miles of the latter) was 78.4 lbs. to the yard on June 30, 1907, against 76.8 lbs. to the yard a year earlier. The average weight of rail on the main line from Baltimore, Md., to Elkins, W. Va., is 87 lbs. to the yard. Of the 574 miles of main and second track, 403 have stone ballast. Maintenance of way and structures cost $1,027 per mile, against $1,028 in 1906.

During the year the George's Creek & Cumberland Railroad was bought at a cost of $1,816,307. This is a self-supporting local road, 33 miles long, from Cumberland north to the Pennsylvania state line and southwest through the George's Creek coal region. It is valuable to the Western Maryland both because it contributes a large and profitable traffic, because its terminal facilities supplement the Western Maryland's, and furthermore, and this, perhaps, the deciding reason for its purchase, because it affords the only available outlet through the Cumberland Narrows for the shortest connection of the Western Maryland with Pittsburgh and the West.

The following table summarizes the results:

	1907	1906
Mileage worked	543	543
Passenger earnings	[illegible]	$876,426
Freight earnings	[illegible]	[illegible]
Gross earnings	[illegible]	[illegible]
Maint. way and structures	[illegible]	497,478
Maint. of equipment	[illegible]	[illegible]
Conducting transportation	[illegible]	1,761,023
Operating expenses	[illegible]	[illegible]
Net earnings	2,019,127	[illegible]
Net income	[illegible]	[illegible]

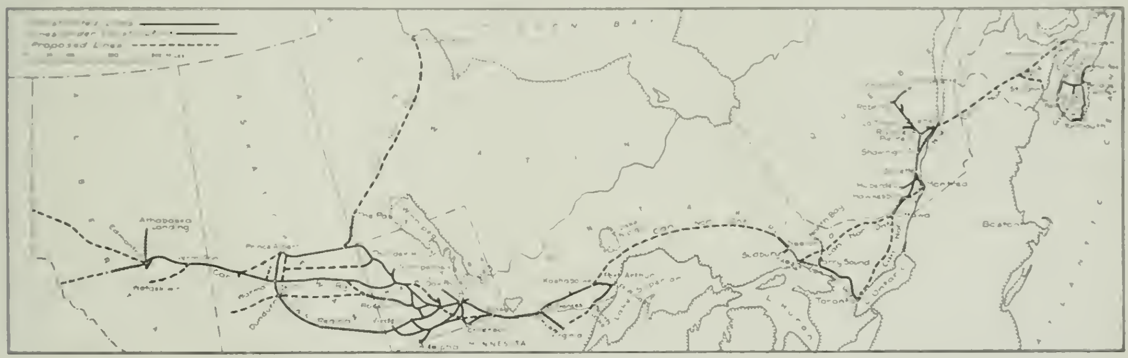
Canadian Northern.

The Canadian Northern is still rapidly expanding. In spite of a winter which, according to the report, was the severest ever known in western Canada, the road has progressed during the last year not only in mileage and in earnings, but in net earnings per mile. Gross earnings per mile of road were $3,328, a gain of 16 per cent. over the previous year, while operating expenses per mile rose 21 per cent., leaving net earnings of $1,166 per mile, an increase of 8 per cent over the previous year. The year's record is specially interesting, first, because it shows growth in every feature and second, because the circumstances of the year's operation are fully and interestingly discussed in the report.

From the last of November, 1906, to the first of April, 1907, the operating department had to devote itself to keeping the lines open. During this period, therefore, the traffic did not earn expenses. There was continuous low temperature with deep snow, and, on the whole, an extraordinary winter. President Mackenzie says that while the extremely rapid development of the road and the unexampled growth of traffic have made necessary the addition of new equipment as fast as possible, the delays of last winter were primarily due to weather conditions and not to equipment shortage. He also feels that the fertility of the soil of the Canadian Northwest and the character of the climate have been put to an extreme test, and the company having come through successfully, the future can be regarded with every confidence. But the road is in need of much. In Manitoba, Saskatchewan and Alberta much equipment of all kinds and other means for handling business faster must be provided. New lines are under construction to meet the demands of farmers who are already producing quantities of grain which will soon be ready for shipment. Other lines are planned not only to serve new localities, but as feeders to protect the enormous revenue-producing areas opened up by the Canadian Northern. The development of new districts during the past year has required considerable expenditures on structural and mechanical improvements. Roadbed has been ballasted, many new stations have been built, new sidings laid, engine houses at division points improved, coal handling plants installed and water stations increased and enlarged. Besides erection of freight sheds in many towns, there have been new freight accommodations built at Port Arthur in particular; stock yards have been built at various points. That much remains to be done, however, is shown by the maintenance of way expenditure per mile of road, which was $490, against $391 in 1906 and $351 in 1905. These sums are much too small even in prairie country to keep a road in good condition.

Over $3,000,000 has been collected and $4,871,000 more is due from lands sold. Against this there are $2,000,000 land grant bonds outstanding. The company also controls the Canadian Northern Prairie Lands Company, an investment which shows a profit. There are still 1,828,251 acres of land unsold. In regard to immigration from the United States, President Mackenzie speaks thus frankly:

"While it is especially gratifying to your directors that the



Canadian Northern System.

company's lands have proved so attractive to settlers from the Middle and Western States, because they are thoroughly experienced in prairie farming, and, besides, being good judges of land, bring it rapidly into cultivation and thus create traffic for the railroad, it is more desirable than ever to encourage the immigration of families of good British stock. The Dominion government is doing admirable work in this direction, and a large proportion of the arrivals of recent years are settled near your railroad."

Special attention is called to the increased value of the road's terminals at important points in the Canadian Northwest. There has been a general land boom in that territory, but terminal property is least likely to suffer from a reaction.

The new iron ore traffic from the Atikokan (Ontario) mines to Port Arthur, referred to in the report of a year ago, has begun. The new blast furnaces at Port Arthur have since July been producing good grade pig iron. It is understood that the output of these furnaces is to be doubled, with the idea of establishing steel works at Port Arthur and supplying the western market from that point. The iron ranges tapped by the main line west of Port Arthur lie north of and are similar to those in the northern part of Minnesota, which have proved so rich in both quality and extent, and it is believed that the movement of ore from the Atikokan and Mattawin ranges will ultimately be a source of great profit.

Port Arthur and Fort William, the ports on Lake Superior, are still expanding, and new industries have been established there. The Canadian Northern coal docks at these points are capable of handling 600,000 tons a season, and so expeditiously as to effect a considerable saving in the cost of water-borne fuel for which the demand in the western provinces is increasing enormously year by year. Direct water connection was established during the year between these ports and Parry sound on Georgian bay, whence a line of the Canadian Northern Ontario runs south to Toronto. This has already begun to carry a large amount of profitable traffic to and from the West. Thus, in addition to the agricultural possibilities on which the road has heretofore had almost its whole dependence, other traffic is springing up and through routes are being developed.

With an increase of 22 per cent. in the average mileage operated, passenger earnings increased 45 per cent. and freight earnings 32 per cent. The principal increases in freight traffic were in flour, grain, logs and lumber, and immigrants' effects. This last item increased from 2,614 cars in 1906 to 4,647 cars in 1907, a gain of over 75 per cent., which vividly suggests the rapid settling of the Canadian Northern's territory. The traffic in both live stock and in firewood fell off sharply.

There were 190 locomotives on June 30, 1907, as compared with 141 a year earlier. In the same period the sleeping and dining cars increased from 18 to 29, passenger cars from 77 to 108, other passenger train cars from 35 to 48, cabooses from 69 to 97, work cars from 83 to 123 and freight cars from 5,437 to 6,868.

The principal extensions during the year were in Manitoba and Alberta. An important addition to the system in the East was the Quebec & Lake St. John, which added a valuable piece of railroad to the Canadian Northern Quebec, for which it previously furnished a Quebec entrance. As shown by the map, however, a cut off is proposed which will considerably shorten the route from Montreal to Quebec.

The following table summarizes the results of the last two years' operations. It shows the rapid growth of the road:

	1907.	1906.
Mileage worked	2,509	2,064
Mileage June 30	2,639	2,482
Passenger earnings	$1,464,256	$1,062,639
Freight earnings	5,741,729	4,335,933
Mail earnings	58,231	23,172
Express earnings	85,124	53,941
Miscellaneous earnings	1,000,858	428,070
Gross earnings	8,350,198	5,903,756
Maint. way and structures	1,228,957	807,692
Maint. of equipment	852,800	585,602
Conducting transportation	3,097,495	2,072,057
General expenses	241,912	209,382
Operating expenses	5,421,164	3,674,733
Net earnings	2,926,034	2,229,023
Net income	1,913,545	719,574

NEW PUBLICATIONS.

Railway Corporations as Public Servants. By Henry S. Haines, M. Am. Soc. C. E., M. Am. Soc. M. E., ex President of the American Railway Association. The Macmillan Co., New York. 1907. 233 pages; 5x7¾ in., cloth. $1.50.

This work contains the substance of a course of lectures delivered in May, 1907, at the Boston University of Law, and to a certain extent supplements the author's previous book on Restrictive Railway Legislation. Mr. Haines expresses his aim as an effort to better the existing relations between railroad corporations and the public whom they serve, and the book at hand is well adapted to this purpose. Dealing first with the nature of public service, then with the public service done by railroads, and by the public benefits which they confer, he follows the line of gradual evolution, and shows the commercial needs that required railroad transportation and the way in which these needs were met.

After the period of early necessity came the period of the promoter and of needy and bankrupt companies, with reorganizations and a general tightening of charter privileges. Then followed the years of unrestricted competition, with discrimination between communities accompanied by a further discrimination between individuals, heightening public indignation in the non-competitive regions, and making new enemies in the competitive regions of shippers who were suffering from this secret discrimination. Meantime, net revenues were being depleted, and by the beginning of the decade of 1880, over one-fourth of the country's railroad mileage was in receivers' hands.

Mr. Haines describes the decade of 1880-1890 as the renaissance of the railroad system in the United States; a period of dissolution followed by reorganization and rebuilding. But railroad managers had now learned the cost of free competition, and began to protect themselves by consolidation. This consolidation and its results, together with a mingling, in legislative enactments, of the results of all the woes and griefs, real and fancied, which shippers had derived from conditions past and present, constitutes the basis of the present situation. Mr. Haines discusses in detail the aims and motives of the original Act to Regulate Commerce and of subsequent additions, including the crude and hasty Sherman Act, and shows clearly some of the evil conditions which this legislation, together with the Elkins Act and the revised commerce Act of 1906, was aimed to remedy.

The latter part of the book deals with the complex questions of present-day inequalities in law and in service; of "reasonable" rates, the effect of ineffectual control, and the standards of railroad service. In these chapters Mr. Haines has handled a matter of much difficulty with clearness and in a conservative and fair spirit, and his book deserves recognition as an excellent picture of conditions old and new, with helpful suggestions for the future. His suggestion that the Interstate Commerce Commission should cooperate with the American Railway Association and draw upon the full store of technical knowledge in the possession of that body, strikes us as excellent.

CONTRIBUTIONS

Firing Stationary Boilers.

Norfolk, Va., Oct. 24, 1907.

To the Editor of the Railroad Gazette:

"There is vastly more difference between a good fireman and a bad fireman than between a mechanical stoker and a good fireman."

"Economy of boiler management is dependent upon the skilful handling of the fuel. The fireman can save more to the plant than anyone else."

"Improper firing is probably the most common cause of the poor economy of boilers. For every ton of coal burned we throw away nearly 7½ tons, losing 88 per cent."

These conclusions have been reached by three of the best-known authorities on steam engineering in the country, Professors Thurston, Hollis and Kent, and it is probable that no one will dispute their truth and accuracy. Is it not time for us to give more attention and thought to improving the work of the fireman?

The technical papers and magazines are very much exercised at present over the great waste of our coal supplies. The President has taken a hand in the matter and the United States Geological Survey people are crying out over it. Even the daily papers are printing interviews on the subject. But in all the articles that have appeared on the subject, both in the technical and daily press and in the Geological Survey papers, very little, if anything, has been said about the question of improving the work of the firemen.

Improvements are made and suggested in boilers and combustion methods and appliances, etc., but apparently no thought is given to the man who has the most to do with making such improvements successful. A poor, careless or ignorant workman will never do a good job even with the best tools.

Most people seem to think that anyone with enough physical strength will answer as a fireman, that it is just ordinary manual labor and requires no special skill or aptitude or intelligence. Now the writer believes, knows that the first-class, skilful fireman, like a true poet or musician, is born and cannot be made. There is just as much difference between the best fireman and the average one as there is between Robert Browning and the average rhymemaker, or between Beethoven and the modern comic opera composers.

We have often seen men who have been firemen for eight or ten years that did not know the first principles of proper firing, and, working alongside of them, others who had been firing only a few months, doing much better work and burning less coal.

It is of great importance to us, as a nation, that prompt and

efficient steps be taken to bring up the average of efficiency of the men who burn our coal. The immense increase in the amount of coal used by the country during the last few years has called the attention of our technical men to the absolute necessity for taking effective and immediate steps to get a greater amount of work out of a pound of coal.

Up to so far these efforts have been mainly altogether in the direction of improving the appliances for burning coal and utilizing the heat into effective work.

Along these lines the United States Geological Survey has done and is doing most effective work, which, however, is not so well known as it should be.

As far as the writer knows, however, there has been no concerted or comprehensive attempt on the part of any government body or engineering society to increase the efficiency of the fireman, the man who handles all the improved appliances and on whose skill and work a large amount of their success depends. The railroads, it is true, make spasmodic attempts to give their firemen instructions in combustion and firing, and the average intelligence and skill of the locomotive fireman are above those of the stationary fireman. This, however, is largely due to the better pay, more interesting work and better chances for promotion given the former. A good locomotive fireman can fire stationary boilers very readily, but it takes the stationary fireman some time to keep up steam on a locomotive. In other countries, notably in Germany, there is much more practical interest taken in improving the firemen. The German government includes a course of lectures on fuel and its combustion in its educational curriculum, and gives a sum annually to lecturers and instructors to boiler firemen. In many cities of German schools for their training are established. These schools give two weeks' instruction for the sum of $3.

The writer has had numerous opportunities of seeing the work of boiler firemen in other countries, and has no hesitation in saying the average fireman in many of them does much better work in handling coal than in our country. This is especially true of Chile and Mexico, countries that we are rather inclined to look down upon. Of all the stationary-boiler firemen he has seen, the best was a Finnlander and the next best a Mexican.

This condition of things in the United States is almost entirely due to the steam-plant owners and to the low price of coal as compared with that in other countries. As stated elsewhere by the writer (see *Black Diamond*, Oct. 5, 1907), it is believed to be a conservative estimate that, at the average hand-fired steam-plant in the country, at least 5 per cent. of the coal used could be saved by possible improvements in firing methods alone. At many plants this amount could be doubled.

Actual tests have shown that there may be a difference of 20 per cent. in evaporation as between two firemen under the same conditions, with the same boiler and same quality of coal.

What we need in this country to improve efficiency of our boiler-plants, is education and instruction for the firemen and the steam-plant owners. We can't get the best results from our automatic stokers and other appliances for saving fuel unless we have intelligence and knowledge to handle them. We can't do more work with a pound of coal unless the men who burn the coal are shown how to do better work themselves and are given some incentive to improve themselves.

Increased knowledge on the part of the firemen and increased attention to their work would surely lead to improvements in the steam-plants, which would add still further to the savings to be effected. In many parts of the country the low wages paid and the long hours of work will not attract young men of intelligence to the hard task of boiler firing. This is a matter that must be remedied gradually, but that it must and will be remedied is apparent to anyone who has given it attention.

The steam-plant owner must decide between low wages and high fuel and repair bills and low efficiencies or good wages, lower bills and more uniform steam pressure and longer life of his boiler plant.

The whole question comes to this, that if we want to increase the length of time that our unused coal supplies will last, we must take practical and concerted steps to add to the efficiency of the men who burn our coal, not only by giving them improved appliances of every kind, but also by increasing their knowledge of combustion.

This can be done by instruction, both practical and theoretical, by showing an increased interest in their work and by giving them better pay and shorter hours and by making the boiler rooms more comfortable places to work in. The writer has in mind boiler rooms (and they are not so exceptional, either) that are not fit for a self-respecting man to work in.

Prof. William Kent says in his "Steam-Boiler Economy" that all kinds of hand firing with ordinary furnaces are improper. Some kinds are worse than others, but all are bad.

The writer believes that, given a first-class fireman and up-to-date tools and appliances, together with close attention on the part of the chief engineer or manager to the handling of the coal, automatic stokers will give no better results. This, of course, does not include the saving of labor, a large point due to the use of stokers.

Considerable publicity has been given recently in the papers to a letter sent out by the President with a view to withdrawing from entry a large amount of coal-bearing coal lands belonging to the Federal Government in the West, with the object of protecting the coal reserves from waste. The suggestion has been made by the writer in another paper (see *Engineering News*, Dec. 19, 1907), and it is now reported that the present wasteful method of burning coal could be greatly improved on and our coal supply made to last longer, if instructions and object lessons in combustion and firing should be given by competent men to firemen all over the country. These instructions should be under the direction of the United States Geological Survey. Such a method would be similar to that now in use by the United States Agricultural Department, and of some of the states, giving instructions to farmers in the best methods of farming.

A board of experts, who should be able to practise what they would preach, appointed by the Geological Survey, should be at the service of every steam plant owner in the country, and their work could be made of great value along the lines indicated above.

Take the conditions that now exist at many smaller boiler plants. The boilers are overloaded, worked day and night without proper cleaning, cheap and badly designed grates are used, the boiler settings and arches are allowed to crack and remain so, and the bridge walls and side walls stay clinkered and choked up. No attention is paid to the ventilation, cleanliness or comfort of the boiler-rooms, and little or no attempt is made to keep accurate records of the coal used each day. The fireman is generally allowed to do as he pleases in regard to firing and water feeding, and as long as sufficient steam is kept up to run the plant, nothing is said to him. The "boss" walks through the boiler-room possibly once a day or more often once a week, satisfied if the machinery is running at its usual speed, and he sees the firemen working. The fireman is paid about the same as an ordinary laborer and works from 10 to 13 hours a day, or even longer; cleaning the fires from once to four times a day, after wheeling out ashes and bringing in coal himself.

At a plant of this kind, and there are a good many of them, it would really seem as though the "boss" should be the one to be instructed and taught the first principles of economy and efficiency in operating a steam-plant.

F. R. WADLEIGH,
Chief Inspector, Casiner, Curran & Bullitt.

Railroad Law in August.

The following abstracts cover the principal decisions in the Federal courts:

Discrimination in distribution of cars.—A rule of a railroad company in distributing coal cars for use between mine operators on its lines in times of shortage of cars not to charge against a mine as part of its quota the cars of other railroad companies for carrying coal bought by them for their own use does not amount to an undue advantage in violation of Section 3 of the Interstate Commerce Act particularly where the coal so carried is not taken into consideration in computing the mine's percentage. And this would be the rule in the case of coal purchased by any buyer for its own use to be delivered into its own cars at the mine and which does not become a subject of interstate commerce. Neither is the statute violated by the allowance by the railroad company of an extra percentage of cars to an operator which during the preceding month has unloaded and returned its cars within a certain average time; this practice having been adopted instead of charging demurrage to encourage prompt return of the car and to enlarge the available supply of cars. United States v. Baltimore & Ohio Railroad Co., 154 Fed. Rep. 108.

Contributory negligence of licensee on track.—A person using a railroad track as a footpath is guilty of contributory negligence where at the approach of a locomotive he steps to the side of the track but not at a sufficient distance to avoid being struck by the bucking beam of the engine pilot, and hence he cannot recover damages for injuries thus received. Delaware & Hudson Railroad Co. v. Wilkins, 153 Fed. Rep. 845.

Jurisdiction of Federal Courts in cases of discrimination.—A shipper cannot maintain an action in the Federal courts against an interstate carrier for damages because of a discrimination in rates where he does not allege that the charge complained of was not in accordance with a schedule of rates duly published and filed with the Interstate Commerce Commission or that any application had been made to the commission to correct such alleged discrimination. Neither can he litigate the matter in the Federal courts under the $2,000 clause by including in his demand a claim for damages which he cannot recover and without which the demand is less than $2,000. Clement v. Louisville & Nashville Railroad Co., 153 Fed. Rep. 979.

Right of insurance company to sue for fire loss.—The Circuit Court for the Western District of Louisiana holds that an insurance company which has paid a loss to the owners of cotton de-

stroyed by fire set out by a railroad company may sue the railroad company for such loss in place of the owner. On the trial the railroad company is entitled to invoke the same defenses that it could against the owner. Svea Insurance Co. v. Vicksburg & Shreveport Railway Co., 153 Fed. Rep. 774.

Safety appliance law.—The safety appliance law makes a railroad company liable unconditionally for its violation and hence in an action for the penalties imposed by the act it is not necessary for the plaintiff to allege and prove that the railroad company did not use due care or ordinary diligence in making an inspection or in repairing such defects as the inspection would have disclosed. United States v. Atlantic Coast Line Railroad Co., 153 Fed. Rep. 918.

Removal of causes.—The Circuit Court of the Southern district of New York in a suit by a stockholder to have stock and bonds issued by a railroad company, to be exchanged for a prior issue of bonds, to be declared beyond the power of the company and void, holds that the company is the only necessary party defendant, and the fact that the directors or persons interested in the bonds to be issued have been joined as defendants will not prevent a removal

Curve and Switch Tables.

The tables reproduced herewith were compiled under the direction of Everett B. Wilson, M. Am. Soc. C. E., in connection with the design and construction of several extensive yard and track schemes. They will doubtless be found very helpful to other engineers on similar work.

It is not expected that they will be generally applicable in their present shape, inasmuch as the "practical leads" and "slip switch lengths" are based on Pennsylvania Railroad standards, but the work of adapting them to the needs of a particular road involves merely the changing of the "SL," "PrL" and "SS" columns to conform with the standards of that road. Copies of these tables as here shown, also copies with these columns left blank, printed on tough paper for "tipping" into hand-books, or for drafting table use, can be had for the asking. Mr. Wilson is now Secretary-Treasurer of The American Bureau of Inspection and Tests, Monadnock Block, Chicago. The following explanations for using the tables are given by the author.

TABLE I

DEG.	RAD	CURVE NO. 20-1	40-1	100-1	DEG.	RAD.	CURVE NO. 20-1	40-1	100-1	DEG.	RAD.	CURVE NO. 20-1	40-1	100-1	DEG.	RAD.	CURVE NO. 20-1	40-1	100-1	DEG.	RAD.	CURVE NO. 20-1	40-1	100-1
0 8	42972			400	1 00	5730				2 30	2292			23	6 00	955		24		12 00	478			
0 9	38197			375	1 02	5545	275	140	55	2 36	2204	110	55	22	6 02	950			9½	12 29	460	23		
0 10	34377			350	1 06	5209		130		2 45	2064			21	6 06	940	47			13 00	442			4½
0 11	31252			325	1 09	4932	250		50	2 52	1999	100	50	20	6 14	920		23		13 03	440	22	11	
0 12	28648			275	1 10	4911				3 00	1910	95		19	6 22	900	45		9	13 41	420	21		
0 14	24555			250	1 12	4775		120		3 03	1879		47		6 31	880		22		14 00	410			
0 15	22918			225	1 13	4703			47	3 11	1800	90	45	18	6 45	849			8½	14 22	400	20	10	4
0 17	20222			200	1 16	4523	225		45	3 22	1702	85		17	6 50	839		21		15 00	383			
0 18	19099			190	1 18	4407		110		3 30	1637				7 00	819				15 07	380	19	9½	
0 19	18093			160	1 20	4297				3 35	1599	80	40	16	7 10	800	40	20	8	15 20	375			3½
0 20	17109			170	1 26	3997	200	100	40	3 46	1521		38		7 33	759	38	19	7½	16 00	359	18	9	
0 21	16370		400	160	1 30	3820	190	95	38	3 49	1501	75		15	7 58	720	36	18		16 25	350			3½
0 23	14947		375	150	1 35	3619	180	90	36	3 59	1439		36		8 00	717				16 55	340	17	8½	
0 24	14324		350	140	1 38	3508			35	4 00	1433				8 12	699	35		7	17 00	338			
0 26	13222		325	130	1 40	3438				4 05	1403	70	35	14	8 26	680	34	17		18 00	320	16	8	
0 28	12278		300	120	1 41	3404	170	85	34	4 13	1359		34		8 41	660	33			19 00	303			
0 30	11459				1 44	3306			33	4 21	1317		33		8 49	650			6½	19 11	300	15	7½	3
0 31	11090		275	110	1 48	3183	160	80	32	4 25	1298	65		13	8 58	640	32	16		20 00	288			
0 34	10111		250	100	1 50	3125				4 30	1274		32		9 00	637				20 34	280	14	7	
0 38	9047		225	90	1 51	3097			31	4 37	1241		31		9 15	620	31			22 10	260	13	6½	
0 40	8594			85	1 55	2989	150	75	30	4 47	1198	60	30	12	9 34	600	30	15	6	23 04	250			2½
0 43	7995	400	200	80	1 59	2889			29	4 56	1162		29		9 54	579	29			24 03	240	12	6	
0 45	7639		190		2 00	2865				5 00	1146				10 00	574				26 16	220	11	5½	
0 46	7473	375		75	2 03	2795	140	70	28	5 07	1120		28		10 14	561	28	14		28 57	200	10	5	2
0 48	7162		180		2 07	2707			27	5 12	1102	55		11	10 38	540	27		5½	30 31	190	9½		
0 49	7016	350		70	2 12	2605	130	65	26	5 18	1081		27		11 00	522				32 15	180	9	4½	
0 50	6876		170		2 15	2547				5 30	1042				11 02	520	26	13		34 13	170	8½		
0 53	6486	325	160	65	2 18	2491			25	5 31	1039		26		11 29	500	25		5	36 25	160	8	4	
0 57	6031	300	150	60	2 23	2404	120	60	24	5 44	1000	50	25	10	11 53	480	24	12		38 57	150	7½	3½	1½

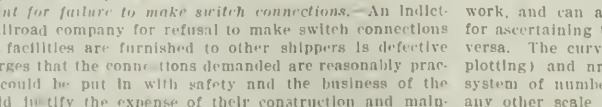
TABLE II

TURNOUTS, CROSSOVERS, LADDERS and SLIP SWITCHES

GAGE 4'-8½"=4.7083'

FROG NO.	CURVE NO. 20-1	40-1	100-1	THEORET'L TURNOUT DEG.	RAD.	LEAD	PRAC. TURNOUT SWITCH	LEAD	FROG ANGLE	CROSSOVER FROG DIST. CENT. TO CENT. OF TRAS. 12'-0"	13'-0"	15'-0"	12'-2"	LADDER FROG DIST. CENT. TO CENT. YARD TRACKS 12'-0"	13'-0"	15'-0"	12'-2"	SLIP SWITCH DIST. BETW. SP & SF	FP & FP	FROG NO.
4	7½	3¾	1½	38 09'	153.0	37.7	10	38.0	14 15'											4
5	12	6	2½	24 17'	237.8	47.1			11 25	12.3	17.5	27.2	13.1							5
6	17	8½	3½	16 51'	341.4	56.5	10	55.0	9 32	15.0	20.9	32.9	16.0	72.45	78.49	90.57	73.46	38.6	56.5	6
7	23	12	4½	12 23'	463.7	65.9			8 10'	17.6	24.6	38.5	18.8	84.48	91.52	105.60	85.65	44.9	65.9	7
8	30	15	6	9 29'	605.0	75.3	13	70.0	7 09'	20.3	28.3	44.2	21.6	96.41	104.44	120.50	97.75	51.3	75.3	8
9	38	19	7½	7 30'	765.1	84.7			6 22'	22.9	31.9	49.8	24.4	108.21	117.23	135.27	109.71	57.8	84.8	9
10	47	24	9½	6 04'	944.0	94.2	18	85.0	5 43'	25.6	35.6	55.5	27.3	120.47	130.51	150.59	122.14	64.3	94.2	10
11	55	29	11	5 01'	1141.7	103.6			5 12'	28.2	39.2	61.1	30.0	132.40	143.43	165.50	134.24	70.6	103.6	11
12	70	34	14	4 13'	1356.4	113.0	30	96.0	4 46'	30.8	42.8	66.8	32.8	L=2GN R=2GN²+¼				77.2	113.0	12
15	110	55	21	2 42'	2121.1	141.3	30	120.0	3 49'	38.6	53.6	83.5	41.1	FD=CC−2.3N(Approx)				96.3	141.3	15
20	190	95	38	1 31'	3769.0	188.2	30	155.0	2 52'	51.5	71.5	111.4	54.8	N=No. of Frog L=Theor. Lead G=Gage						20
24	275	140	55	1 03'	5426.4	226.0	30	175.0	2 23'	62.0	86.0	134.0	66.0	R=Radius CC=Cent. to Cent. of Tracks						24
N	D	R	L	SL	PrL	F ∠	FD	FD	FD	FD	FF	FF	FF	FF	SS	EF	N

All measurements are theoretical except those shown in columns SL, PrL and 55 which are practical being based on Penna. R. R. Cos. Standards



THE AMERICAN BUREAU OF INSPECTION AND TESTS
Consulting and Inspecting Engineers
New York CHICAGO Pittsburg

Degrees of Curve, Radii and Curve Numbers for Plotting Railroad Track Work.

of the cause to the Federal courts if the citizenship of the person instituting the action and the company are diverse. Pallitz v. Wabash Railroad Co., 153 Fed. Rep. 941.

Indictment for failure to make switch connections.—An indictment of a railroad company for refusal to make switch connections where these facilities are furnished to other shippers is defective unless it charges that the connections demanded are reasonably practicable and could be put in with safety and the business of the shipper would justify the expense of their construction and maintenance. It should also aver that the shipper making the demand offered to pay such portion of the cost as is usual and reasonable. United States v. Baltimore & Ohio R. R. Co., 153 Fed. Rep. 997.

Reconsignment charges.—The Circuit Court of Appeals of the Seventh Circuit holds that an additional charge by carriers of two cents per hundred weight for the privilege of reconsigning hay from the northwest at St. Louis and shipped into southeastern territory was excessive under the Interstate Commerce Act, and that a rate of one cent per hundred weight as found by the commission was reasonable. Southern Railway Co. v. St. Louis Hay & Grain Co., 153 Fed. Rep. 728.

TABLE I.

Railroad Curves.

This table is for use in plotting railroad curves and switch work, and can also be used by interpolating, to a limited extent, for ascertaining the degree of curvature for a given radius, or vice versa. The curve numbers shown are the numbers of curves (for plotting) and are equal to the radii of the same in inches—this system of numbering being best adapted to general uses. Should any other scale be desired, a multiple of one of those shown can be used.

TABLE II.

Turnouts, Crossovers, Ladders and Slip Switches.

The three "Curve No." columns are on the same basis as Table I. and are to be used in plotting both theoretical and practical turnouts from straight jackets only. The rest of this table is self-explanatory when taken jointly with the sketches below it. It is to be noted that the radii of the theoretical turnouts are not of the center of track, but of the gage of the "curved lead rail."

The distances in "SL," "PrL" and "SS" columns are practical, being based on Pennsylvania Railroad standards. The practical

leads, "Frl.," are measured between actual points along the "straight lead rail" and are based on 1' 11. R standard length straight switch points (5¾ in. spread at heel) and frog toe rails connected by regular curves.

Following is an example of the combined use of Tables I. and II. In plotting or laying out a theoretical No. 8 turnout from the inside of a curve of 2,865 ft. radius, scale 40 ft. = 1 in.

The degree of a curve of 2,865 ft. radius is 2 deg. 00 min. (Table I.) By subtracting this from 9 deg. 29 min., which is the degree of curve for a No. 8 theoretical turnout from a straight track (Table II.), the degree of curve of the desired turnout, 7 deg. 29 min., is obtained. Therefore, the nearest curve (Table I.) for plotting the turnout is No. 19. Where the turnout is from the inside of the main track the degress of the two curves should be added.

American Railway Association.

The fall session of the American Railway Association was held at New York City, October 30. There were present 75 members, represented by 175 delegates. The present membership of the Association is 331 members, operating 235,457 miles, and 46 associate members, operating 1,457 miles.

The committee on car service reported having held five meetings. Twenty-four roads have joined the Per Diem Rules Agreement and three have withdrawn. Two of the three have been put on a car demurrage basis, and the other one is the New York, New Haven & Hartford. The committee recommends to the favorable attention of the members the interline card way bill which has been prepared by the Accounting Officers' Association.

The committee recommends a new code of demurrage rules, which with a few minor changes, was adopted. This code is the result of a careful study of all demurrage rules now in use, and careful consideration of criticisms of members of the association. While the free time prescribed is 48 hours, and while, therefore, some roads may not be able to adopt the rules without modification, the committee hopes that such modification will be found necessary only for a short time. The committee has restored the use of the word "demurrage" in place of the meaningless term "car service." This change has been made after careful consideration. The committee strongly recommends that demurrage be collected with the same strictness as freight bills.

The committee recommended and the Association adopted changes in car service rules 1 to 4, in line with the recommendation which was made six months ago when a penalty for diversion was proposed. As the Association, in rejecting the penalty rule, did not disapprove the regulations governing the use of foreign cars, these regulations are now again recommended. A slight change is recommended also in car service rule No. 5; also in rules Nos. 9 and 10, to make these rules consistent with the new demurrage rule. Rule 3, which was cut out when the penalty for delay was abolished, is restored, in suitable form to give a road the right to demand the return of its cars. Rule 6 is modified for the same reason. Rule 9 is modified to require the numbering of the sheets of interchange reports. The committee recommends that five copies be made of interchange reports, and that rule 11 be amended to forbid the presentation of corrections in per diem reports until after three months. Premature checking of these reports has caused some difficulty. Rule 15 is amended so that an embargo shall not take effect until after 24 hours. The whole report was accepted after slight modifications.

The Committee on Statistical Inquiry presented an interesting report as to its work, covering the past six months. The report included a report of a sub-committee in regard to tests to determine the mileage allowance to be made engines in switching service. The name of the Committee on Statistical Inquiry was changed to the Committee on Accounting and Statistical Inquiry.

The Committee on Standard Cipher Code reported that 2,995 copies of the Standard Cipher Code are now in use by members of the Association. The committee has authorized the publishers of the "Pocket List of Railway Officials" to designate in that publication all officials who use a Standard Code.

The Committee on Transportation of Explosives included in its report a list of manufacturers of explosives and a list of magazines. It referred to the work accomplished by the Bureau of Explosives, and also submitted for consideration revised regulations for the transportation of explosives and regulations for the transportation of inflammable substances.

The recommendations of the Committee on Standard Rail and Wheel Sections were for the most part approved, and the points of disagreement were referred back to the committee with instructions to investigate further, and with authority to employ experts for this purpose.

The Committee on Standard Location for Third Rail Working Conductors, in its report, embodies a series of definitions, which were adopted.

The Committee on Car Efficiency presented an elaborate report, together with statistics showing car performance. Most of these statistics have been reported in previous issues of the *Railroad Gazette*. The report says in part:

The roads which normally hold and use cars in excess of the number they own are still found chiefly in New England, the Southwest and on the Pacific Slope. Most of the roads holding such an excess have ordered a considerable amount of new cars. The committee has been able to suggest in a number of cases, transfers of equipment which have taken care of surplus cars and reduced shortages. Better results would be obtained if all roads were to send in regular statements showing the location of their cars as well as copies of their daily interchange reports showing cars delivered to their connections. Demurrage rules covering bituminous coal handled at tide-water were adopted April 1, by six of the seven roads handling such coal at New York, Philadelphia, Baltimore, Norfolk and Newport News; and the seventh line will probably adopt rules on the first of April next. The rules are in effect on anthracite coal on one road, and will probably be put into effect on anthracite coal on other roads shortly. The rules are supervised by a committee, which meets monthly. Its chairman is also chairman of this committee. The roads are handling more coal this year than last, and in less cars. Demurrage rules covering bituminous coal handled on Lake Erie were adopted July 1 by all roads handling such coal. These rules are supervised by a committee, with chairman and secretary, the same as those of the Tide-Water Committee. The committee has attempted to secure the formation of a box car pool, one of the essential rules of which would be the imposition of a very high per diem or penalty charge at times when cars are scarce, but it has not succeeded in securing the promise of enough cars for such a pool to warrant a trial. The attainment of this principle will be impracticable so long as so many roads are without the equipment necessary to do their own business. The increase of the per diem rate to 50 cents has made it profitable to own cars. * * * The committee recommends a strict adherence to the 50-cent rate and a prompt reporting of freight car interchanges, locations, shortages, surpluses and congestions to the Clearing House in Chicago. Daniel Willard was elected First Vice-President. The next meeting will be in New York City on April 22, 1908.

Car Efficiency for April.

The American Railway Association Committee on Car Efficiency, Arthur Hale, Chairman, has issued Bulletin No. 6 showing car balances and performances for the month of April, 1907. The principal results, as compared with preceding periods, are summarized in the bulletin as follows:

During the month of April, 1907, the severe shortage which had existed throughout the previous winter had been relieved to some extent, although it was still severe enough to warrant a continuation of the earnest efforts which were made by the railroads of the country to secure a greater efficiency from their freight cars. The marked improvement in the performance denotes the success which rewarded those efforts.

The "average miles per car per day" shows an increase of 1.3 miles over the first quarter of 1907; the per cent. of loaded mileage about held its own and the "average tons per loaded car" shows a slight increase. The net result of these factors is represented in the "average ton miles per car per day," which shows an increase of 22 ton miles, or 6.7 per cent. The improved performance is also reflected in the earnings, which show an increase of 14 cents per day in the average "per car on line."

While this improvement in performance is quite gratifying, it is to be regretted that it was not accompanied by a similar improvement in the situation as regards car balance. Although there have been gains on a number of the large owning lines, it will be noted that as a rule those roads which habitually use more cars than they own still show large excesses on line, while several of the large car owners have lost equipment.

The losses which car owners suffer from an unequal balance may be graphically demonstrated by comparing the per cent. of cars on line with the average earnings per car.

Taking for instance Group 3, which during the period of this report shows the largest net loss in equipment, we find that the total shortage on roads having less than 100 per cent. on line is 48,615 cars.

Based on the average daily earnings per car on line, and assuming that these roads could have used their full quota of cars, the loss in gross freight revenue which these lines sustain by reason of this condition aggregates $110,356 per day. As a credit against this loss, these roads earned per diem on 48,615 cars, which at 40 cents per day (the approximate average for April), amounted to $19,446, making the net loss in revenue $90,906 per day, $2,727,180 per month, or 18.25 per cent. of the gross freight earnings of the roads which are short their equipment. The loss for any particular road may be similarly calculated.

The increase in the per diem rate to 50 cents, effective July 1, 1907, will decrease these net losses somewhat, and a further increase in the rate, or the adoption of a graded per diem would reduce the margin of loss which the lending roads must suffer in

times of car shortage. However, from the standpoint of the car owner a partial compensation is unsatisfactory, and under any per diem rate the compensation will be but partial until the amount of per diem received equals the net daily value of the car as a producer of revenue. Too much should not be expected from the per diem rate. In the effort to secure a rate which will be compensatory to the car owner when he has use for all his cars there is danger of fixing the rate at a point where it will become burdensome when cars are easy, or greatly increase the empty haul, which would be wasteful. The general interchange of cars being an established order, the necessity for its regulation already exists and it would appear that there is less necessity for an immediate change in the per diem rate than for some regulative system to which the per diem rate will be supplementary, and to which it would, in time, naturally adjust itself.

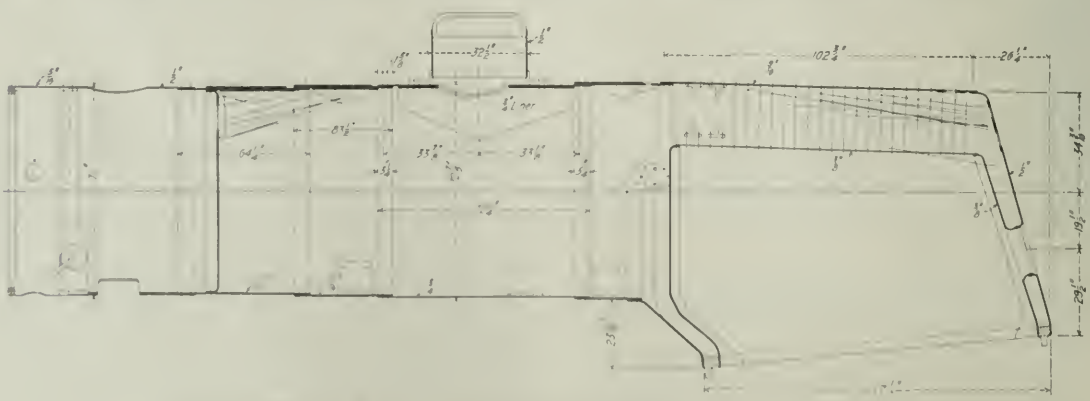
Pacific Locomotives for the New York, New Haven & Hartford.

The Baldwin Locomotive Works has recently delivered 21 Pacific (4-6-2) locomotives to the New York, New Haven & Hartford. These engines are of special interest, as they are the first locomotives with trailing wheels to be built for this road. Their calculated tractive force is 31,560 lbs., and as the weight on the driving wheels is 134,250 lbs., the factor of adhesion is 4.25. The adhesive weight is thus used to excellent advantage.

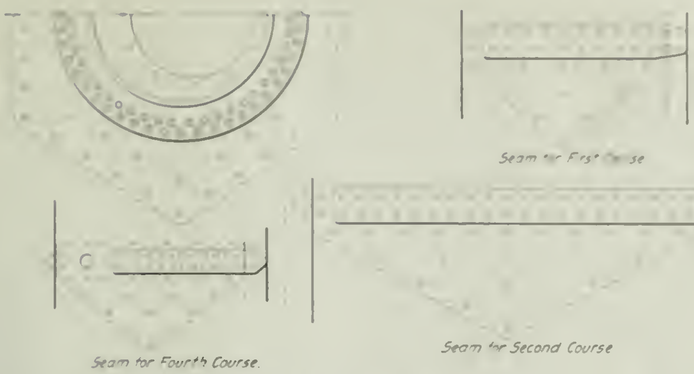
The boiler is of the straight top type, with sloping throat and back head. The barrel is built up of four rings with the seams placed on the top center line. On the third ring, which carries the dome, the seam is welded throughout its entire length on each side of the opening. The other seams are welded at the ends. All inside welt strips are of the diamond form, as frequently used by

Pacific Locomotive for the New York, New Haven & Hartford; Built by the Baldwin Locomotive Works.

Ten-Wheel Passenger Locomotive for the New York, New Haven & Hartford; Built by the Baldwin Locomotive Works.



Longitudinal Section of Boiler for Pacific Locomotive; New York, New Haven & Hartford.



Details of Boiler Riveting.

the Baldwin Locomotive Works. In this seam the outside welt is of simple rectangular form with rounded corners, while the one on the inside tapers off in diamond shape on each side, with riveting spaced at longer pitches than at the center as shown in the engraving of the boiler.

The firebox is radially stayed with the crown and sides in one piece and the outside and roof sheets also in one piece. Two rows of T irons support the front end of the crown, while flexible stays are distributed in the sides, throat and back head. The throat is of ample width and narrows down to 5 in. at the mud ring. The firebox is supported by sliding shoes in front and a buckle plate in the rear. The brick arch is supported on four tubes each 3 in. in diameter. An interesing feature of this firebox is one to which attention has often been called before, the method of distribution of the flexible staybolts. In this distribution it is customary to group them in the vertical rows at the front and back of the side sheets and across the whole length at the top, while common practice does not always put them in the back or tubesheets. In this case there is the usual grouping in the vertical rows at the front and back, while none is used in the top row for a space covered by 15 stays. On the other hand there is a single row at the side of the back sheet and in the throat sheet the four upper rows are all flexible with the exception of six scattered ones that would interfere with the attachments if they were made flexible. Attention is called to this because of the lack of uniformity of practice on different roads in this matter of the use and distribution of flexible bolts. It would appear that each responsible official is using them where it seems that they are needed, as shown by personal experience, and personal experiences evidently differ widely. It would be interesting to know to what extent the quality of the water used as well as the service demanded has upon the breakage and strain of staybolts.

The smokebox has a short extension, with an adjustable diaphragm plate in front of the nozzle, and double petticoat pipes. The stack is of cast-iron, 32 in. high. It is $15^7/_8$ in. in diameter at the choke and $17^3/_4$ in. at the top.

The cylinders are single-expansion, equipped with slide valves and lined with cast-iron bushings $^3/_4$ in. thick. They are double bolted to the smokebox and also in the vertical flanges, and are built with heavy walls and ribs to insure strength against breakage. In accordance with the most recent practice in locomotives equipped with the Walschaerts valve gear, the center lines of the ports are placed 2 in. outside the cylinder center lines, and the use of rock shafts is thus avoided. The valves are set with a constant lead of $^3/_{16}$ in.; the steam lap is $1^1/_{16}$ in., and the exhaust clearance $^1/_8$ in., while the maximum travel is $6^7/_8$ in. The links and reverse shaft are supported on a substantial cast-steel crosstie, which spans the frames between the first and second pairs of driving wheels. The radius rods are supported directly on the reverse shaft arms by means of sliding bearings, and the links are arranged with cast-steel side plates and double trunnions. Cast-steel is also used for the reverse shaft arms and eccentric cranks.

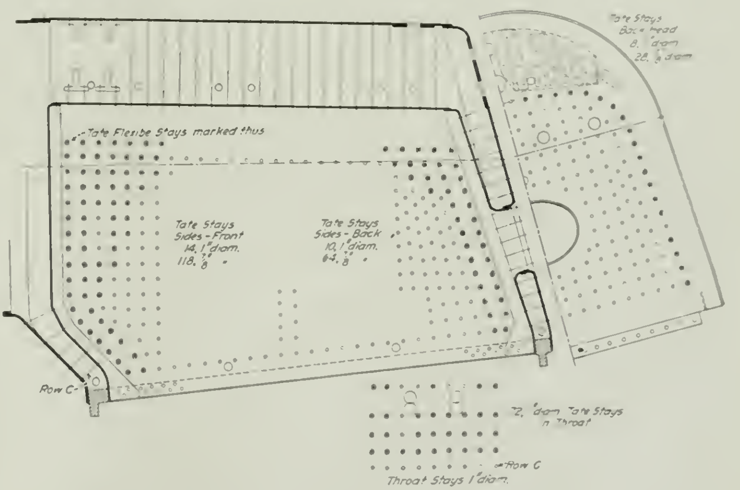
The main frames are of cast-steel with double front rails of the same material. The rear sections are in the form of slabs, [illegible] and provided with supplementary frames which are secured to the main frames by steel castings. The pedestal binders are of cast steel, and are lugged and bolted to the pedestals. The driving boxes, driving wheel centers, equalizing beam fulcrums, crossheads and foot plate are also of cast steel. The trailing truck has outside journals, and is provided with a spring centering device which is placed under the foot plate.

The tender frame is built of 10 in. steel channels, and the trucks are of the arch bar type equipped with steel tired plate wheels, cast steel and double elliptic springs.

An interesting comparison is afforded between these engines and the latest ten-wheel passenger locomotives built for this road, which were delivered by the Baldwin Locomotive Works in June, 1907. The dimensions are given in the tables, and the photograph shows the principal features of the ten-wheel engines. The superiority of the new locomotives, as far as power and capacity is concerned, is clearly indicated.

The following is the comparative table of the principal dimensions of these engines.

	Pacific (4-6-2)	10 wheel (4-6-0)
Cylinders, diameter	22 in.	21 in.
Piston stroke	28 "	26 "
Boiler, diameter	70 "	6[illegible] "
Boiler, thickness sheets	$^{11}/_{16}$ & $^3/_4$ in.	$^9/_{16}$ & [illegible] in.
Working steam pressure	200 lbs.	200 lbs.
Firebox, length	$108^1/_8$ in.	$120^3/_8$ in.
" width	$71^1/_4$ "	$41^1/_2$ "
" depth, front	$76^1/_2$ "	73
" depth, back	62 "	62
" thickness, sides, back, crown	$^3/_8$ "	$^3/_8$ "
" thickness, tube sheet	$^1/_2$ "	$^1/_2$ "
" water space, front	5 "	4 "
" water space, sides and back	4 "	3 "
Tubes, number	310	318
" diameter	$2^1/_4$ in.	2 in.
" length	20 ft. 6 in.	15 ft. 1 in.
Heating surface, firebox	186 sq. ft.	168 sq. ft.
" " tubes	3,720 "	2,497 "
" " arch tubes	29 "	....
Heating surface, total	3,935 sq. ft.	2,665 sq. ft.
" " grate area	53.5	34.7
Wheels, diameter, driving	73 in.	73 in.
" " front truck	33 "	33 "
" " rear truck	51 "	....
" " tender	36 "	36 in.
Journals, main, driving	10 x 12 in.	9 x 12 in.
" trailing driving	$9^1/_2$ x 12 "	$8^1/_2$ x 12 "
" front truck	6 x 12 "	$5^1/_4$ x 10 "
" rear truck	8 x 14 "	....
" tender	$5^1/_2$ x 10 "	5 x 9 "
Wheel base, driving	13 ft. 1 in.	13 ft. 6 in.
" engine	33 " $5^1/_2$ "	25 " 1 "
" engine and tender	61 " 2 "	55 " 1 "
Weight on drivers	134,250 lbs.	132,000 lbs.
" " front truck	48,550 "	33,950 "
" " rear truck	44,200 "	....
" of engine	227,000 "	165,950 lbs.
" of engine and tender	357,000 "	285,000 "
Tank capacity, water	6,000 gals.	6,000 gals.
Tank capacity, coal	14 tons.	12 tons.
Tractive effort	31,560 lbs.	26,688 lbs.



Details of Firebox Staying Showing Location of Flexible Stays.

Weight on drivers / Tractive effort	=	4.25	4.94
Total weight / Tractive effort	=	7.19	6.22
Tractive effort x diameter drivers / Heating surface	=	585.5	730.49
Heating surface / Grate area	=	73.55	76.80
Firebox heating surface / Total heating surface	=	4.72*	6.30
Weight on drivers / Total heating surface	=	34.11	40.53
Total weight / Total heating surface	=	57.94	62.27
Volume of 2 cylinders	=	12.32	10.40
Total heating surface / Volume of two cylinders	=	319.4	256.25
Grate area / Volume of two cylinders	=	4.34	3.34
Tube heating surface equated to firebox heating surface (Vaughan formula), sq. ft.	=	870.57	643.45
Total equated heating surface, sq. ft.		1,085.57	811.45
Total heating surface / Total equated heating surface	=	3.62	3.28

*Per cent

Certificates of Public Necessity and Convenience in Massachusetts.

Following is the report of the Massachusetts State Railroad Commission on petitions of the Boston & Providence Interurban, the Boston & New York, the Boston, Lowell & Lawrence and the Boston & Eastern electric railroad companies for certificates of public necessity and convenience allowing the construction of the lines described in their respective proposals. As the chairman of the commission, James F. Jackson is the most accomplished writer in America of lucid reports on subjects of this kind, the present report will be found of interest outside of Massachusetts.

The vigorous rivalry among four groups of promoters, each asking a special charter to authorize the building of an interurban electric railroad between Boston and Providence, and the feeling that the time had come for general legislation with reference to such railways, led to the passage in 1906 of the electric railroad act, under which these petitions are brought. Owing to the close resemblance between the new electric and the old steam railroad, the act provides that a company which desires to build an electric railroad must first secure a certificate that public necessity and convenience require its construction. This had long been the law governing the building of new steam railroads. In effect the statute declares that indiscriminate competition is undesirable, and that the resources of a monopoly, provided the management be efficient and progressive, may provide the largest and best public service; that established companies conducting their business in a proper manner are to be given a reasonable measure of protection, and that the extraordinary right of eminent domain is not to be exercised at the will of those who, professing public purposes, have in view merely private gain.

The question to be decided under each of these petitions is whether, upon the whole, the net results of a proposed undertaking promise public gain or public loss. It surely cannot be said that public necessity and convenience require the building of an additional railroad, if the effect upon existing railroads is so disastrous that the service as a whole is impaired, rather than improved. Men keenly interested in the development of interurban railroads have long had in mind an electric road between Boston and Providence. Though it must openly compete with an excellent steam railroad service, it would offer equal speed with more frequent trains and with freedom from smoke and cinders. Physical conditions are favorable for an electric road of modern type, and as matters now stand it cannot be said that the adventure would be unprofitable. Without exception cities and towns in this section welcome the new service, and no similar accommodation is offered in connection with any existing lines. The question is simply which of the two companies that desire to build shall receive the necessary certificate, for it has been taken for granted from the first that there is room for only one.

The route of the Boston & Providence Interurban is the choice of experts who in the beginning had different lines in view. Their investigation has been exceptionally thorough and their plans have on the whole popular preference in the communities that would be served. This railway would connect existing street railways with a high-speed main line, manifestly a great convenience to patrons. Home capital is largely interested in the road, and the acquaintance of the men behind it with the conditions to be met would warrant the expectation of a high standard of service. The route of the New York & Boston Electric Railroad is of recent suggestion. While this project, as the name indicates, is more ambitious than that of the Boston & Providence, its future would be far more uncertain and speculative, success being dependent upon the ability of the company to prosecute the enterprise in other states where as yet nothing of a definite or tangible nature appears to have been accomplished. In our opinion a certificate ought to be issued to the Boston & Providence Interurban Electric Railroad Company as the company by comparison is in better position to make use of it for the public advantage.

The Boston, Lowell & Lawrence Electric Railroad as planned would pass through Charlestown, Somerville, Medford and Arlington, connecting with the Boston Elevated system in Charlestown. Residents of these cities and towns earnestly remonstrate against the building of this railroad. Though these remonstrants cannot rightfully set up their local interests as an impassable barrier to all new facilities for travel between Boston and more distant cities and towns, they may reasonably ask that their interests shall not be heedlessly overridden. It cannot be gainsaid that the railroad which is proposed would interfere with important street railway extensions of the Boston Elevated system, which have long been awaited as a public blessing in these suburban towns. Are prospective benefits from the new enterprise such as to justify the sacrifice of these other public interests? New freight facilities and low fares were prominent features of the prospectus of the Boston, Lowell & Lawrence Electric Railroad. The suggestion of better freight accommodation was attractive in Lowell and would explain much of the interest in the enterprise at first aroused in that quarter; but all intention of carrying on a freight business has since been disavowed. A five-cent fare from any point in Arlington, Medford and Somerville to all parts of Boston was attractive in those communities and explains certain support secured in each; but it has since become evident that this assurance had no substantial basis. The freedom with which stations have been promised and the manner in which methods of operation have been explained challenge faith in the fulfilment of prophecies regarding train service. In general it may be said that the method pursued in placing this project before the public at different times and in different places in the early days of its promotion was notable for indifference to law and conditions and to the possibility that promises made might call for performance. Then, too, the structure which the company proposes in Sullivan square is undesirable and unsightly and the selection of that connection with the elevated system makes rapid transit improbable and aggravates conditions that already vex and menace the public at this terminal. Nor can the company build the structure which it has planned without special legislation, and such legislation has been expressly denied.

Stripped of all the glamor given it by unsubstantial proclamations there is little in the enterprise to recommend it to the business judgment of investors or to give it standing with the public: too little to warrant the exercise of the right of eminent domain or the interference with other public works that the building of such a railway would involve. The standing and character of members of the temporary board of directors who were enlisted in the undertaking cannot be challenged, and able counsel have endeavored to show substantial merit in what the company proposes to accomplish, but the more careful the study and the closer the scrutiny of the history and character of this transportation scheme the less there is found in it to call for a certificate that public necessity and convenience require it.

It does not follow from what has been said that there is no call for an electric railroad in the territory which lies to the north of Boston, and a carefully studied plan for such a railroad has been presented by the Boston & Eastern Electric Railroad Company. Existing railroad and railway companies have argued that they are now giving all needed facilities in this territory, but the argument falls short of the mark. It is true that the Boston, Revere Beach & Lynn Railroad, within the limitations of a steam railroad hampered by ferry connection, is furnishing an admirable service to and from Lynn, and that much commendation is due the management of the Boston & Maine for a service along the north shore that proves its interest in the comfort and convenience of patrons. But this is not the whole story. With all the railroad and railway lines that now serve it, this densely populated territory, especially its rapidly growing cities, needs additional facilities both for immediate use and for its development of a commercial prosperity that might be realized were larger instrumentalities at hand.

As we have before stated in criticising recent exasperating delays in the running of trains, it is apparent that railroad terminals, yards, tracks, rolling stock and motive power are to-day inadequate for the demands of traffic. With passengers and freight overtaxing present accommodation, there can be no doubt about the benefit that might be received from a quick and frequent electric service in this section of the state, a service distinctly different from any now given upon railroad or street railway. If the Boston & Maine were making, or were in a position to make, immediate and extraordinary expenditure for track extension and new equipment to meet the situation, and were ambitious to itself provide electric interurban trains, we would agree that better things for the public could be secured through the enlargement of this service than through the wasteful expedient of inaugurating competitive enterprises. It is idle to argue, however, that in the present state of affairs the service given by steam railroads and street railways is supplying the transportation facilities upon which the commercial prosperity of this section of the state must depend for a wholesome existence and growth.

Of equal importance with the recognition of an opportunity is the selection of the right way to meet it. The plan of the Boston & Eastern Electric Railroad, though carefully studied, is not satisfactory in the way it provides for Lynn, and is fatally defective at the Boston end of the undertaking, in proposing a connection with the Boston elevated railway at Sullivan square. That feature of the enterprise is absolutely prohibitive. The travel which now comes to Sullivan square as a connecting point between elevated and surface lines overloads the railway, and the relief which is promised through changes soon to be completed cannot with our consent be endangered by conducting an additional tide of travel to this point.

The Legislature of 1906 in distinguishing the new electric railroad from other railroads and railways calls for a broad outlook on the part of those who make use of it and for the adoption of a far-sighted policy that will not shrink from large outlays in bringing about the benefits that are possible under it. It would be a lamentable mistake to indorse an enterprise that fails to fully grasp the opportunity presented, and to permit the construction of a railroad which in a few years would probably be only a stumbling block in the way of carrying out larger plans for the public good. In our opinion no electric railroad can successfully reach Boston from the north that does not secure an entrance to the city independent of the existing elevated structure in Charlestown. Without intending to define any exclusive route it may be suggested that the present tunnel or a second tunnel under the harbor might well be the connecting link.

Our conclusion is that while public necessity and convenience call for enterprise in this field, the present route of the Boston & Eastern Electric Railroad does not meet the emergency. Its petition, however, is not dismissed, but held to await further study and development of plans by this or by any other public agency desirous of furnishing additional transportation facilities in this territory.

Commissioner Clark on the Freight Car Situation.*

* * * In the year ended June 30, 1896, the railroads of the United States, with 20,300 freight locomotives and 1,200,000 freight cars, moved 95 billions of tons of freight one mile. In the year ended June 30, 1900, with 21,600 locomotives and 1,365,000 cars, they moved 141⅘ billions of tons. In the year ended June 30, 1906, with 30,000 locomotives and 1,800,000 cars, they moved 216 billions. That is, in 1896 each locomotive moved 4⅔ million ton-miles, and each car moved a little less than 50,000 ton-miles. In 1906 each locomotive moved a little less than eight million and each car 120,600. Thus, the actual efficiency of each locomotive and each car was increased about 50 per cent. It may be said that the numbers of locomotives and of cars did not increase as much as they should, but in that period a very large proportion of the locomotives and cars were replaced with new ones of greater capacity, the construction of which kept builders busy.

The history of the winter of 1906 and 1907 in the Northwest is one of unheard of difficulty for shippers. Severe weather conditions added greatly to the hardships of both shippers and would-be shippers who could not get cars and also to the difficulties under which the carriers labored. And yet it was testified by a well-informed witness, who was a complainant against the carriers before the Interstate Commerce Commission, that the amount of lumber actually moved by the railroads out from the state of Washington, exclusive of movements between points in the state, was 800 per cent. greater than in 1900.

During the same season an up-to-date double-track railroad in the East became so congested with traffic that was poured in upon it from the West that its principal connection held back loaded cars until many miles of one main track were occupied with cars so held, until tracks and terminals of the delivering road could be relieved. And not long thereafter one of the states served by that road passed a law giving consignees 96 hours' free time within which to unload a car, thus doubling the delay that may be indulged in before demurrage may be assessed.

A large syndicate owning mines, smelters and a railroad, anticipating a proposed increase in the transportation charges on coke, bought up large quantities of it, had it loaded into cars and started on its way nearly across the continent. The price of copper took a bad slump, and hence the coke was not immediately needed. And so some 8,000 cars of this commodity are now, and for some two or three months have been held back by some influence other than air-brakes, accumulating demurrage against the consignees not at destination, but at various points on the lines of various intermediate carriers, not only unavailable for use of other shippers who are clamoring for cars, but actually obstructing the free movement of other traffic. These are the things that account for the low average mileage which carriers get from cars and which affect seriously the efficiency of the cars. Why should the carriers be expected to provide storage in such manner? And why should they permit one shipper to thus, through them, impose such injustice upon other patrons, to say nothing of the imposition upon the carriers, whose earnings upon the traffic will seemingly be eaten up in per diem rental on the cars?

I will not stop to suggest the multitude of smaller ways in which the same principles of selfishness and favoritism contribute to the sum total of lack of efficiency of cars and other facilities of transportation.

The whole situation has been summed up in the inaccurate phrase, "car shortage." In such blockades as have been referred to on an eastern road, how would a larger number of cars relieve the situation? As has been seen, there is a substantial portion of the year during which these troubles are not present. Manifestly if the carriers were to provide themselves with enough cars so that everyone could have all he wanted in the busy season, they must also provide corresponding motive power, terminals, tracks and extra employees. This would mean thousands of locomotives and hundreds of thousands of cars standing idle upon storage tracks (which would have to be provided) during a substantial portion of the year. It seems clear that such an increase in facilities could be had only by the expenditure of many millions of dollars, would be inexcusable economic waste and could be provided and maintained only by largely increased transportation charges. It may be that they could be provided by interring all of the carriers in the graveyard of bankruptcy, but even that would not maintain them.

The communities served by a railroad prosper and fail to prosper just as the railroad is or is not prosperous. Prosperity showered upon the community by nature and Providence brings corresponding prosperity to the railroad if it chooses to place and keep itself in a position to reap that advantage. But if a railroad upon which the community is dependent for transportation fails to furnish reasonably adequate service, the blessings of nature and Providence are to a corresponding degree nullified and wasted. It can bring no good to the community to unnecessarily or unwarrantably impoverish the railroad. It can bring no good to our country to unnecessarily or unwisely or unwarrantedly cripple these arteries of our national life upon which so much depends.

It is because of this reflection in all of our affairs of the effects of the conduct of our common carriers that it is not possible to apply, in dealing with or in regulating them, just the same business principles that apply in transactions between private parties. To hold that in collection of transportation charges the carrier should be held to the rate erroneously quoted by its agent would be to give widest license to the very discriminations which the law condemns, and would place in the hands of the carriers absolute power to make and break individuals and firms and to create and destroy communities and commercial centers almost at will, deterred only by consideration of their own financial welfare and the possibilities of construction of new and rival railroads. And like results would follow the application of the theory that the man who owns a business may do with it as he wills.

Regulation of railroads by state and national governments, each within its proper sphere and lawful limits, is essential. Such regulation must be firm, sane, reasonable and just. Those who administer it must be actuated solely by a desire and a determination to do the right thing by both sides, and must not be influenced by the clamor of the extremists on either side. In that way only can lasting good be done and substantial progress be made.

The American people will not object to paying whatever transportation charges may be necessary to permit the railroads to keep the properties up to date and to earn fair and substantial profit and return upon capital invested therein when they, the people, can feel assured that the capital is in the property and that stocks and bonds are not being added to in multiples of millions with no corresponding investment for the welfare or earning power of the property. The people will never fail to disapprove such tricks of

*Address at Chicago, Oct. 25, by Hon. E. E. Clark, member of the Interstate Commerce Commission. Addresses given by Messrs. Boyd and Hale, at the same time, were reported in the *Railroad Gazette* of Nov. 1, page 524.

high finance as have recently been exposed. The people desire and would be willing to pay for high grade and efficient service. The people must have that kind of service, and, having it, must expect to pay for it that which it is really and fairly worth.

If the railroads cannot secure the co-operation of shippers in the effort to get the highest efficiency from cars in congested seasons, and if the railroads are not strong enough to adopt and enforce adequate rules to that end, it would seem that the only thing left would be for the Federal Government to take the matter in hand as a regulation of commerce and apply such rules and practices regarding use and interchange of cars as will provide the best and most equitable service and results. In that, as in any other feature of regulation of the carriers, care must be taken to do simple and even-handed justice, regardless of what would be popular at a certain time. The carrier that has neglected to provide itself with its proper quota of cars may not expect that its needs will be supplied from the equipment of its more provident neighbor. The shipper who has neglected to provide himself with facilities for doing his business as economically and efficiently as his more enterprising competitor may not expect special consideration of his needs at the expense of others or of the carriers.

The privately owned or exclusively leased car should be eliminated from use in moving ordinary traffic. Satisfaction among shippers may not be expected so long as certain of their number are given exclusive use of facilities which the carrier should furnish to all alike and which, in fact, perhaps, are the property of the carrier. There is and probably always will be room and reason for using special and privately owned cars for certain classes of traffic which require refrigeration, tank cars, poultry cars, etc. But even then their use must be open to all and for all alike.

The railroads have upon them, and must struggle from under a heritage of woe resulting from the mistaken policies, evil practices and unreasoning competition in the past. The shippers are not blameless, and now there is nowhere to turn for relief and correction except to Government regulation.

* * * Only a year has passed since the law became effective which contemplated and which brought about more radical and sweeping changes in practices in the conduct of transportation and in the relations between shippers and carriers than any law has ever effected before. It is not surprising that the magnitude of the work so undertaken is wholly unappreciated by the average citizen. And so now we are met with many proposals for amendment to the law. No doubt some amendments would be beneficial, but it may well be doubted if it is wise to now open the law for amendment and so jeopardize all the constructive work that has been done under it, especially in view of the readiness with which the commission's interpretations and rulings are being accepted.

In some way the impression has gone out that the commission is hopelessly buried in an avalanche of complaints, and some suggestion has been made that its work should be divided. It is true that the commission has many and varied and important duties to perform, and that it has much work to do. But the commission is by no means appalled nor discouraged. Constant progress is being made. It is true that certain cases before the commission have a somewhat prolonged existence, but it is also true that it is the exception and not the rule to find parties to a case ready to proceed with it when the commission is ready to hear it. The commission pushes the cases before it much more than the cases push the commission.

If the spirit announced by a prominent railroad president* is adopted and adhered to by railroads generally, and by shippers, upon whom the obligations to observe the law rests just as clearly as upon the carriers, and the commission exercises in a broad, fair and practical way its administrative functions and powers, the occasion for judicial work will be reduced to a minimum and will be limited largely to two classes of cases—those in which honest error or oversight has worked injustice, and those involving the rivalries of commercial centers. A commission so exercising its administrative functions will acquire that special and expert knowledge which is essential to a proper exercise of the judicial functions in determining the reasonableness of a rate or of a practice.

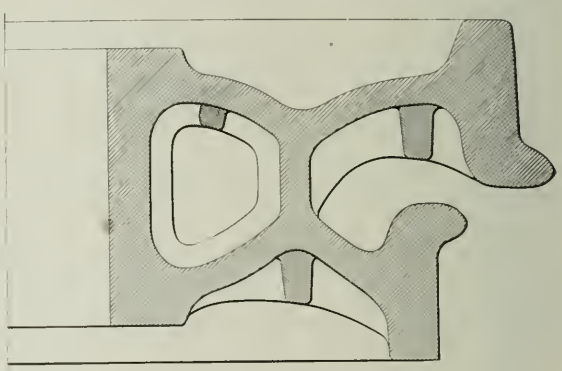
*Robert Mather, President of the Rock Island Company. His address was published in the *Railroad Gazette*, of Oct. 18.

A New Idea in Car Wheels.

A patent was granted Oct. 22, 1907, to P. H. Griffin, President of the New York Car Wheel Co., Buffalo, New York, on a double tread car wheel which is as revolutionary in design as the double plate wheel was when it was first proposed. Summed up, Mr. Griffin's purpose is to divide the destructive effects of heavy wheel loads and the wear and heating action of the brake-shoe between two substantially similar treads and thus to more than double the life of the wheel. The accompanying drawing shows the form of the double trend wheel. The outer tread, of large diameter, rolls on the rail and carries all of the load. The inner tread, of smaller diameter, is used only for braking, but like the outer tread is cast with a chill ring in the mold. The web of the wheel is made with double plates and curved brackets under the outer flange. The inner tread is supported by a single plate with brackets, springing from the junction of the double plates. This construction requires a longer hub than the ordinary double plate wheel and adds between 200 lbs. and 250 lbs. to the weight of a 700-lb. 33-in. wheel. A wheel of this design is no more difficult to cast than a single tread wheel, the brackets under the inner and outer treads being formed by dry sand pan cores. The claims allowed in the patent specification are very broad. They include all possible arrangements for supporting the inner tread integrally with the web and also provide for cast-iron center, steel-tired wheels.

The principal advantage of this construction is, of course, in relieving the rolling tread from all heating and abrasion of the brake shoe. It is generally admitted that the trouble with ordinary cast-iron wheels under high capacity cars is due largely to the increased severity of the brake-shoe action in combination with the heavier load supported by the wheel. Minute heat cracks are opened in the tread and at the root of the flange and under the action of the load stresses and the flange pressure in rounding curves, these cracks develop into fractures. Such cracks would not be started in a tread not subjected to brake-shoe heating and would not develop so rapidly in a braking rim carrying no load. There is nearly twice as much radiating surface on the double tread wheel to give off the heat generated by the brake-shoe and the temperature of the whole wheel would be lower. This in combination with the longer hub would prevent almost entirely trouble from loose wheels.

The smaller diameter of the braking tread and the narrower gage between the two treads on the same axle might be considered objectionable because they would require brake-shoes and brake-



Griffin Double Tread Cast Iron Car Wheel.

beams of different dimensions than the standards now in use. There are a number of advantages, however, to offset any such objection, in addition to the important advantage of a separate braking tread. The stiffness of a brake-beam varies as the cube of its length and a reduction of 10 in. to 12 in. in the gage of the brake-shoes would result in reducing the deflection of the beam nearly one-half under the same load. The brake-shoes are supported inside of the track rails and if they break off or the brake-beam hanger breaks the shoe will drop down on the ties clear of the rails and will not derail the car. Because of the smaller diameter of the braking tread there will be a slight gain in brake-shoe efficiency because of the lower speed of the two surfaces in contact.

Steam and Trolley in Indiana.

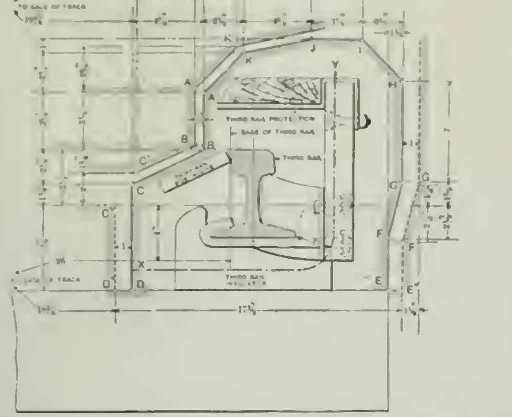
In the July number of *Appleton's Magazine*, Merrill A. Teague prints the following table showing the relative frequency of service and passenger fares of steam and electric lines in the vicinity of Indianapolis:

		1899		1906		
		Trains		By trolley		
To Indianapolis from	Miles.	Per day	Fare.	Trains.	Trains.	Fare.
Anderson	39	6	$1.10	9	20	$0.60
Muncie	54	5	1.65	7	18	.85
Marion	70	3	2.10	3	16	1.05
Wabash	90	3	2.70	3	11	1.40
Union City	85	4	2.55	6	17	1.55
Crawfordsville	43	4	1.30	4	13	.75
Lebanon	28	5	.85	5	18	.45
Lafayette	64	5	2.00	6	15	1.05
Frankfort	47	4	1.40	3	15	.75
Kokomo	54	2	1.65	3	17	.90
Logansport	77	2	2.30	3	12	1.25
Columbus	41	6	1.25	6	18	.65
Franklin	41	6	1.25	6	18	.65
Richmond	68	6	2.05	7	14	1.05

Standard Location for Third Rail Conductors.*

The committee on Standard Location for Third Rail Working Conductors submitted the following definitions of terms which were adopted by the association.

1. THIRD RAIL.—An electrical conductor placed adjacent and parallel to the track rails as a means of conducting electric current to the locomotive or cars. It is maintained in permanent relation to the tracks by suitable supports and is insulated from ground.



Clearances for Top Contact Third Rail; West Jersey & Seashore.

2. THIRD RAIL CONTACT SHOE.—A conductor attached to the car or locomotive for the purpose of collecting current from the third rail.

3. THIRD RAIL CONTACT SURFACE.—The surface of a third rail with which the contact shoe makes contact.

4. TOP CONTACT THIRD RAIL.—A third rail with the contact surface on the top.

5. UNDER CONTACT THIRD RAIL.—A third rail with the contact surface on the bottom.

6. GAGE OF THIRD RAIL.—The distance measured on the plane of the track between the gage line of the nearest track rail served to the nearest gage line of the third rail.

7. ELEVATION OF THIRD RAIL.—The distance at right angles to the plane of the track between the top of track rail and the contact surface of the third rail.

8. THIRD RAIL SUPPORT.—The support which holds the third rail in position as regards elevation and gage.

9. THIRD RAIL INSULATOR.—That part of the third rail support which isolates, electrically, the third rail from the ground, ties, track work and other grounded structures.

10. THIRD RAIL PROTECTION.—A covering employed to guard the third rail against the weather and from accidental contact of persons and material.

11. THIRD RAIL PLATFORM PROTECTION.—The guard used at low station platforms to protect the contact shoes from persons on the platform. This term applies principally to the protection along edges of platfroms when the third rail is on the opposite side of the track from the platform.

*Abstract of committee report presented at the October meeting of the American Railway Association.

12. THIRD RAIL INCLINE.—The sloping approach at the end of a section of third rail made to receive contact shoes moving in line with the third rail and bring them from their free position to contact with the normal surface of the third rail.

13. THIRD RAIL SIDE INCLINE.—The sloping approach at the side of a third rail made to receive contact shoes moving sidewise toward the third rail and guide them from their free position to contact with the normal surface of the third rail.

14. THIRD RAIL TIE.—The tie which is extended beyond the end of the standard track tie to provide a base for the third rail support.

15. THIRD RAIL ANCHORAGE.—A device that holds the third rail in position longitudinally, preventing creeping.

16. THIRD RAIL JUMPER.—A cable connecting the ends of the third rail at openings made necessary by track and road crossings or other local conditions. On surface roads the third rail jumpers are usually placed in conduit under ground.

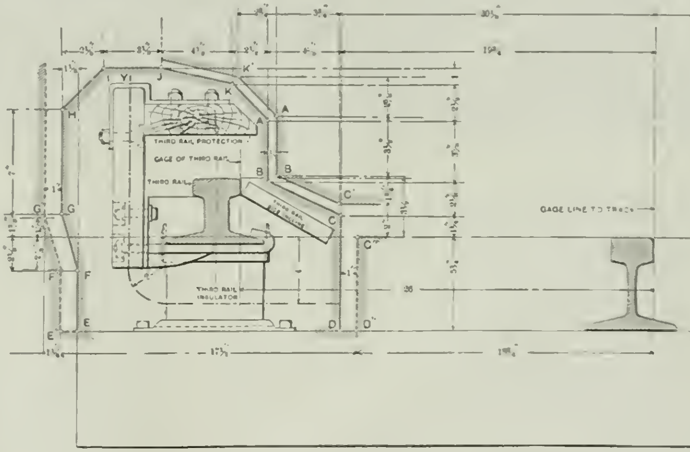
17. THIRD RAIL JUMPER HEAD.—A device placed at the end of a conduit for third rail jumper to protect and insulate the end of the conduit. This is usually an insulated structure projecting above the track ballast and from which the third rail jumper may be flexibly connected to the third rail.

18. THIRD RAIL BOND.—An electrical conductor bridging a joint in the third rail used to secure electrical continuity of the third rail.

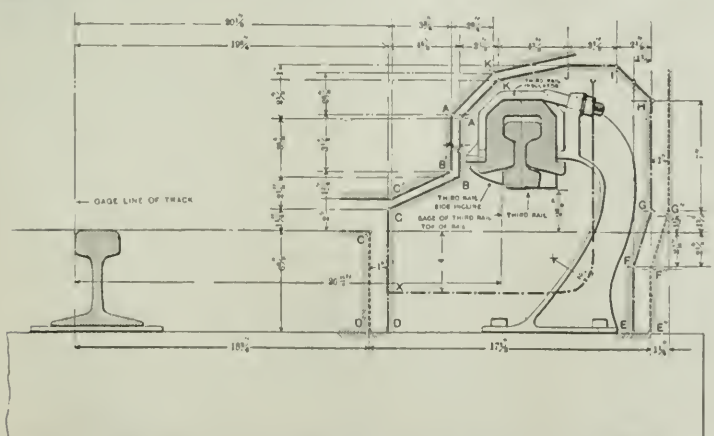
19. THIRD RAIL FEEDER.—The connection between the source of power supply and the third rail. This is usually a cable carried either overhead or in conduits underground.

The committee was also instructed to establish a standard location for third rail working conductors on electrically operated railroads for the purpose of facilitating interchange of equipment, electric or otherwise, between different roads. As the third rail must be located adjacent to the track rails, the question of interference with existing permanent way structures and with existing rolling stock is important. In order that the committee may establish a location for the third rail which will interfere least with existing equipment, diagrams were submitted for criticism showing the two types of existing third rail construction in most extensive use, i.e. the "top contact" type, as used by the Pennsylvania Railroad, the Long Island Railroad and others, and the "under contact" type, as used by the New York Central & Hudson River Railroad and others.

The line A-B-C-D-E-F-G-H-I-J-K shown thereon is the limiting line for third rail structure, and is determined by the composite sections of the different types. In preparing this outline, allowance



Clearances for Top Contact Third Rail; Long Island Railroad.



Clearances for Under Contact Third Rail; New York Central.

has been made for the variations which will necessarily occur in the alinement with respect to the gage line of the track and in the elevation with respect to the top of the track rail. These variations occur, due to the wear of the rail head and to the fact that the rail may be deflected from weight of passing equipment, between those ties which support the third rail, without equal deflection of the third rail. Another cause for variations is the wear which takes place in the tie, lowering the track rail without a corresponding lowering of the third rail. It should therefore be understood that the line A-B-C-D-E-F-G-H-I-J-K is the line beyond which the third rail structure shall in no case extend, all variations in the third rail with respect to the base line (top of rail and gage of track) being included.

The line K'-A'-B'-C', the limiting line for rolling stock, has been plotted by allowing ½ in. working clearance between this line and the limiting line of third rail structure, and it is considered that rolling equipment should under no conditions of wear or dis-

tortion due to broken springs, etc., extend beyond this line.

As the third rail contact shoe is carried on the truck, which has usually a very short wheel base, the distance from the end of the shoe to the gage line of the track is not appreciably affected by curvature of the track, and it is therefore not possible to place the third rail structure at an appreciably greater distance from the gage line of the track on curves than on tangent track. It should therefore be understood that the line K'-A'-B'-C' is the limiting line for rolling equipment on curved as well as tangent track. Allowance in equipment clearance, however, should be made for curved track, depending on the degree of track curvature and the distance between truck centers of the cars, and, to cover yard conditions, the offset of rolling equipment should be figured on curves as sharp as 20 deg. In making this allowance, the side throw of car body as a whole, due to truck bolster end movement, should be added to the total of the horizontal variations, given in the table below, and the effect determined upon clearances of such portions of equipment as steps, truss rods, hoppers, tool boxes, etc. This end movement of bolsters may be taken as 2⅝ in. for passenger, and ⅜ in. for freight equipment. It should also be noted that the third rail may be placed on either the inside or the outside of the curve.

Horizontal Variations in Rolling Equipment Should be Allowed as Follows:

Wear of axle, collars and boxes	9/16 in.
End play of brasses	1/8 "
End wear on brasses	1/4 "
Wear on wheel flange	3/8 "
Clearance between new flange and rail	3/16 "
Constructional variations	1 "
Total	2 1/2 "

Vertical Variations in Rolling Equipment Should be Allowed as Follows:

	Passenger.	Freight.
Wear of journals and brasses	3/4 in.	3/4 in.
Radial wear on wheels. (Passenger, steel tires; freight, cast iron tires)	1 1/4 "	1/4 "
Compression of springs	4 1/4 "	1 5/8 "
Sagging at center of car	1 "	1 "
Constructional variations	1 "	1 "
Total	8 1/4 "	4 3/8 "

The line C"-D"-E"-F"-G" represents what is considered the desirable clearance line for continuous permanent way structures. This has been determined by allowing a working clearance of 1 in. between it and the limiting line of third rail structures, and applies particularly to such permanent way structures as station platforms and bridge girders. As the station platforms are usually supported independently of the ties, and the third rail structure is supported by the ties, and as the ties are occasionally shifted with respect to the platforms, the considerable clearance shown is deemed necessary. All variations in the permanent way structures, due to variations in dimensions, warping or deflection of material, should be allowed for, and the results should not encroach beyond the line C"-D"-E"-F"-G", the clearance of 1 in. net being allowed for the possible subsequent shifting of the track as a whole.

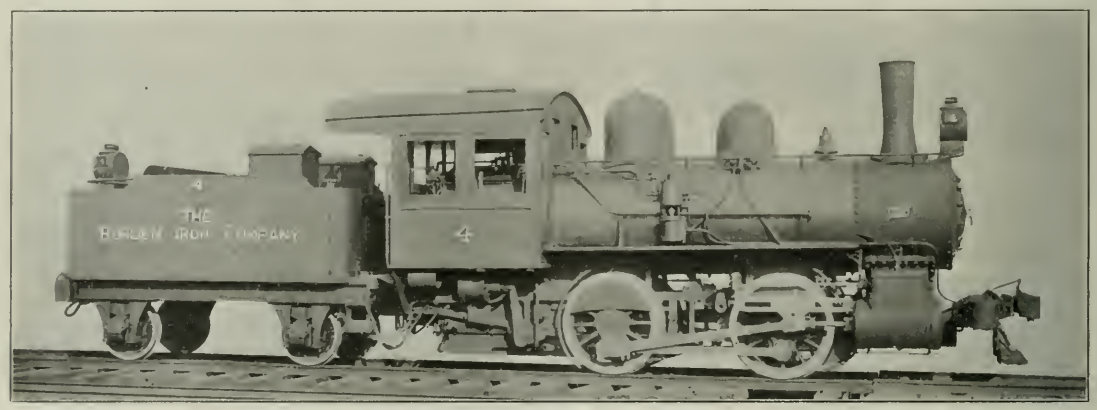
The line XY is the allowable clearance line for non-continuous permanent way structures, such as bridge gussets or other structures which are not continuous for length greater than the distance between the third rail ties or between the brackets supporting the third rail protection. In other words, it is a line to which the permanent way may project, provided it comes between the third rail supports and between the third rail protection brackets.

In the year 1906 the number of tickets sold at the stations in Berlin and its 12 suburbs was 136,000,000, 14 per cent. more than in the previous year. Many of these tickets were for two or more journeys, and the total number of journeys was 252,000,000, or about 700,000 per day, and 12 per cent. more than the year before.

Four-Wheel Switching Locomotive.

The accompanying engraving shows the general appearance of a four-wheel switching locomotive that has recently been built for the Burden Iron Co. by the American Locomotive Co. It is intended for service in the yards of the manufacturing company, and is the standard design of the builders for an engine of this type, having cylinders 16-in. diameter with 24-in. stroke. Within the past few years the American Locomotive Co. has been standardizing its designs for small locomotives, and this example is well worked out for the service for which it is intended. The four-wheel switcher has almost disappeared from the railroad yards, where heavy trains are to be handled, and is now confined, for the most part, to the yards of manufacturing firms. The wheel base is well adapted for use over light rails, a poor roadbed and sharp curves, while the adhesive weight and tractive power is sufficient to handle such loads as are likely to be encountered.

The cylinders are 16 in. in diameter by 24 in. stroke, and are actuated by Richardson balanced slide valves. The total weight



Four-Wheel Switching Locomotive; Built by the American Locomotive Co.

in working order, all of which is, of course, on the driving wheels, is 85,000 lbs. With a boiler pressure of 180 lbs. and driving wheels 50 in. in diameter, this engine has a maximum tractive power of 18,800 lbs., which, using the usual figures for resistance on the level and 20 lbs. per ton for 1 per cent. of grade for grade resistance, gives this engine a net hauling capacity exclusive of locomotive and tender on a 1 per cent. grade of 640 tons, and on a 2 per cent. grade of 330 tons. With 18,800 lbs. of tractive power, it will be noticed that the weight on drivers gives a factor of adhesion of 4.52, which is an excellent figure for an engine of this type designed for switching or industrial purposes. With a wheel base of 84 in. this engine will easily negotiate a curve of 65 ft. radius.

In this design, particular attention has been paid to securing the proper ratios between heating surface, grate areas and cylinder volume, as will be seen by a reference to those given below. With 85,000 lbs. on drivers, the engine has a load per wheel of 21,250 lbs., which can easily be carried on a 60-lb. rail. In this design the tender, which is of the "U" shape flat top type, has a capacity of 2,500 gallons of water and three tons of coal. The tender frame is built of steel channels, as will be seen from the drawing.

By changing to a wood-burning stack, the design is well adapted to logging service, as the water and fuel capacity is ample for that class of work.

The following are some of the principal dimensions of the engine:

Cylinder diameter	16 in.
Piston stroke	24 in.
Valves, travel	5 1/2 "
" lap	3/4 "
" exhaust lap	
" lead	1/16 "
Stack, diameter	14 in. & 16 7/8 "
Stack, above rail	12 ft. 10 "
Boiler, diameter	54 "
Steam pressure	180 lbs.
Firebox, length	72 5/16 in.
" width	33 1/4 "
" thickness, back sheet	5/16 "
" " crown and sides	3/8 "
" " tube sheet	1/2 "
" water space, front	4 "
" water space, sides and back	3 "
Tubes, number	178
" diameter	2 in.
" length	11 ft. 1 "
Heating surface, firebox	113.8 sq. ft.
" " tubes	1,025.2 "
" " total	1,139.0 "
Grate area	16.6 "
Wheels, diameter, driving	50 in.
Wheels, diameter, tender	33 "

Journals, driver	8 in. x 9½ in.
Journals, tender	5½ x 9
Wheel base, engine	7 ft.
Wheel base, engine and tender	29 ft. 4½ in.
Weight, engine	85,000 lbs.
Weight, engine and tender	132,700
Tender, capacity, water	2,500 gals.
Tender, capacity, fuel	3 tons
Tractive effort	18,800 lbs.
Weight on drivers / Tractive effort	4.51
Tractive effort x diameter of drivers / Heating surface	825.29
Heating surface / Grate area	68.61
Firebox heating surface / Total heating surface	10.0*
Weight on drivers / Total heating surface	71.63
Total heating surface / Volume of 2 cylinders	6.28 cu. ft.
Total heating surface / Volume 2 cylinders	181.41
Grate area / Volume 2 cylinders	2.61
Tube heating surface, equated to firebox heating surface (Vaughan formula), sq. ft.	388.0
Total equated firebox heating surface, sq. ft.	421.8
Total actual heating surface / Total equated heating surface	2.46

*Per cent.

Investigation of Steel and Structural Members by the Watertown Arsenal.

An increased governmental appropriation has been made available for the current fiscal year for the extension of the work carried on in the past at the Watertown Arsenal in the investigation of the properties of materials of construction. It is proposed to conduct this investigation along lines of the greatest practical value to users as well as manufacturers of materials. In the experimental study of steel and steel products it is proposed to begin with the metal in the ingot and thence to follow it ont to the finished sections and to built members.

By authority of the Ordnance Department, William R. Webster, consulting engineer, and Edgar Marburg, professor of civil engineering at the University of Pennsylvania, have been engaged to cooperate in the preparation of the program of tests, and in the prosecution of the work. A meeting attended, at their invitation, by about twenty-five consulting engineers and representatives of leading consuming and manufacturing interests was recently held at the Engineers' Club, New York City, for the purpose of meeting Major C. L. H. Ruggles, Commanding Officer, Watertown Arsenal, and J. E. Howard, in charge of the Watertown Testing Laboratory, with a view of determining the most desirable program for the proposed investigation. This meeting was held in two sessions.

One session, presided over by Dr. Charles B. Dudley, Chemist, Pennsylvania Railroad, was devoted to a discussion of metallurgical questions applying to ingot structure, blooms, billets, slabs and forgings, and it was the sense of the meeting that it was desirable to make a study of these questions a special feature of the proposed work.

The second session, at which J. V. W. Reynders, Vice-President Pennsylvania Steel Co., presided, was devoted to the consideration of a preliminary program for tests of structural members, including columns, riveted tension members, riveted splices, riveted connections in building construction, and the general subject of riveting.

At the opening of the meeting Major C. L. H. Ruggles, Commanding Officer U. S. Watertown Arsenal, explained that the work was not to be regarded in any sense a government investigation of steel, but that it was the desire of the Ordnance Department to utilize the increased appropriation with a view not only to the needs of the government, but also to making the results as valuable as possible to all persons interested in the subject of steel, whether as consulting engineers or as representatives of consuming or manufacturing interests.

J. E. Howard, in charge of the testing laboratory at Watertown Arsenal, presented in abstract his report to the Ordnance Department in which attention was drawn to the desirability of making provision for the extension of the usefulness of the testing laboratory, and indicating in detail numerous lines of research that might be taken up to advantage.

It was the sense of the meeting that the extension of the testing facilities in this country has not kept pace with the advance in engineering construction, and a resolution was adopted by unanimous vote that the enlargement of the present facilities at the U. S. Watertown Arsenal by the erection of a testing machine of at least 10,000,000 lbs. capacity was desirable. It was also decided to authorize the Chairman, Dr Charles B Dudley, to appoint two committees, subject to the approval of the Watertown authorities, one on Ingot Structures, Billets, Blooms, Slabs and Forgings, and the other on Tests of Structural Materials. These committees have since been appointed and much preliminary work has already been accomplished, which will be submitted at an early date to the engineering profession for criticism and suggestions.

The Bureau of Explosives.*

This bureau has been organized in pursuance of action by the American Railway Association at the March, 1907, meeting, and already has a membership of 78 railroad companies, operating 130,026 miles.

Major B. W. Dunn, detailed from the Ordnance Department, U. S. A., began his duties as chief inspector of the bureau on June 11th, Mr. C. P. Beistle having begun work as chemist about a month previous to that date, and Mr. J. L. Taylor, who has had broad railroad experience, was temporarily taken on to assist in getting the work started.

Arrangements were made with the Pennsylvania Railroad Company to furnish a site and erect thereon a building for the laboratory at South Amboy, N. J., and at this date the laboratory is nearly ready for occupancy. The site chosen is easily accessible, there being quite a number of trains each way daily, connecting with New York and Philadelphia, both by the Central Railroad of New Jersey and by the Pennsylvania Railroad, and at the same time the location of the building is far enough away from surrounding property to be entirely safe and to offer ample facilities for experimental tests of dangerous articles.

Local inspectors have been appointed in the manner provided for by the constitution and by-laws, and have begun their work under the supervision of the chief inspector. The total number of local inspectors authorized to date is 12, and the number in actual service at the present time is eight. As soon as practicable four additional inspectors will be placed on duty.

The method adopted is to begin with lines that, having factories located upon them, handle a large volume of shipments of explosives. Under the direction of the general managers, the local inspector makes a general inspection of factories and magazines, and of the principal stations, transfer stations and junction points, where shipments of explosives are handled. All violations of regulations observed are reported by the local inspector to the proper official of the line and to the chief inspector.

Upon completion of this general inspection, the chief inspector compiles, for the information of the general manager, a condensed report of the more important violations reported and the action taken by the local inspector to secure correction.

The local inspector is then transferred to another locality and, pending the inauguration of a second inspection, the enforcement of these regulations is left to the officials of the line with the exception that, in case of emergency, an inspector is always available for temporary duty.

Experience teaches that constant inspection on all lines is more than desirable, and, as the work develops, it will be for the members of the bureau to decide whether they will authorize that material increase in the expense of the bureau that will be necessary to enable it to take entire charge of inspection work.

It is believed that the work of the bureau will be of great value to the association, and especially to its own members. As the result of practical experience, a large amount of valuable information, leading toward greater safety in the transportation of explosives, has already been obtained.

Based partly on this information, and partly on the fact that owing to the large number of interpretations which have necessarily been made of the regulations for the transportation of explosives adopted by the association, it has been deemed wise to revise those regulations, and present them for your consideration. The development of the explosive business is very rapid, and new questions are constantly coming up. A number of points have already been found in which the old regulations are defective. The amount of work involved in this revision of the regulations is so great that, although your committee, with the chief inspector, have devoted two meetings to the subject, in addition to the time spent individually over the printed matter, the regulations are not yet deemed sufficiently perfect to be submitted to you for adoption. It has, accordingly, been deemed advisable to present them as proposed regulations, and to ask for criticisms of them by the members of the association.

Special attention is invited to Rule 106 relating to the precautions deemed necessary in accepting shipments of explosives from connecting lines that have not made due provision for enforcing

*From a report of the committee on transportation of explosives to the American Railway Association, Oct. 30, 1907.

the regulations. To prescribe and publish regulations is not sufficient to insure their enforcement. As practice is corrected and improved on lines which are members of the Bureau of Explosives, it is to be anticipated that inspection of shipments, offered at junction points, will be more rigid and rejections for failures to comply with the regulations will increase. This may produce considerable local friction, and the only satisfactory remedy will be found in a uniform enforcement of the regulations by an extension of the inspection facilities and other assistance that are offered by the Bureau of Explosives to all members of the association.

The reports of the local inspectors of the bureau show that the regulations are not properly enforced at the present time, and there is reason to assume that it is only on the lines of members of the bureau that improvements are in progress.

Attention has been attracted to the large number of distributing magazines in various parts of the country from which reshipments of dynamite and other dangerous articles may be made. Such reshipments are more liable to involve defective material than are the original shipments of freshly made explosives offered by the factories.

As an example to show the necessity for competent inspection over non-membership lines, attention is invited to those distributing magazines which have been found to contain deteriorated and dangerous explosives and whose location permit them to make shipments of such explosives over several lines, including members and non-members of the bureau. The inspectors of the bureau have reported a number of such cases, and its members have been duly warned and protected. A dangerous shipment, once en route, may result in widespread danger and disaster in spite of careful handling.

A great deal of progress has been made in securing the co-operation of manufacturers in the difficult task of enforcing the regulations. All permanent reforms in their practice must be based very largely on this co-operation.

A revised list of the manufacturers of explosives in the United States, arranged according to location on railroads, and so far as it has been possible to secure the correct data, has been prepared by the chief inspector.

A start has been made toward providing regulations for the transformation of inflammables and other dangerous articles, and a copy of proposed regulations is likewise submitted herewith for your criticism and suggestion. These regulations may require some modifications before they are quite ready for final action. It is hoped that each member of the association will feel sufficiently interested to carefully study both sets of proposed regulations, and to send their criticisms at an early date to the Secretary, Mr. W. F. Allen, 24 Park place, New York City.

Lack of space prevents us from republishing the interesting circular which follows in its entirety, especially since it is readily obtainable by those interested, and is, at present, only recommended practice. We wish to reprint the following portions, however, to illustrate the principles which governed the committee in its work, and the care with which that work was done.

REGULATIONS FOR THE TRANSPORTATION OF EXPLOSIVES.

General Notice.

1. The safe transphrtation of explosives is largely influenced by the manner in which they are made and packed for shipment, as well as by the careful and intelligent handling of them by railway employees. Information in regard to the kind of explosives is necessary so that railway employees may not ignorantly incur danger or endanger lives or property.

2. Shipments made by the United States Government will be accepted upon the certificate of an army or navy officer or duly authorized non-commissioned or warrant officer, or civilian employee of the Government, that the shipments are made in accordance with United States Government regulations, including limitations of weight, for which the form of certificate entitled "United States Government Certificate of Explosives Offered for Transportation," will be used and kept on file. All the following regulations, provided for other shipments, must be observed for Government shipments except as to packing and weights.

3. Other explosives, except such as are forbidden, will be received for transportation on the ..... on and after ..... 190..., provided the following regulations are complied with, and provided their method of manufacture and packing, so far as it affects safe transportation, is open to inspection by a duly authorized representative of this company or of the Bureau for the Safe Transportation of Explosives and other Dangerous Articles.

4. All explosives, in the form of powder or grains, containing no liquid ingredients, must be packed for shipment in "double packages." The inner package must be securely closed and made of such material that it will prevent leakage of the explosive even if any ordinary defect or injury should develop in the outer package.

Standard Test for all Double Packages.

5. When fine sand, filling the interior package, is substituted for the powder and the complete double package is dropped in any manner from a height of four feet on a steel rail, neither package must rupture nor must any of the sand escape.

Connecting Lines.

6. Shipments of explosives destined to points beyond the lines of this company will only be accepted subject to these and any additional regulations of the roads over which the shipments are to be moved. Shipments offered by connecting lines will be received subject to the following regulations:

Classification.

7. For transportation purposes, all explosives are divided into the following groups:

1. Forbidden Explosives.
2. Common Black Powder.
3. High Explosives.
4. Smokeless Powders.
5. Fulminates.
6. Ammunition.
7. Fireworks.

SECTION I—INFORMATION AND DEFINITIONS.

Group 1—Forbidden Explosives.

See Rules 24 *to* 26.

8. The following are forbidden explosives:

(*a*) Liquid nitro-glycerine.

(*b*) Dynamite, containing over 60 per cent. of nitro-glycerine (except gelatine dynamite).

(*c*) Dynamite containing an unsatisfactory absorbent.

(*d*) Nitro-cellulose in bulk, in a dry condition.

(*e*) Fulminate of mercury in bulk, in a dry condition, and fulminates of all other metals in any condition.

Group 2—Common Black Powder.

See Rules 27 *to* 31.

9. Common black powder embraces all explosives having the constituents of ordinary gunpowder or similar in composition. This group includes rifle, sporting, blasting, cannon and the prismatic powders.

SECTION II—RULES.

Group 1—Forbidden Explosives.

24. Forbidden explosives must not be accepted for shipment.

25. Should any packages of high explosives, when offered for shipment, show excessive dampness or be mouldy, or show outward signs of any oily stain, or other indication that absorption of the liquid part of the explosive is not perfect, or that the amount of the liquid part is greater than the absorbent can carry, the packages must be refused in every instance and must not be allowed to remain in the property of the company.

26. Station agents should know that a shipment of leaking dynamite is liable to cause a disaster in spite of careful handling; and that storage, especially in warm and damp magazines, tends to cause leakage. They must for this reason examine with more than usual care all shipments not offered by factories, especially shipments that have been stored during the summer months, as shown by dates of manufacture.

Group 2—Common Black Powder.

27. Packing—Packages containing less than twenty (20) lbs. of rifle, sporting, blasting or cannon powders must be enclosed in a tight wooden box so that the filling holes of the packages will be up. If the small packages comply with paragraphs 4 and 5 a strong crate may replace the box.

28. Twenty (20) lbs. or over of common black or brown powder must be packed as prescribed by paragraphs 4 and 5.

29. Weight—Packages containing over 125 lbs. net will not be received.

30. Marking—Each exterior package must be plainly marked "COMMON BLACK POWDER," or "BLACK POWDER," or "BROWN POWDER." Additional marks, trade names, etc., may appear if desired by shipper.

31. Car—A car containing shipments exceeding 50 lbs. gross weight must be certified and placarded as prescribed by paragraphs 91 and 92.

Group 3—High Explosives.

32. No high explosives containing over 60 per cent. of nitro-glycerine, or an unsatisfactory quality or quantity of absorbent material, will be received. The 60 per cent. limit does not apply to gelatine dynamite. Explosives like Rack-a-Rock, one constituent of which is liquid, will be accepted if the liquid is not explosive and is not packed in the same boxes with the other constituent.

33. High explosives consisting of a liquid combined or mixed with an absorbent material must have the absorbent material, in sufficient quantity and of satisfactory quality, properly dried at the time of mixing; and the ingredients must be uniformly mixed so that the liquid will remain thoroughly absorbed under the most trying conditions incident to transportation.

34. Explosives containing nitro-glycerine must have uniformly mixed with the absorbent material a satisfactory antacid having, at least, the acid neutralizing powder of an amount of magnesium carbonate equal to 1 per cent. of the nitro-glycerine.

35. Packing—High explosives, containing more than 10 per cent. of nitro-glycerine, must be made into cartridges not exceeding 2 in. in diameter, or 8 in. in length, and must not be packed in bags or sacks. Bags or sacks of high explosives containing not more than 10 per cent. of nitro-glycerine and not over 12½ lbs. each of explosive, will be accepted as cartridges. The covering of all cartridges, consisting of paper or other material, must be so treated that it will not absorb the liquid constituent of the explosive.

36. All boxes in which nitro-glycerine explosives are packed must be lined with a suitable material that is impervious to liquid nitro-glycerine. Cardboard cartons closed at the bottom and coated with paraffine form a satisfactory lining. Dry sawdust or similar material must fill all the space in the box not occupied by the cartridges. These cartridges, except the bags or sacks authorized in paragraph 35, must be so arranged in the boxes that when they are transported all cartridges will lie on their sides and never on their ends.

37. The boxes must be strong and, when made with lock corners, the lumber throughout must be free from loose knots and not be less than ½ in. in thickness. When nailed boxes are used, the ends must not be less than 1 in., nor the sides, top and bottom less than ⅛ in. in thickness. The limits for thickness refer to the finished box and not to the undressed lumber. A box must not be too large to be handled readily by one person.

38. High explosives not containing an explosive liquid ingredient and not having a sensitiveness to percussion greater than measured by the blow delivered by an 8 lb. weight dropping from a height of seven (7) in. on a compressed pellet of the explosive .03 in. in thickness and .2 in. in diameter, held rigidly between hard steel surfaces, as in the Standard Impact Testing

Apparatus of the Bureau of Explosives, may be securely packed in bulk in double packages that will stand the test prescribed in paragraph 5. These explosives may also be packed in cartridges.

(c) Nitro-cellulose.—Packages containing not more than 1 lb. of dry nitro-cellulose, wrapped in strong paraffine paper, or other suitable spark proof material, will be accepted for shipment if securely packed in double packages that will stand the test prescribed in paragraph 5.

(d) Weight.—Packages containing over fifty (50) lbs. net of cartridges will not be accepted. For explosives defined in paragraph 88, when packed in bulk, the net weight in one package must not exceed 125 lbs. One box must not contain more than ten (10) lbs. of dry nitro-cellulose.

41. Marking.—The boxes must be plainly marked on top and on one side or end "HIGH EXPLOSIVE—DANGEROUS." On the top must appear "THIS SIDE UP," and a diagram showing the position of the cartridges in the boxes. Boxes containing nitro-glycerine explosives must also be marked on one side to show plainly (not in cipher) the date of manufacture and the percentages of nitro-glycerine and of wood pulp, or of other non-deliquescent absorbent.

42. Car.—For shipments of high explosives exceeding 50 lbs. in gross weight, the car must be certified and placarded as prescribed by paragraphs 91 and 92.

43. Wet Nitro-Cellulose.—Nitro-cellulose, uniformly wet with not less than 25 per cent. of water, wrapped in water-proof material, securely packed in a strong and tight wooden box containing no other explosive and marked "WET NITRO-CELLULOSE—25 PER CENT. WATER," will be received for transportation without other restrictions than a limit of 220 pounds for gross weight. Nitro-cellulose uniformly wet with not less than 30 per cent. of a volatile solvent, such as fusel oil, or alcohol of any kind, must be packed in strong galvanized iron vessels of the milk can type, with a satisfactory means for keeping them hermetically sealed. Packed in this way it will be transported under the restrictions that apply to packages containing dangerous inflammable liquids. It must be marked "WET NITRO-CELLULOSE—INFLAMMABLE LIQUID."

SELECTION AND PREPARATION OF CARS.

86. For the transportation of common black powder, or smokeless powder for small arms, or high explosives, or fulminates in bulk, or blasting caps—all in quantities exceeding fifty (50) lbs. gross weight—or explosive projectiles, or detonating fuses in any quantity—only certified box cars in good condition (see paragraph 88), or not less than 60,000 lbs. capacity, must be used. Steel underframe box cars or other cars with friction draft gear must be used whenever practicable.

87. Shipments of a combined gross weight not exceeding fifty (50) lbs. may be transported, when properly stayed and protected from injury, in box cars that comply with paragraph 89, and such small shipments will not require a placard on the car. This relaxation of precautions is authorized, however, solely to decrease the number of placarded cars and with a view to more rigid general enforcement of rules for handling cars containing the more dangerous shipments.

88. Certified cars (see paragraph 86) must be as follows:

(a) Equipped with air-brakes and hand-brakes in condition for service.

(b) Must have no loose boards or cracks in the roof, sides or ends.

(c) The doors must shut so closely that no sparks can get in at the joints, and, when necessary, they must be stripped. The stripping for Wagner doors should be on the inside and nailed to the door frame where it will form a shoulder against which the closed door is pressed.

(d) The journal boxes and trucks must be carefully examined and put in such condition as to reduce to a minimum the possibility of hot boxes or other failure necessitating the setting off of the car before reaching destination. The car must be carefully swept out before it is loaded.

(e) Holes in the floor or lining must be repaired and special care taken to have no projecting nails or bolts or pieces of metal which may work loose and produce holes in packages of explosives during transit.

(f) When the car is to be fully loaded with explosives, or when explosives are loaded over the draft bolts or king bolts, these bolts must have short pieces of hardwood, 2-in. plank, spiked to the floor over them to prevent possibility of their wearing through the floor and into the packages of explosives.

(g) The roof of the car must be carefully inspected from the outside for decayed spots, especially under or near the footboard, and such spots must be covered to prevent their holding fire from sparks. A car with a roof generally decayed, even if tight, must not be used.

(h) Agent or inspector must examine each car, see that it is properly prepared, and sign a "Car Certificate" upon the prescribed form (paragraph 91) before permitting the car to be loaded.

89. Small arms ammunition or smokeless powder for cannon, or gun ammunition with empty projectiles, or primers, percussion or combination fuses, or fireworks, may be loaded in any box car in good condition, into which sparks cannot enter and whose roof is not in danger of taking fire through unprotected decayed wood. These cars may be transported without being certified and placarded as prescribed by paragraphs 91 and 92.

PLACARDING OF CARS AND CERTIFICATION OF CONTENTS.

90. Uniform practice is important, and the prescribed forms of car certificates, placards and shipper's certificates must be used.

91. Car Certificates.—The following certificate, prescribed by paragraph 88 (h), must be signed by the car inspector before loading and by the shipper, or the railway agent, who inspects the loading and staying of packages. It must be made out in triplicate, one copy to be filed at the receiving station, and the other two to be attached to the car, one on each side, and not less than 4½ ft. above the floor level.

.....It....

CAR CERTIFICATE.

.....Station.....190....

We hereby certify that we have this day personally examined ..... car No. ..... and that the roof and sides have no loose boards, holes or cracks; that the doors close so tightly, or have been stripped so that sparks cannot get in at the joints; that the king bolt or draft bolts are properly protected, and that there are no bolts or nails projecting from the floor or sides of the car which might injure packages of explosives; also, that the floor has this day been cleanly swept before the car was loaded, and that we have examined all the axle boxes and that they are properly packed and oiled, and that the explosives in this car have been loaded according to paragraphs [illegible] of the Regulations for the Transportation of Explosives (General Notice No.).

.....

Car Inspector. Inspector of Loading and Staying.

NOTE.—For all shipments loaded by the shipper he or his authorized agent, must sign this certificate as Inspector of Loading. The shipper should decline to use a car not properly prepared. A car inspector who is also the inspector of loading will sign twice.

92. Placard.—Each car containing any of the explosives specified in paragraph 86, and in the quantities specified (the limit applying to the aggregate gross weight), must be protected by attaching to both sides and ends, not less than 4½ ft. above the car floor, a placard 16 x 18 in., on which will appear in conspicuous red and black type, on strong white paper, the following:

.....It....

EXPLOSIVES.

HANDLE CAREFULLY—KEEP FIRE AWAY.

.....Station. .....190...

This car must not be moved in a train carrying passengers, and, if for through road movement, must not be handled in the local freight trains.

Through Road Trains.—Not more than three (3) cars containing explosives will be handled in a train for through road movement, and they must not be placed closer than five (5) cars from each other.

Unless length of train will not permit, this car must not be closer than fifteen (15) cars from the engine or ten (10) cars from the caboose.

This car must have air-brakes and hand-brakes in service, and be placed between box cars in good condition with air-brakes in service. The cars between which it is placed must not be loaded with oil or other inflammable material, charcoal, lumber, iron, pipe or other articles liable to break through end of car from rough handling. If this car has a steel underframe it may be placed between steel coal cars.

Shifting and Local Freight Trains.—Shifting and local freight trains may handle more than three (3) cars of explosives per train, provided they are coupled in the air service and placed as near the center of train as possible and every precaution taken to insure safety.

Handling in Yards.—When handling cars containing explosives in yards or placing them on sidings they must, unless it is practically impossible, be coupled to engine protected by a car between, and the cars not cut off while in motion. When this is not possible in placing cars, the hand-brakes must be examined and known to be in perfect working order. Other cars must not be allowed to strike a car containing explosives. This car must be so placed in yards or on sidings that it will be subject to as little handling as possible and removed from all danger from fire.

Agents at destination and transfer stations must see that these cards are removed from car as soon as the explosives are unloaded.

93. The agent will be held responsible if a car containing any of the explosives (as prescribed in paragraph 86) leaves his station or a siding within his jurisdiction without having the certificates and placard prescribed in paragraphs 91 and 92 securely and properly affixed.

94. Shippers' Certificate.—Before any package containing one or more of the following articles: Black or Brown Powder, High Explosives, Wet Nitro-Cellulose, Smokeless Powder for Cannon, Smokeless Powder for Small Arms, Fulminates, Small-Arms Ammunition, Ammunition for Cannon, Explosive Projectiles, Detonating Fuses, Blasting Caps, Primers, Percussion or Combination Fuses, Common or Special Fireworks, can be accepted the shipper must deliver to the receiving freight agent a duly executed certificate on the prescribed form. The shipper must obtain these forms from the station agent, who must keep an adequate supply on hand.

SHIPMENTS FROM CONNECTING LINES.

106. Cars offered by connecting lines, not known to have adopted and made due provision for enforcing these regulations, will be thoroughly inspected and if it be found that either the car or its lading is not in the condition required by these regulations, the car will not be received until the defects are corrected by the line offering it.

HANDLING OF EXPLOSIVES.

107. In handling packages of explosives at stations and in cars, the greatest care must be taken to prevent their falling or getting shocks in any way. They must not be thrown, dropped nor rolled on the platform or car floor, but must be either carried by one or more men or handled on trucks well adapted to this service, and in such a way that the packages cannot fall.

108. The agent must choose careful men to handle explosives, must see that the platform and feet of the men are as free as possible from grit, and must take all possible precautions against fire. No unauthorized person must have access to the explosives at any time while they are on the property of the company. Suitable provision must be made for the safe storage of explosives and every effort possible must be made to reduce the time of this storage. Prompt removal by consignees must be enforced.

LOADING IN CAR.

109. Boxes of high explosives must be loaded in the car, top side up, so that the cartridges will be on their sides and never so that the cartridges will be on end.

110. All other boxed explosives must be loaded with the boxes top side up. Explosives packed in round kegs, except when boxed, must be loaded on their sides in rows across the car if there is more than one tier. Larger casks, barrels or drums may be loaded on their sides or ends as will best suit the conditions.

111. Whatever the kind or form of the packages, after they are loaded they shall be so stayed by whomever loads the car that they cannot change position under the ordinary shocks of transportation. Special care must be

used so that they cannot fall to the floor or have anything fall on them during transit. Shippers must furnish the lumber and labor required for staying all shipments loaded by them, and this lumber should not be less than two (2) inches thick, except in cases where this thickness is manifestly not required.

112. Detonating fuses and blasting caps must not be loaded in a car or stored with high explosives of any kind, including wet gun cotton, nor with smokeless powder for small arms.

113. Fulminates in bulk must not be loaded with any explosive or inflammable material.

114. When necessary, detonating fuses may be assembled in explosive projectiles shipped by the Government.

115. Fireworks must not be loaded in the same car with any other explosive or inflammable substance, except small-arms ammunition, safety fuse and safety squibbs.

116. With the exceptions noted in paragraphs 112, 113 and 115, packages of explosives may be loaded in the same car.

117. No inflammable substance, including nitro-cellulose wet with an inflammable liquid, and no shipment of an acid or of other chemicals, must be placed in a car containing explosives of any kind, or stored on railway property near an explosive. When practicable, special and separate days should be assigned for receiving shipments of explosives and of inflammables respectively. Samples for shipment to the Chemical Laboratory, Bureau of Explosives, should be accepted at any time.

118. In a car containing explosives, all packages of other freight must be so loaded and stayed as to prevent all injuring of packages of explosives during transit.

Handling Cars Containing Explosives.

119. Cars containing explosives must not be hauled in a train carrying passengers.

120. The conductor must under no circumstances take a car containing explosives from a station, including transfer stations or a siding, unless it is properly carded as per paragraphs 86, 91 and 92, and unless the car appears to be in first class condition. He must also have in his possession the special card way bill for explosives, paragraph 102, showing record of movement of car over his line.

121. The conductor must in all cases notify the enginemen and trainmen that a car containing explosives is on the train and where it is in the train before leaving the initial station.

122. Conductors must frequently inspect such cars to see that the carding is intact. When any of these cards become detached or lost in transit, the conductor will give notice thereof on arrival at the next division terminal yard to the yardmaster or other person in charge, who must attend at once to recarding the cars as required.

123. When such a car is destined to be transferred, unloaded or stored for any purpose at a given junction, station or yard, the conductor must give due notice to such station by wire of the probable time of arrival and the number of cars (not car numbers), in order that proper provision may be made at that point for handling the car or cars.

124. At points where trains stop, trainment must examine cars carded as containing explosives and adjacent cars to see if they are in good condition and free from hot boxes or other defects liable to cause damage. If cars are set off short of destination for any cause, the conductor must notify the nearest agent, who must see that every precaution is taken to prevent accident. The conductor must also notify the superintendent from the first telegraph office.

125. Whenever a car containing explosives is opened for any purpose, inspection must be made of the packages of explosives to see that they are properly stayed and in good condition, and that no boxes of dynamite are standing on end. Upon the discovery of leaking dynamite or loose powder the defective packages must be removed to a safe place by careful handling. If necessary, place the car carefully on an isolated siding and notify superintendent by wire.

126. In a through train, a car carded as containing explosives must be placed as near center of train as possible, and not closer than fifteen (15) cars from the engine or ten (10) cars from the caboose, unless length of train will not permit; it must have its air-brake and hand-brakes in service and be placed between cars with air-brakes in service. It must be placed between two box cars in good condition not loaded with oil or other inflammable material, lumber, iron, pipe or other articles liable to break through end of car from rough handling. Cars containing explosives must not be placed in a train within five cars of each other, and not more than three such cars must be placed in any one train. For branch lines special regulations will be made by individual lines and only necessary departures from these regulations will be authorized. See paragraph 92.

127. If the car containing explosives is a steel under-frame car in first-class condition it may be placed between two coal cars.

128. Handling in Yards.—In handling cars carded as containing explosives in yards or placing them on sidings, they must, unless it is practically impossible, be coupled to the engine protected by a car between, and the car must not be cut off while in motion. It must be known that the hand-brakes are in good condition. Other cars must not be allowed to strike a car carded as containing explosives. They should be so placed in yards or on sidings that they will be subject to as little handling as possible and removed from all danger of fire.

129. Agents at destination and transfer stations must see that the certificates and placards prescribed in paragraphs 91 and 92 are removed from car as soon as the explosives are unloaded.

Distribution of Regulations.

130. Agents must furnish all the shippers of explosives within their territory with copies of these regulations, and the receipts of the shippers must be mailed to the Division Superintendent.

In Case of a Wreck.

131. In case of a wreck involving a car containing explosives, the first and most important precaution is to prevent fire. Although most of the group, "high explosives," will burn in small amounts quietly, and without causing a disastrous explosion, yet it must be remembered that it is the characteristic of most explosives to burn, and consequently everything possible must be done to keep fire away. Before beginning to clear a wreck in which a car containing explosives is involved, all unbroken packages should, if possible, be removed to a place of safety, and as much of the broken packages as possible gathered up and likewise removed. Furthermore, it should be borne in mind that many "high explosives" are readily fired by a blow, and many explosives, except when they are wet, by the spark produced when two pieces of metal or a piece of metal and a stone come violently together. In clearing a wreck, therefore, care must be taken not to strike fire with tools, and in using the crane or locomotive to tear the wreckage in pieces, the possibility of producing sparks must be considered. With most explosives thorough wetting with water practically removes all danger of explosion by spark or blow; but with the dynamites, wetting does not make them safe from blows. With all explosives, mixing them with wet earth renders them safer from either fire, spark or blow. In case "fulminate" has been scattered by a wreck, the ground involved after the wreck has been cleared should have the top surface removed and after saturating the area with oil, replaced by fresh earth. If this is not done, when the ground and fulminate get dry, small explosions may constantly occur whenever the mixed material is trodden on or struck.

RULES FOR TRANSPORTATION OF INFLAMMABLE MATERIALS.

Section I—Rules for Shippers.

1. It is the duty of the shipper to deliver his goods properly manufactured, packed, marked and labeled, and to permit any inspection of his works by duly authorized railway officials deemed necessary to check the proper performance of this duty. The bill of lading prepared by the shipper should also give complete information as to the nature of the material in his shipment. For example, the word "Cement" does not properly describe a shipment consisting of "Rubber Cement—Volatile Liquid."

Labels.

2. All exterior packages containing inflammable materials or acids, including tank cars, must have securely and conspicuously pasted on them when presented for shipment a label of diamond shape. In pasting his label on tank cars the shipper must be careful to remove the old label. The color of the label will be red for packages in Group 1, yelow for packages in Group 2 and white for acids.

3. With these rules as a guide, shippers will have no difficulty in reaching a prompt and accurate decision as to the proper label to apply to a given package; and they will appreciate the importance of the label when informed that rules are based on them for the guidance of railway employees in handling, storing and loading packages protected by them.

4. Any deception, by a shipper or his agent, consisting in a misrepresentation of the nature of his shipment, by the use of the wrong label, or otherwise, and for any improper purpose, will be prosecuted under any law applicable to the offense.

5. Each label must bear the signed, stamped or printed name of the shipper, or of a party or firm for whom the shipper has assumed the responsibility in writing, as an assurance that the shipper has complied with these regulations. Blank labels will be supplied by station agents, or shippers may have them printed for their own use.

CLASSIFICATION OF INFLAMMABLES.

Group 1—Volatile Liquids.

6. This group includes any cement, drier, lacquer, paint, paste, solvent, varnish or any other compound or mixture that gives off inflammable vapors (as determined by the "open test" known to all chemists) at or below a temperature of 100 deg. F.

Some examples of substances that may place any mixture containing one or more of them in this group are:

Acetone.	Ether.
Alcohol, Amyl.	Fusel Oil.
Alcohol, Grain.	Gasolene.
Alcohol, Wood.	Naphtha.
Benzine.	Petroleum Ether.
Benzole.	Tar, Coal, Undistilled.
Bisulphide of Carbon.	Toluol.
Coal Tar Naphtha.	Turpentine.
Crude Oil.	Xylol.

Cylinders Containing Inflammable Compressed Gases.

Packing for Group 1.

7. All materials must be packed in strong and tight barrels or preferably in metal drums or vessels, and all packages must be securely closed.

8. Packages must not be entirely filled. Sufficient interior space must be vacant to permit expansion of liquid and vapor, and prevent distortion of containers.

9. A red label, of diamond shape, measuring 5¾ in. on each diagonal, and bearing the following inscription in black letters, will be pasted on each exterior package that contains any interior package belonging to this group: [Caution Label omitted.—Editor.]

Group 2—Inflammable Solids.

10. This group includes all materials subject to spontaneous combustion; or liable to cause fires when packages containing them are ruptured; or of a highly inflammable nature when ignited. The following list shows prominent examples, but is not intended to be complete:

Barium Peroxide.	Phosphorus, Yellow.
Calcium Carbide.	Potassium Chlorate.
Cotton Waste (oily).	Potassium Permanganate.
Matches, Friction.	Potassium Peroxide.
Metallic Sodium or Potassium.	Celluloid.

Packing for Group 2.

11. Packages must be tight and strong, and the interior packages must

be so cushioned and secured that no rupture of either package can result from the ordinary shocks incident to transportation.

12. A yellow label, of diamond shape, measuring 5½ in. on each diagonal, and bearing the following inscription in black letters, will be pasted on each exterior package containing one or more packages belonging to this group, and no package belonging to other groups. [Caution Label omitted.—EDITOR.]

GROUP 3—ACIDS

13. This includes the liquid mineral acids, that may cause fires or damage other shipments, and consists principally of the following:

Hydrofluoric Acid.	Sulphuric Acid.
Hydrochloric Acid.	Nitric Acid.

PACKING FOR GROUP 3.

14. Hydrofluoric acid in india rubber or ceresine bottles, hermetically sealed, or in lead carboys, packed in strong cases, barrels or casks, or acid may be packed in tight hardwood barrels lined with asphaltum. Barrels to be painted on outside with acid-proof paint, securely hooped and carefully inspected by shipper.

15. Sulphuric or hydrochloric acids in earthen jars, or glass bottles, or carboys, all hermetically sealed. Jars or bottles must be packed in a strong case and well cushioned; carboys must be packed in special cases provided with strong handles.

16. Nitric acid of gravity below 1.48 must be packed as prescribed for sulphuric or hydrochloric acid, except that the bottles, jars or carboys must be well cushioned by elastic incombustible dunnage. When the gravity is above 1.48, the bottles, jars or carboys must, in addition to the elastic dunnage, be surrounded by an equal volume of incombustible absorbent material.

17. Mixed nitric and sulphuric acids may be packed as prescribed for nitric acid, or shipped in strong iron drums or tank cars.

18. A white label of diamond shape, measuring 5½ in. on each diagonal and bearing in black letters the following inscription, will be pasted on each exterior package containing an acid of this group: [Caution Label omitted. EDITOR.]

SECTION II—CAUTIONS AND RULES FOR RAILWAY EMPLOYEES.

PACKAGES OF INFLAMMABLE LIQUIDS PROTECTED BY RED DIAMOND LABELS.

1. Leakage forms gas that may be ignited by a flame of match or lantern.

2. L.C.L. lots of explosives and inflammables should be received on different days. Return to shippers all packages of inflammables not properly labeled.

3. Must never be stored nor loaded in car with explosives, nor with valuable freight; when necessary, may be loaded with packages protected by yellow diamond labels, kerosene oils, etc.; but, as a rule, try to keep these packages separated from all other inflammable articles.

4. Packages must be loaded in car so that all labels of diamond shape, and especially the red ones, are as conspicuous as possible to freight handlers.

5. Load in box cars in good condition, but clear the doors back six inches for ventilation.

6. When practicable store these articles away from other freight in stations and on platforms. Replace lost or detached labels.

7. If necessary to enter at night a placarded car, use electric light only. Station agents will keep portable electric lanterns on hand when other electric lights are not available.

8. Enforce prompt removal by consignee.

9. Upon detection of any strong odor, similar to that of gasoline or of alcohol, seek the broken package and remove it, but do not search at night with lantern. If necessary, place guard on car to keep lanterns away.

The Action of Sea Water on Concrete.

A committee of the Superintendents of Bridges and Buildings Association reporting on the above subject sent a circular letter to members asking information on the following points:

1. Concrete made in air and sunk into sea water.
2. Concrete deposited direct into sea water.
3. What effect has the rise and fall of tide water on concrete?
4. What effect has the frost on concrete where the tide rises and falls on same?

A New York member wrote:

1. Where there is no ice formation, concrete, if made in air with fresh water and then sunk into sea water works well, but shows a tendency to disintegrate slightly on the faces between low and high water levels.

2. I would not deposit concrete direct into sea water. Where the salt water permeates the whole mass of concrete the faces disintegrate faster than where the concrete mixed with fresh water is made in air and then sunk into position in the sea water.

3. Between low and high water the faces of the concrete show a tendency to disintegrate.

4. Where there is severe cold and a large ice formation concrete exposed to the rise and fall of the tide will disintegrate on the exposed faces; (in my experience to a depth of ⅛ in. to ¾ in.). If this disintegrated portion is faced up with cement mortar each spring there will be no further trouble until the ice goes out the next winter. Bridge piers and abutments should be built from about 2 or 3 ft. below extreme low water to the top of the masonry, of granite ashlar dressed smooth on the faces exposed to the ice and salt water and backed with concrete.

Another New York member wrote:

1. Mix it dry and put it through chutes into the water; never mix with water before putting into bed.

2. Concrete deposited into sea water will be covered under 'I. In the vicinity of New York there is very little of this done, most of the concrete handled at this point is made into blocks and sunk to the depth required and handled by divers. This seems to be the better method and gives more satisfaction than trying to put it in in any loose form.

3. The rise and fall of the tide seems to have no effect whatever on the concrete blocks when placed as mentioned above. The frost does not seem to have any appreciable effect on the concrete. Very often granite blocks are placed above the substructure of granite blocks, as granite is known to be much stronger than concrete. In places where foundations are on a slope concrete filled in bags are sunk, which makes a very solid foundation.

A Boston member says:

2. So far as I know this gives perfectly satisfactory results if the material and method of work are right. The cement should contain not over 2 per cent. sulphuric tri-oxide and a low content of magnesia; the sand should be good and crushed stone should be used rather than pebbles; the mixture should be not leaner than 1:2:4, and it should be deposited either with a tube or a bucket on the O'Rourke pattern, which opens wholly inside the bucket, making practically a closed tube for the concrete to drop through. In using a tube the first charge is bound to be washed, hence it is best to begin operations each morning out in the area well away from the forms, so as not to have washed concrete on the outside of the mass when finished. This is difficult to impress on the workmen, as they always want to start operations at one corner. At times there is trouble from the milk of lime, which is too heavy to float away in the water. If it collects more than about 3 in. thick, it should be pumped off or otherwise disposed of; it will not harden, and if covered into the mass will make a weak section. If concrete is properly deposited in pure sea water it sets even stronger than in air, but I prefer to have a stone masonry facing between high and low water. If concrete is exposed to the sun's action between tides it must be extraordinarily good to withstand the combined action of all the forces acting to disintegrate it. An example given as successfully deposited under water, is shown on pages 60 and 61, Proceedings of our association for 1901. There are a large number of piers around Boston built similarly to this, and there has been no failure or trouble with them due to lack of integrity of the concrete. Above low water the pier is faced with stone. Attention is always given to the chemical constitution of the cement used, and it is tested for soundness in sea water by the so-called barrel test. This consists of placing a small barrel in a large cask filled with sea water, and then filling the small barrel with cement through a small tube. After 24 hours the cask is dumped and the barrel cut off from the concrete. If the cement is suitable to use, the concrete will be quite hard and will require a pick to break it up. Analysis for sulphuric acid should accompany this test, as the barrel test alone will not prove durability. A remarkable instance of concrete made in air and sunk into sea water (item 1) has just been executed at Brunswick, Ga., where reinforced concrete piles 18 in. square, 41 ft. long, tongued and grooved, have been placed for a pier facing. These are rodded back to a double row of timber piles and the pier is filled solid with earth. Timber fender piles are driven in front of the concrete face to take the blows from vessels. The concrete piles are sunk by water jet through a pipe cast in the center of the pile.

The report states that all of the replies seem to agree that concrete should be faced with granite above low water, as the rise and fall of the tide has a tendency to disintegrate the concrete. Also that frost and ice formation, where tide rises and falls, has a greater tendency to disintegrate the concrete. A number of structures of concrete in tide-water in the vicinity of Boston were examined and in every structure disintegration was taking place with more or less rapidity between high and low water, in some cases, notably the arches under the piers at Charlestown Navy Yard, this disintegration being to such an extent as to seriously affect the stability of the work. The committee is informed that this disintegration was considerably more rapid in cold weather when frost was experienced that at other times, although disintegration occurs even in warm weather. In some cases the concrete scales off in quite large patches, but in most of these cases it comes out in small particles, so that the stones which form a part of the concrete were left projecting from 1 in. to 2 in. beyond the general surface, or until such time as the weight of the stone would offset what little holding power remained to the concrete at the inner point of the stone. The same trouble occurs with granite above low water. Several places examined showed the mortar had disappeared in the joints and had to be repointed after three or four years.

A concrete pier on the Providence river, at Warren, R. I., was built about 25 years ago with a mixture of sand and cement of about 1 to 3. This concrete is in a good state of preservation, except between high and low water, where it is worn away in places from 4 to 8 in., which looks as if it was done more by the current and ice as the tide ebbs and flows, than by the combined action of frost and tide water rising and falling. The current at this point

runs at about the rate of eight miles per hour, which is pretty fast, and causes quite a whirlpool as it passes the pier. The granite abutments mentioned above, where the pointing was all gone between high and low water, was near this place, above high water the pointing was in good condition.

It is the opinion of the committee that Item 2 is the cheapest and best method of sinking concrete into sea water, and if properly mixed with proper material and properly handled and faced with granite above low water, with a suitable number of headers to make the granite masonry firm, it will do good service. Also that it would add to the stability of the granite if the joints were calked with lead.

The report is signed by G. Aldrich, Chairman; Willard A. Pettis, Geo. W. Andrews and John E. Barrett.

Some Early Royal Railroad Journeys.

BY W. B. PALEY.

The connection of royalty with railroads in Great Britain is of very old standing and certainly does not tend to diminish as time goes on. In fact, it began so soon as the first line of any considerable length was completed. On September 17, 1838, the section of the London & Birmingham Railway between Denbigh Hall, near Bletchley, and Rugby was brought into use and the great work finished after more than four years of unparalleled toil and difficulty. On that day a special train conveying the directors, Robert Stephenson and others, left Euston for Birmingham at 7.15 a.m. Among the passengers was H. R. H. the Duke of Sussex, the Queen's uncle, who took much interest in scientific developments of all kinds. He was attended by a small suite and had with him two private carriages on trucks, but left the train at Rugby to proceed by road to Newstead Abbey, in Nottinghamshire. Contemporary accounts say that the Duke was "introduced into the spacious area and anxiously watched the operation of arranging the order of the carriages." It is further stated that he "appeared throughout the whole of the journey to be highly delighted with railroad traveling," which must have been extremely gratifying to the directors! From the guard's journal, quoted by *The Times*, it appears the engine was taken on at the top of the rope-worked incline at Camden (Chalk Farm) at 7.20 and Tring reached at 8.25. Water was taken here, and the engine changed at Wolverton at 9.16. The new piece of line, for 30½ miles further, was run over so cautiously that Rugby was not reached till 11 o'clock.

It is not recorded that King William IV. ever traveled by rail, but his widow, the Queen-Dowager Adelaide, first did on Oct. 15, 1839, when she went from London to Rugby by the 12 o'clock ordinary train. When returning, however, on Nov. 30 a special train of seven coaches was used, the journey of 83 miles being made in 2 hours 50 minutes. As "some unavoidable delay occurred in passing the 10 o'clock up train at Tring," and the engine was probably changed at Wolverton, this must have been decidedly a fast run for those days. The vehicle used by the Queen-Dowager is still preserved at Wolverton. It is not really a "saloon," however, in the modern sense, but merely a three-compartment first class of the type then used on the mail and express trains, with two ordinary compartments and another "coupé," that is, with only one seat and having windows in the front. It was run over many lines on Queen Adelaide's numerous visits to the nobility in the early forties.

The late Prince-Consort seems to have made his first railroad journey in England on Nov. 14, 1839, at the conclusion of his second visit. Accompanied by his elder brother, he traveled from Slough to Paddington by the Great Western, continuing his way by road to Dover. No particulars of the trip are given in the papers, but after his marriage to Queen Victoria the following year the Prince frequently used the railroad, and, in fact, seems to have preferred it to the uninteresting journey by road. On Sept. 21, 1840, he had a fast run up. A special had been kept in readiness, the Princess Augusta, aunt of the Queen, being on her death-bed in London. The train left Slough at 3.06 p.m. and reached Paddington 3.28½, the 18 miles being run in 22½ minutes, or at the rate of 48 miles per hour. It consisted of an open-sided carriage containing "two old and experienced guards for the purpose of using the break in case of need," and the new saloon just built for the Queen's use. The engine was the "Sun," a 6-ft. "single" of Hawthorn's design, just built by them at Newcastle-on-Tyne. Including the drives at each end, the Prince reached Buckingham Palace in 59 minutes from leaving Windsor.

One of the most famous broad-gage runs made by Prince Albert in those days was on July 19, 1843, when returning from witnessing the launch of the "Great Britain" steamship at Bristol. According to the diary of Sir Daniel Gooch, the trip of 118 miles was done in 124 minutes. This may have been the actual running time, though if it was there must have been much delay somewhere, but the diary is not very trustworthy, and *The Times*' statement that the Prince left Bristol at 4 p.m. and reached Buckingham Palace at 7.15 is far more likely to be correct.

The Great Western had been open between London & Slough for about four years before Queen Victoria ventured upon it, or indeed upon any railroad. In this, possibly, she was guided by the advice of others, and for some time, too, there was no proper station at Slough. However, on June 13, 1842, the Queen made her first railroad journey. Accompanied by Prince Albert she left Slough by special train at 12 noon and reached Paddington at 12.25, Mr. Daniel Gooch, as Locomotive Superintendent, driving the engine "Phlegethon." Brunel also was on the foot-plate, in fact, for many years one or both of them was on the engine of the Royal special on the G. W. R.

Having satisfied herself by personal experience of its comfort and safety the Queen soon entrusted her family to the care of the rail. On Saturday, July 23, 1842, she left Paddington about 3.40 p.m. with Prince Albert, the Princess Royal and the Prince of Wales. The train consisted of four vehicles, namely, the usual open-sided second class, followed by two firsts with the Royal saloon between them, and 'the Mentor engine having been attached to the train the signal was given and the royal party were quickly out of sight." It is further stated that "Her Majesty and Prince Albert appeared much pleased with the animated scene they beheld." This was the first railroad journey made by the present King, who was at the time only eight months old. Both "Phlegethon" and "Mentor" were 7 ft. "single driver" engines of Gooch's design, similar to the one illustrated in the *Railroad Gazette* of January 8, 1904.

More than a year elapsed after this before Queen Victoria traveled on the narrow-gage, as it was then termed. The occasion was a journey to Southampton, on August 28, 1843. Farnborough was the point at which the railroad was taken, after a drive of 15 miles from Windsor. Prince Albert went with the Queen, the trip of 45½ miles being run in 81 minutes without a stop. The train, consisting of five vehicles, was worked by a new engine named "Elk," and left Farnborough at 9.19 a.m.

Royal Saloon at Slough Station, 1842.

The Prince of Wales, now King Edward, made his first journey on what is now the standard gage on Sept. 10, 1844. Traveling up to Paddington by the Great Western, the party, consisting only of the royal children under the care of the Dowager Lady Lyttelton, drove by Bramhall Bridge to New Cross station, where they took train for Brighton. The special arrived at 5.45 p.m., the engine being driven by Mr. Benjamin Cubitt, the head of the Locomotive Department. The object in going to New Cross was to avoid the dangerously narrow and crowded streets that then existed near London Bridge station.

It is remarkable, however, that the first railroad journey made in this country by a crowned head was run, not by our own sovereign, but by a foreigner. This was on January 24, 1842, when the King of Prussia, Frederick William IV., who had come over to attend the christening of the Prince of Wales, went up to London by the Great Western for a day's sight-seeing. We are indebted to the *Great Western Railway Magazine* for the illustration.

The average annual mileage of freight cars on the Prussian railroads is stated as follows:

	Miles.		Miles.		Miles.
1851—1860.....	9,247	1881—1890.....	9,832	1901—1905.....	10,384
1861—1870.....	9,750	1891—1900.....	10,251	1905.....	11,127
1871—1880.....	9,186				

Allowing 300 working days in a year, this gives for the year 1905 37 miles for the average daily travel per car loaded or empty.

GENERAL NEWS SECTION

NOTES.

The Pennsylvania now has about 1,000 acres of forest under cultivation, containing 2,250,000 young trees in addition to the seed planted.

The Fall River Line, between New York and Boston, has made its usual autumn reduction in the through fare, which is now $2.65, instead of $3.65.

The Baltimore & Ohio is now using fuses with two colors. They burn red five minutes and then five minutes green. Heretofore the company has used fuses burning red ten minutes.

The New York State Public Service Commission, second district, has summoned the railroads of the state to show cause, November 25, why an order should not be issued requiring the sale everywhere of interchangeable 1,000-mile and 500-mile tickets at 2 cents a mile.

The railroads of Chicago have decided to no longer furnish men to assist consignees in unloading those classes of carload freight which, by the terms of the traffic, are required to be unloaded by the consignee himself. It is estimated that in the city 300 railroad employees have constantly been employed in this kind of work.

The New York, New Haven & Hartford has proposed to its western connections that it will pay 50 cents a day for foreign cars, provided the connections will accept enough New Haven cars to make the interchange equal, and also that the New Haven be allowed $1 a car reclaim, this reclaim to be in the nature of an allowance for the two days' additional free time which it is necessary to give consignees in Connecticut under the law of that state.

In the Federal Court at Little Rock October 25 the suit for an injunction to prevent the Railroad Commission of Arkansas from enforcing the flat cotton rate was dismissed. By a compromise, offered by Commissioner Allen, the railroads may charge a minimum of 50 cents on cotton hauled from one to 15 miles, instead of 25 cents, as originally set by the commission. The compromise carries with it the agreement of the various railroads to continue the concentration rate and to allow the shipper to choose what rate he prefers at any time. Thus is settled a serious controversy.

The Texas State Railroad Commission reports the mileage traveled on free passes over Texas railroads in the year ending June 30, 1907, as follows: Exchange, 21,062,065, or 17.02 per cent. of total free travel. By employees and members of their families, 81,307,345, or 65.69 per cent. of free travel. On account of newspaper advertising, 5,866,836, or 4.73 per cent. of free travel. By public officials of United States, state, county and municipal governments, 7,968,421, or 6.44 per cent. of free travel. By other persons, charity, religious, etc., 7,569,895, or 6.12 per cent. of free travel. Grand total, 123,774,562 miles traveled free, or 11.66 per cent. of the entire travel in the state.

Press despatches from St. Paul say that the shortage of freight cars in the Northwest has now become acute. Although the railroads have bought large numbers of new engines and freight cars during the past year, and although 500 new grain warehouses have been built in Minnesota and North and South Dakota, the increase in population has more than kept pace with these improvements, so that hundreds of shipments of merchandise are now from four to six weeks behind time. Much freight for the East is being transferred so as to insure the retention of home cars at home. At Buffalo, N. Y., all the eastbound roads are reported short of cars. Traffic in the city has become so heavy that a blockade is on, though as yet it is small, as compared with last year. At Chicago the railroads are strained to their utmost to handle freight without delay. Not only is there a larger grain movement than usual at this season, but there is a heavy traffic in live stock, coal and merchandise.

At Seattle, Wash., October 31, the Pacific Coast Lumber Manufacturers' Association secured from the Federal court a temporary injunction against the increase of 25 per cent. in through eastbound rates on lumber, which had been announced by all the railroads and which was to go into effect November 1. In consequence of the court's order the Northern Pacific has announced that no more lumber shipments will be received for the East until further notice. This move is expected to be followed by all the railroads affected by the injunction. The decision requires shippers to give bonds to pay the increased rate, if it shall hereafter be decided to be just, but the roads claim that they would be taking too great a risk to allow the excess freight charges to accumulate until a final decision is made. Litigation will ensue and many of the lumber firms may have gone out of business before the legality of the rate is settled. Another contingency the railroads have to face is the law providing that all rates must be published and posted thirty days in advance. In case they decide to go back to the old rate they cannot do it now without such notice.

Merchants' Despatch Absorbed by N. Y. C.

The New York Central & Hudson River Railroad announces that it has leased the Merchants' Despatch Transportation Company, and henceforth that name, like the names of other fast freight lines, will be only a form for use in advertising. The Merchants' Dispatch was organized in 1856, and is believed to be the oldest organization of its kind in the country. Primarily, it was a soliciting agency, employing agents of its own, and paying commissions to the local freight agents of the railroads, to secure competitive westbound freight. Later it built large numbers of cars, and the management of these cars became a chief part of its business. Many of these cars were refrigerators, for use in carrying eastbound freight, and the profits from car rentals constituted the main part of the company's income. Claims for loss, damage and overcharge on freight will hereafter be settled by the individual roads. No change has been announced in the soliciting agencies.

New York-Boston Steamers.

The Metropolitan Steamship Company has discontinued for the winter its through 15-hour all-water passenger line between New York and Boston. This line, which was operated by the turbine steamers "Harvard" and "Yale," had been running only six weeks. The gossips are undecided whether this sudden cessation of business is due to an agreement with the New Haven road or to a lack of profitable patronage.

The Joy Line has been bought by the United States Transportation Company, operating the Neptune Line. The United States company was formed early this year under Connecticut laws, with $750,000 capital, and its two boats plying between New York and Fall River were purchased from the New England Transportation Company. The new company is looked upon as a New Haven railroad concern.

"Mauretania" 27.36 Knots.

The new Cunard turbine steamship "Mauretania," on a trial November 5 off the Irish coast, made an average of 27.36 knots (31.5 miles) an hour over a 300-mile course. This is nearly one knot faster than the "Lusitania" made for the same distance on her trial. The "Mauretania" is due to arrive in New York for the first time November 21.

A Hundred-Ton Wagon.

J. A. Shephard & Son, of Brooklyn, N. Y., have built what is believed to be the most powerful wagon-road truck ever constructed. It was built especially to carry the heavy iron girders and columns for the new Pennsylvania Railroad terminal in Manhattan and has a capacity of 100 tons. It is owned by the Meade Transfer Company. The wheels are 3 ft. in diameter, with tires 14 in. wide, and are made of cast-steel. They weigh 3,000 lbs. each. The front axle is 14 in. in diameter in the center and 7 in. at the ends. The rear axle is smaller. These axles weigh about one ton each. The reach is 37 ft.

Panama Canal Record in October.

The Washington office of the Panama Canal reports that in the month of October 1,844,471 cu. yds. were dug from the prism of the canal, an increase of more than 23 per cent. over the quantity excavated in September. The rainfall in October was 17.1 in. In the same month 24,258 cu. yds. were excavated on accessory works.

Protection of Track Circuits from Foreign Currents.

Henry Bezer, whose invention for insuring the safety of automatic block signal operation by neutralizing the effect of stray electric currents in the rails has been in use on the Central of New Jersey for 15 months, has made a radical improvement in his designs, and the improved apparatus is to be put in use on a section of the Cincinnati, New Orleans & Texas Pacific, as well as on another section of the Central of New Jersey. In this latest arrangement the track circuit of a given block section has a battery at the outgoing end, as usual, and at both this end and at the entrance of the section there is an arrangement of special relays by means of which a vibrating current is temporarily produced each time the signal is to be cleared. The signal cannot clear unless an instrument at the track battery end of the block, vibrating at the rate of about two vibrations per second for from 3 to 6 sections, operates the circuit; and when a train is in the block the instrument does not vibrate. There is therefore next to no wear and tear upon contacts. The system is so arranged that the signal is held clear by a direct cur-

rent which follows in and takes the place of this temporary intermittent current. A foreign current, whether direct or alternating, could not produce the vibrations necessary to operate the relays.

The relays will operate with the track battery generally in use, but for the sake of smart vibration Mr. Bezer plans to use 2 volts.

From the exhaustive tests which have been conducted on the Central of New Jersey, it is practically certain that with the new arrangement 2 volts of track battery will be sufficient to combat foreign currents usually met with on steam roads, with the track and the insulated joints kept in reasonably proper condition. That is to say, 2 volts will be sufficient to prevent foreign current holding a signal in the stop position. But whatever the strength of the track battery, neither neglect in track maintenance, nor a broken rail, will enable foreign current to clear a signal. Means are provided also to prevent foreign current from causing the track relay to hold its armature when a train enters the block either from a siding or from the track-battery end.

The installation already in service on the Central of New Jersey is "wireless" and the signals stand normally at clear. A brief description of this was given in the *Railroad Gazette* of January 18, last. With this installation, which is still in service, it is necessary that the maximum foreign current be ascertained and that the apparatus be adjusted accordingly; and in order to give adequate protection in case of a broken rail or adverse traffic conditions, a powerful track battery has to be used. With the intermittent current arrangement now to be used, a foreign current is inoperative, whatever its power, and without regard to whether it is direct or alternating.

By the use of this apparatus and arrangement, the employment of an alternating current is made unnecessary, and it is thus possible to avoid the cost and inconvenience of a power house and long stretches of copper conducting wire, with the increased chances of failure which are inseparable from the added complication.

Steam Consumption in a Curtis Turbo-Generator.

In a paper read before the American Street & Interurban Railway Engineering Association, A. H. Kruesi gave the results of tests at Chicago with a Curtis turbine coupled to a 9,000 k.w. generator. The steam consumption of the turbine per horse-power hour, at the ratings given, was as follows:

Rate	Steam consumption, per h.p. hr.	Rate.	Steam consumption, per h.p.-hr.
7,200 h.p.	9.81 lbs.	16,125 h.p.	9.74 lbs.
10,814 "	9.70 "	18,625 "	10.15 "
13,650 "	9.62 "		

In which it appears that the steam consumption increased as the power varied in either direction from the normal rating of 13,000 h.p.

Engineering Societies' Libraries.

The reference libraries of the American Institute of Electrical Engineers, the American Society of Mechanical Engineers, and the American Institute of Mining Engineers, at the Engineering Societies' building, 29 West Thirty-ninth street, New York City, will hereafter be open evenings until 9 o'clock on all week days except public holidays. These libraries are available to members of the above societies, to engineers and to the public generally, subject to proper regulations. Strangers are requested to bring letters of introduction from members or to secure cards from the secretaries of the respective societies.

Adams Express Company.

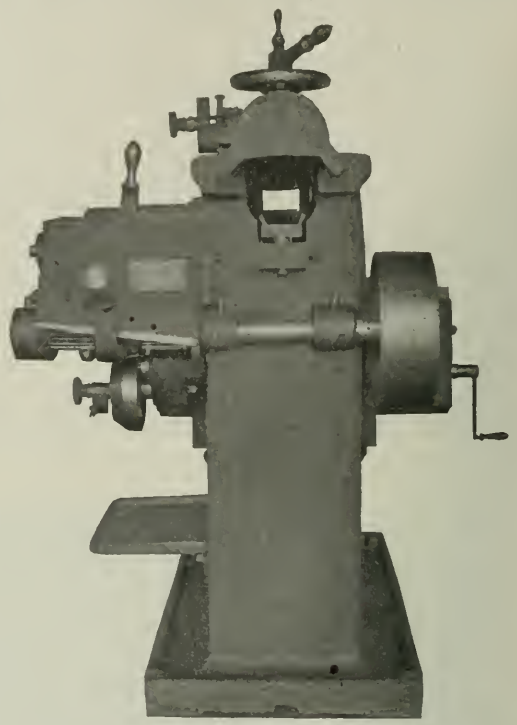
W. W. Barrett, Resident Manager of the Adams Express Company at Philadelphia, Pa., has been elected Vice-President in charge of the territory east of Pittsburgh, Pa., with office at New York City. H. E. Hoff, Superintendent at Baltimore, Md., succeeds Mr. Barrett. G. B. Curtis, Superintendent at Columbus, Ohio, has been appointed General Manager in charge of the territory west of Pittsburgh, with office at Chicago. This is a new office, the work having heretofore been in charge of Vice-President W. H. Daniels.

Reason and Red Tape Coincide.

Army or navy officers desiring to make use of the fastest trains between New York and Chicago must themselves pay the additional rate charged for riding on such trains. A paymaster's clerk received orders to take station at Bremerton, Wash., and he traveled on one of the "flyers" and paid $7 over the usual rate. His orders made no mention of any need for unusual haste, and in the adjustment of his accounts the extra rate was deducted. The regular overland trains are fast enough to transport officers from one point to another unless they receive specific orders to the contrary. The clerk asserted that he did not know when he purchased his ticket that he was entitling other than a first-class ticket, but his duties, it is held, should make him more particular [intelligent?] in his business transactions.—*New York Tribune.*

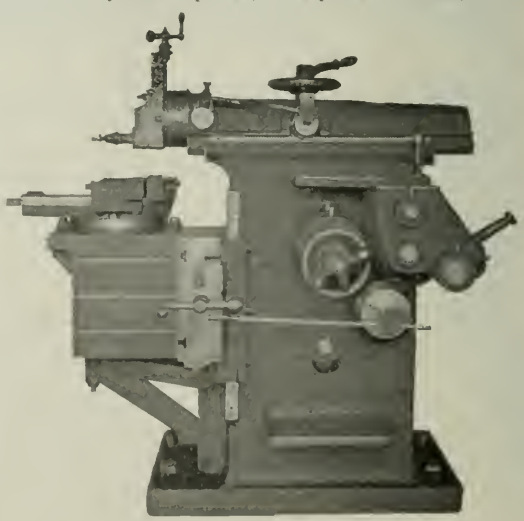
A New Flather Shaper.

The accompanying engravings show a new 16-in. shaper built by the Mark Flather Planer Co., which embodies several improvements. The ram bearings are of an entirely different type from those furnished on shapers heretofore, in that the alinement is



Rear View of Flather Shaper, Showing Gear Box.

maintained by means of the V-way, and that gibs have been entirely eliminated, while at the same time provision has been made for taking up wear. The ways are oiled by a V spring oiler, such as is ordinarily used on planers, and wipers are furnished for both



Side View of Flather Shaper.

ends of the ram bearings. The gear box is designed for heavy duty. All gears are made of steel cut from bar stock and each gear is cut with a cutter made to the exact number of teeth. Ten changes of speed are secured.

The machine is driven by a 4-in. belt and is ordinarily fur-

nished with a tight and loose pulley to be belted directly from the main line. This avoids the necessity of mounting a counter shaft on the ceiling, and at any future time the shaper can be equipped with a motor drive by simply attaching the motor to the rear of the column and connecting the driving shaft with suitable gears.

This shaper is furnished with power down feed of a new design. It may be made to feed either down or up and its construction makes it impossible for the feed attachment to get out of order or wear out. The support for the box table which is furnished with each machine, is always in position and needs no adjustment.

The Sherwin-Williams Convention.

The Sherwin-Williams Paint Co. held in Chicago last week its twenty-seventh annual convention of officers and representatives, more than 250 of which were in attendance from all parts of the world. The meetings were held at the company's plant at Pullman, there being two sessions a day from Monday to Friday inclusive. At each session there was an address on some matter of special importance to the sales representatives. These conventions serve the dual purpose of a school of instruction and of bringing these men into closer relationship with each other and with their officers. Prizes are awarded to the men having the best records. The program for the week was as follows:

Monday Morning, Oct. 28.—Reception from 8.45 to 9.15 a.m. Address of welcome by W. H. Cottingham, Vice-President and General Manager. Address by S. P. Fenn, Secretary and Treasurer. Distribution of "top-notcher" and other prizes. Inspection of Chicago plant.

Monday Afternoon.—"The Fundamental Principles Governing the Right Use of Paint," by J. C. Beardslee, General Superintendent. "The Fundamental Principles Governing the Right Use of Varnish," by M. L. Sims, General Superintendent of varnish manufacturing department.

Tuesday Morning, October 29.—"S. W. P.—Knowledge of the Goods and Their Proper Application," by A. E. Schafer, Manager General Sales Department.

Tuesday Afternoon.—"Floor Finishes, Painters' Goods, Sundry Shelf Lines—Knowledge of the Goods and Their Proper Application," by A. E. Schafer, Manager General Sales Department. "Dry Colors," by H. M. Ashby, Superintendent Dry Color Works.

Tuesday Evening.—Smoker at Chicago Beach Hotel.

Wednesday Morning, October 30.—"C. & M. Paint and Color Specialties," by W. J. Sohlinger, Manager C. & M. Sales Department.

Wednesday Afternoon.—"C. & M. Paint and Color Specialties" (concluded). "Credits," by S. P. Fenn, Secretary and Treasurer.

Thursday Morning, October 31.—"C. & M. and Trade Sales Varnishes," by W. W. Mountain, Manager Varnish Sales Department.

Thursday Afternoon.—"C. & M. and Trade Sales Varnishes" (concluded). "Railroad Street Railway and Marine," by E. M. Williams, Manager Street Railway Sales Department.

Friday Morning, November 1.—"Salesmanship—Application of Practical Knowledge to Salesmanship," W. H. Cottingham, Vice-President and General Manager, chairman; assisted by J. F. Hommel, General Supervisor, and A. D. Joyce, Manager Southwestern District.

Friday Afternoon.—"Advertising and Promoting," L. R. Greene, Manager Advertising Department.

The entertainment features included the smoker mentioned in the programme, and a banquet on Friday evening. At the latter there were some important addresses made, the speakers including ex-Senator W. E. Mason; L. A. Goddard, President Fort Dearborn National Bank, Chicago; President Sherwin and Vice-President Cottingham, of the company.

In connection with the convention there was an exhibit of the various products of the company and a full line of advertising literature.

TRADE CATALOGUES.

Business Atlas and Shippers' Guide.—A new feature of the 1907 edition of the Business Atlas and Shippers' Guide, published by Rand, McNally & Co., Chicago, is the printing in red, on the state maps, of electric railways. An alphabetical list of all electric lines in the United States, including a complete index of all terminal points of the main and branch lines, is given. The list of steam railroads of the United States, Canada and Mexico, which is a regular feature of this atlas, is brought up to date, a special index giving the names of through lines and branches and points between which they run. The book is almost indispensable to the business man, and is useful to the railroad man.

Track and Railroad Supplies.—General catalogue No. 20, just issued by the Kalamazoo Railway Supply Co., Kalamazoo, Mich., covers the principal articles made by the company. They include track drills, hand and push cars, velocipede cars, gasoline motor cars, jacks of several types, rail benders, [illegible] machines, replacer frogs, cattle guards, steel water tanks, water columns, pumping engines, snow scrapers, track gages and levels and curve lining gages. The book is 4½ in. x 7 in. [illegible] and has 144 pages, with index and considerable useful information in the back.

Santa Fe Employees' Magazine.—The October number of this magazine is larger than previous issues. "An Old Train Register", "Teamwork—Employees and the Public," and "Railroad Regulation," the last named being Walker D. Hines' address to the New York Traffic Club, are leading articles. An article on "The Grand Canyon" is reprinted, and there is a story, "The [illegible] Engineer," by a fireman on the road. The magazine has offered prizes to Santa Fe men for short stories—$50, $30 and $20 for the first, second and third best, the time limit being the end of the year.

Murali & Co., Engineers, 114 Liberty street, New York, have begun the issue of a small monthly bulletin under the title "Electric Trunk Line Age," of which the first number is dated October, 1907. The publication is to be a record of what electricity can do as a motive power under steam railroad conditions, with particular reference to the three-phase alternating current system. This first issue contains an illustrated description of the Simplon tunnel electric locomotives and an analysis of a typical steam road electrification problem.

MANUFACTURING AND BUSINESS.

The Isthmian Canal Commission has ordered 12 steam shovels from the Marion Steam Shovel Co., Marion, Ohio.

F. G. Whipple, formerly with the Weber Concrete Steel Chimney Co., Chicago, has been made Manager of the Sales Department of the Wiederholt Construction Co., Chicago.

S. T. DeLaMater, formerly with the Standard Construction Company, Chicago, has gone to the General Fireproofing Co., Youngstown, Ohio. He will be in the Youngstown office for the present.

The Tweedy-Randolph Co., Chicago, has been succeeded by Tweedy, Hood & Finlen, Inc., who will conduct the business under the same policy, and represent the same lines as heretofore. The office is in the Fisher building.

Joseph R. Foard and Arthur G. Wellington have been appointed receivers of the South Baltimore Steel Car & Foundry Co., Baltimore, Md. It is said that the receivership was caused because of the delay in collecting payment for cars delivered to railroads.

The Expanded Metal & Corrugated Bar Co., St. Louis, Mo., is furnishing the reinforcement for concrete work in the Pennsylvania Railroad's new terminal station in New York City. An order for 1,000 tons of corrugated bars was given by the contractor, The National Fireproofing Co.

The Pressed Steel Car Co., New York, and the Western Steel Car & Foundry Co. have opened offices in the National Bank of Commerce building, Fifth and Olive streets, St. Louis, with W. P. Coleman and his assistant, C. D. Terrell, in charge. They will handle business in the southwest.

With some ceremony and many speeches by the Mayor, railroad officers and guests, the first sod was turned, on October 26, at Ottawa, Canada, and work was begun on the new Central Union station, hotel and subway. The plans were made by Bradford Lee Gilbert, 50 Broadway, New York, and he will superintend the construction.

The Atha Steel Casting Co., Newark, N. J., was put in the hands of receivers last week. All of the stock of the company is owned by the Securities Investment Company, Pittsburgh, Pa., which is the holding company for the Westinghouse companies. The Atha company sells a great part of its output to the Westinghouse Electric & Manufacturing Co. and the receivership of the last named company tied up the funds due the Atha company, so that its receivership also became necessary.

The United States Steel Corporation has acquired control of the Tennessee Coal, Iron & Railroad Co. The T., C., I. & R. operates coal and iron mines, blast furnaces, foundries and 26 miles of railroad in Alabama and Tennessee and is the largest maker of open hearth rails in the country. It has outstanding about $30,000,000 common stock and about $15,000,000 bonds. The Steel Corporation is offering its 5 per cent. bonds in exchange, dollar for dollar, for the remaining T., C., I. & R. R. stock.

C. L. de Muralt, Consulting Engineer and Professor of Electrical Engineering at the University of Michigan, has been granted leave of absence from the university to supervise the electrification of the Arlberg tunnel under the Tyrolean Alps. Mr. Muralt has

been appointed Consulting Engineer of the Austrian State Railroads. The work to be done under his supervision will probably be the longest stretch of steam railroad electrified in either Europe or the United States, there being about 140 miles of road exclusive of the tunnel. The tunnel is on the main line from Paris to Vienna and is seven miles long, with steep grades from each mouth to the middle. When the plans developed by Mr. Muralt are carried out, the speeds of the trains passing over this line will have been increased 25 per cent. and the capacity of the road 50 per cent. Three phase alternating current locomotives will be used, developing 3,000 h.p., or about three times as much as the New Haven locomotives used in the New York suburban service. The locomotives designed for the Arlberg tunnel will, when coasting down the grade out of the tunnel, generate and return to the system about 60 per cent. of the energy used to pull the train up the grade into the tunnel.

Iron and Steel.

About 1,500 tons of rails have been ordered by traction companies.

The Great Northern has ordered 12,000 tons of rails for immediate delivery.

An inquiry is reported in the market for 7,500 tons of girder rails for Australia.

The Chilian State Railway has ordered 1,750 tons of light rails for delivery this year.

The United States Steel Products Export Company (United States Steel Corporation) has an order from the Japanese Government for 12,000 tons of 75-lb. rails. The price is said to be a little less than $30 a ton.

OBITUARY NOTICES.

C. W. Sanders, Chief Engineer of the Copper Range Railroad, died of pneumonia a few days ago at Houghton, Mich.

Hugh B. Ely, who has been Superintendent of the Insurance Department of the Pennsylvania for 25 years, died last week at his home at Beverly, N. J.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad conventions and engineering societies, etc., see advertising page 24.)

Canadian Railway Club.

At the meeting of this club November 5, a paper on Standard Time by W. J. Camp, of the Canadian Pacific, was read.

Canadian Society of Civil Engineers.

At a meeting of the electrical section November 7, a paper on "The Calculation of Copper Conductors for Alternating Current Three-phase Transmission Lines," by F. B. Brown (M. Sc., S. Can. Soc. C. E.) was read.

American Society of Civil Engineers.

At the meeting of this society November 6 a paper on "Water Purification at St. Louis, Mo., by Edward E. Wall, was discussed. This paper was printed in the October "Proceedings."

St. Louis Railway Club.

At the meeting of this club November 8 a paper will be presented for discussion on the "Preservation of Wood Ties and the Forestry Department of a Railroad," by Chas. E. Koons.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Cincinnati, Hamilton & Dayton.—Edward Colston, a law partner of Judson Harmon, has been appointed General Counsel of the Cincinnati, Hamilton & Dayton, succeeding F. W. Stevens, resigned.

Galveston, Houston & Henderson.—See this company under operating officers.

New York, New Haven & Hartford.—John G. Parker, Secretary; Edward D. Robbins, Attorney, and Augustus S. May, Treasurer, have been elected Directors, succeeding Charles M. Pratt, Louis C. Ledyard and Richard Olney, who resigned last summer.

Tonopah & Goldfield.—C. K. Lord, formerly Third Vice-President of the Baltimore & Ohio, and later President of the Consolidation Coal Company and of the Cumberland & Pennsylvania, has been elected President of the Tonopah & Goldfield, succeeding J. W. Brock, resigned.

Operating Officers.

Atlantic Coast Line.—V. R. C. King has been appointed Trainmaster of the Wilmington division, with office at Wilmington, N. C., succeeding T. L. Dumas, transferred to the Second division.

Canadian Pacific.—R. W. McCormick, Assistant Superintendent at Montreal, Que., has been transferred to Ottawa. W. B. Cronk succeeds Mr. McCormick.

Chicago & North-Western.—See Southern Pacific.

Chicago, Milwaukee & St. Paul.—L. R. Clausen, Signal Engineer, has been appointed Superintendent of the Prairie du Chien and Mineral Point divisions, succeeding E. D. Wright, resigned. Alexander Brown succeeds Mr. Clausen.

Chicago, Rock Island & Pacific.—H. R. Saunders, Superintendent at Little Rock, Ark., has been appointed Superintendent of Terminals at Kansas City, Mo., succeeding A. B. Copley, transferred.

Delaware, Lackawanna & Western.—J. G. Sickles, Trainmaster of the Morris & Essex division, has been appointed Assistant Superintendent of that division, with office at Hoboken, N. J. F. Cizek, Assistant Trainmaster, has been appointed Passenger Trainmaster. W. H. Bailey, Assistant Trainmaster, has been appointed Freight Trainmaster of that part of the division east of Dover, N. J., with office at Hoboken, N. J. M. J. McGowan, assistant chief train despatcher, has been appointed Freight Trainmaster of the part west of Dover, with office at Port Morris, N. J.

Galveston, Houston & Henderson.—J. H. Hill, who has for some months been Secretary and Treasurer, has been reappointed to his former office of Manager.

Great Northern.—J. M. Gruber, who was recently appointed General Manager of the Great Northern in charge of operation and maintenance, was born in 1868 at Iowa City, Iowa. After a High School education he began railroad work as a stenographer in the general freight office of the St. Paul, Minneapolis & Manitoba. He later worked in the office of the General Manager and in 1889 went to the Atchison, Topeka & Santa Fe as a stenographer to the President. After a year he went to the Gulf, Colorado & Santa Fe, where he was chief clerk for a few months in the office of two superintendents, and was then appointed Assistant Trainmaster of the Northern division. After a year he was made Trainmaster of the Southern division and was then appointed chief clerk to the Superintendent of Transportation. After being chief clerk to the General Manager, he went to the Eastern of Minnesota as Assistant Superintendent. In 1895 he was appointed Superintendent of that road and in 1896 was made General Superintendent of the Montana Central. A year later he was appointed Assistant General Superintendent of the Eastern district of the Great Northern. In 1903 he was appointed General Superintendent of the Western district of the Chicago, Rock Island & Pacific, and the next year he went to the Union Pacific as General Superintendent. In 1905 he was appointed General Manager of the Chicago, Burlington & Quincy Lines East of the Missouri river, where he remained until he returned to the Great Northern last month.

J. M. Gruber.

Lehigh Valley.—C. T. O'Neill has been appointed Superintendent of the New York division, with office at Jersey City, N. J. This division consists of the road east of and including Parkview Station, N. J., together with the National Docks, Jersey City and Newark terminals.

Louisville & Nashville.—F. S. Griffin has been appointed General Agent at Detroit, Mich., succeeding L. R. Wasson, resigned to go into other business.

Mobile, Jackson & Kansas City.—Albert Franklin Church who was recently appointed Superintendent at Laurel, Miss., was born in 1858 at New Iberia, La., being the eldest of a family of three. When he was five years old his father died. He went to school for five years and then, when he was 14 years old, went to sea. After four years he began railroad work on Morgan's Louisiana & Texas as a switchman. He was made a brakeman in 1878, freight conductor in 1880 and passenger conductor in 1882. Six years later he was made yard despatcher. In 1903 he was appointed Trainmaster and in 1906 was made Train Inspector of the Atlantic system of the Southern Pacific, which includes the road he had been serving on. This position he recently resigned to go to the Mobile, Jackson & Kansas City.

New York Central & Hudson River.—H. J. Avery has been appointed Assistant Trainmaster of the Rochester division, with headquarters at Rochester, N. Y., succeeding M. E. Welch, transferred. The following have been appointed Assistant Trainmasters of the Mohawk division: L. Phelps, with office at Utica, N. Y., and W. H. Leonard and C. H. Steckel, with offices at Hoffmans, N. Y.

Pennsylvania.—C. R. Cosgrove has been appointed Assistant Trainmaster of the Buffalo division, succeeding D. C. Daley, transferred.

Panama Railroad.—J. Q. Matthews, Acting Superintendent of the Rio Grande Junction, has been appointed Superintendent of the Panama Railroad, succeeding J. A. Smith, promoted.

Rio Grande Junction.—See Panama Railroad.

St. Louis Southwestern of Texas.—C. J. Larimer has been appointed Superintendent at Mount Pleasant, Tex., succeeding W. N. Neff, transferred.

Southern Pacific.—W. R. Scott, General Superintendent of the Northern district of the Pacific system, has been appointed to the new office of Assistant General Manager of the Pacific system, with office at San Francisco, Cal. J. H. Young, Superintendent of the Western division, succeeds Mr. Scott, with office at San Francisco. T. A. Lawson, Assistant General Superintendent of the Chicago & North-Western, succeeds Mr. Young, with office at Oakland Pier, Cal.

See Union Pacific.

Union Pacific.—W. A. Worthington has been appointed Assistant to the Director of Maintenance and Operation of this company and of the Southern Pacific, with office at Chicago. Mr. Worthington will have special duties to be defined from time to time.

Traffic Officers.

Arkansas, Louisiana & Gulf.—T. J. Shelton has been appointed Traffic Manager, with office at Monroe, La.

Southern.—R. W. Hunt has been appointed Assistant General Passenger Agent at Atlanta, Ga.

Engineering and Rolling Stock Officers.

Buffalo, Rochester & Pittsburgh.—E. F. Robinson, who was recently appointed Acting Chief Engineer, has been appointed Chief Engineer, with office at Rochester, N. Y. G. C. Cleaver, roadmaster at Punxsutawney, Pa., succeeds Mr. Robinson as Assistant Engineer of Track, with office at Rochester, N. Y.

Chicago, Milwaukee & St. Paul.—See this company under operating officers.

Grand Trunk.—J. Markey, Master Mechanic of the Northern division, has been appointed Master Mechanic of the Middle division, with office at Toronto, Ont., succeeding W. Kennedy, resigned to go to the Central Vermont. J. R. Donnelley, Master Mechanic of the Ottawa division, succeeds Mr. Markey, with office at Allandale, Ont. W. Gell succeeds Mr. Donnelley, with office at Ottawa, Ont.

Houston & Texas Central.—Frank Cain, Master Mechanic of the St. Louis Southwestern of Texas at Texarkana, Tex., has been appointed Assistant General Master Mechanic of the Houston & Texas Central, with office at Houston, Tex.

Missouri Pacific.—J. J. Reid has been appointed Master Mechanic at Fort Scott, Kan., succeeding R. G. Long, resigned.

New York Central & Hudson River.—F. B. Freeman has been appointed Engineer of Construction in charge of track construction outside of the electric zone, with office at Grand Central Station, New York.

Pennsylvania.—H. H. Russell, supervisor of the Maryland division, has been appointed Assistant Engineer of the Allegheny division, with office at Pittsburgh, succeeding J. R. McGraw, who has been given leave of absence.

St. Louis Southwestern of Texas.—W. D. McDermott has been appointed Master Mechanic of the St. Louis Southwestern of Texas, with office at Texarkana, Tex., succeeding Frank Cain, See Houston & Texas Central.

LOCOMOTIVE BUILDING.

The Southern is said to have ordered 25 locomotives from the Baldwin Locomotive Works.

The Maine Central is said to have ordered 10 locomotives from the Baldwin Locomotive Works.

The Peruvian Government has ordered one mogul locomotive from the American Locomotive Co.

The Florida East Coast is said to have ordered 12 locomotives from the American Locomotive Company.

The Southern Indiana is said to have ordered 10 locomotives from the American Locomotive Company.

The Isthmian Canal Commission has ordered four locomotives from the Davenport Locomotive Works.

The Dolese & Shepard Co. has ordered one six-wheel switching locomotive from the American Locomotive Co.

The Muscatine, North & South has ordered one mogul 50-ton locomotive from the Hicks Locomotive & Car Works.

The United States Engineering Office, through S. W. Roessler, Portland, Ore., is in the market for three locomotives.

The Chicago & Illinois Western has ordered one switch engine from the American Locomotive Co. for January delivery.

The Taiwan Sugar Refinery, Formosa, has ordered three four-wheel tank locomotives from the American Locomotive Co.

The Howell-Hinds Consolidated Mining Co. has ordered one four-wheel tank locomotive from the American Locomotive Co.

The Japanese Government is said to have ordered six locomotives from the Baldwin Locomotive Works through Fraser & Sale, New York.

CAR BUILDING.

The South Georgia is said to be in the market for 100 freight cars.

The Grand Trunk is asking for bids in the United States on 1,000 steel coal cars.

The Atlantic & Western has ordered 60 box cars from the Lenoir Car Company.

The Kanawha & West Virginia is still in the market for from 700 to 1,500 freight cars.

The Northwestern Pacific is asking prices on trucks for 10 flat cars of 70,000 lbs. capacity.

The Tonopah & Goldfield has ordered four chair, one smoking and one baggage car from the Pullman Company.

The San Antonio & Aransas Pass has ordered 25 standard Hart convertible cars from the Rodger Ballast Car Co.

The Duluth, Missabe & Northern, as reported in the *Railroad Gazette* of July 5, is asking new bids on passenger equipment.

The New York City Railway has ordered 120 standard type street cars since it placed the order for 155 Montreal type cars.

The Nevada Northern is said to have ordered 100 all-steel gondola cars of 100,000 lbs. capacity from the Pressed Steel Car Company.

The Choctaw Railway & Lighting Co., McAlester, Okla. T., has ordered two standard interurban cars from the Niles Car & Manufacturing Co.

The Chicago & Illinois Western has ordered two cabooses from the American Car & Foundry Company, and will be in the market for passenger cars in about two months.

The South Manchuria has ordered through Mitsui & Co., New York, three dining, three sleeping, six passenger and baggage, four baggage and mail cars and six coaches from the Pullman Co.

The Nashville, Chattanooga & St. Louis, as reported in the *Railroad Gazette* of November 1, has asked preliminary bids on 100 composite hopper bottom coal cars of 80,000 lbs. and 100,000 lbs. capacity. The special equipment has not yet been considered.

The Brooklyn Rapid Transit, which, as reported in the *Railroad Gazette* of September 20, was in the market for 100 surface cars and 100 elevated cars, has, it is said, decided not to order the surface cars, but will order the elevated cars within a few months.

The Philippine Railways, as reported in our advance sheet of October 26, are in the market for four combination parlor and first class passenger cars. The order is to be placed through J. G. White & Company. These cars will measure 42 ft. 3½ in. long and 7 ft. 9¼ in. wide, inside measurements, and 43 ft. 1½ in. long and 9 ft. 6 in. wide, over all. The bodies will be of wood and the underframes of open hearth steel. The special equipment includes:

Axles	Philippine Railways standard
Bolsters	Philippine Railways standard
Brake-beams	Buffalo
Brakes	Westinghouse automatic
Brasses	Phosphor bronze
Couplers	Major
Draft rigging	Miner
Heating system	None
Journal boxes	Cast iron; Philippine Railways standard
Light	Adams & Westlake oil lamps
Paint	Dixon's Graphite, for steel work
Platforms	Standard Coupler Co.
Seats	Wheeler
Trucks	Philippine Railways standard

The Boston & Maine, as reported in the *Railroad Gazette* of November 1, has ordered 1,000 box cars of 60,000 lbs. capacity from the Laconia Car Company for July, 1908, delivery. These cars will measure 36 ft. long, 8 ft. 6 in. wide and 8 ft. ½ in. high, inside measurements; 37 ft. 6 in. long, over end sills; 9 ft. 7¼ in. wide, over eaves, and 13 ft. 11⅞ in. high, over brake staff. The bodies will be of wood and the underframes of steel. The special equipment includes:

Brake-beams	Buffalo
Brake-shoes	Steel back; American Brake-Shoe & Foundry Co
Brakes	Westinghouse automatic
Brasses	Boston & Maine specifications
Couplers	Gould steel
Door fastenings	Boston & Maine standard
Draft rigging	Miner tandem
Dust guards	Wooden
Journal boxes	Boston & Maine standard
Paint	Boston & Maine specifications
Roofs	Murphy No. 2 inside
Springs	Railway Steel-Spring Co.
Wheels	Laconia

The Duluth & Iron Range, as reported in the *Railroad Gazette* of October 11, has ordered three first class coaches and two combination baggage and mail cars from the American Car & Foundry Co., for January, 1908, delivery. These cars will be 60 ft. 7 in. long, 10 ft. ⅛ in. wide and 14 ft. 1⅝ in. high, over all. The special equipment for both includes:

Bolsters	Commonwealth
Brake-beams	National-Hollow
Brake-shoes	Christie
Brakes	Westinghouse
Brasses	American Car & Foundry Co.
Couplers	Buckeye
Curtain fixtures (for coaches)	Forsyth
Curtain material (for coaches)	Pantasote
Door fastenings (for coaches)	Adams & Westlake locks
Draft rigging	American Car & Foundry Co.
Heating system	Safety Car Heating & Lighting Co.
Journal boxes	McCord
Light (for coaches)	Adams & Westlake; Acme
Light (for combination)	Bliss electric
Paint	Duluth & Iron Range standard
Platforms	American Car & Foundry Co.
Trucks	Commonwealth Steel Co.
Vestibule	Pullman

RAILROAD STRUCTURES.

Bellaire, Ohio.—Plans, it is said, are being made by the Baltimore & Ohio for improvements to its freight terminals here to cost $25,000.

Brooklyn, N. Y.—The new concrete car barns, 86 ft. x 352 ft., for the Brooklyn Rapid Transit Co. at Fresh Pond station, on the Ridgewood line, have been finished. The cost of the improvements was $125,000.

Bluffton, Ind.—The Lake Erie & Western and the Cincinnati, Bluffton & Chicago, it is said, will jointly build a union passenger station here.

Grand Forks, B. C.—The Canadian Pacific, it is said, will make this place a division point, and next year will spend about $100,000 for a roundhouse, shops and a new yard.

Lawrenceville, Pa.—An ordinance is being prepared for a bridge from Liberty avenue and 37th street over the Pennsylvania tracks to Grant Boulevard.

London, Ont.—The Southwestern Traction Company, it is said, will rebuild its car barns recently destroyed by fire, at a loss of $150,000.

St. Stephen, N. B.—The New Brunswick Southern has asked for authority to build a bridge over the St. Croix river at this place.

Swissvale, Pa.—The Pennsylvania will shortly ask bids for a new passenger station. Grade crossings are to be eliminated and other improvements made to cost $75,000.

Wichita, Kan.—General Manager J. E. Hurley is quoted as saying that the Atchison, Topeka & Santa Fe will make improvements next year to include a passenger station here to cost about $200,000; also a roundhouse to cost $16,000.

Winnipeg, Man.—Work, it is said, has been started on the new union terminal station here. Contracts for the excavation work let to S. Brown, of this place.

The Canadian Northern, it is said, in addition to improvements under way will put up a roundhouse here, to cost $50,000.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

Atchison, Topeka & Santa Fe.—President E. P. Ripley, of this company, is quoted as saying that proposed extensions in Texas to cost $7,000,000 will not be made this year, perhaps not for many years, on account of the financial stringency and adverse legislation in Texas.

Atlantic City Railway (Electric).—See Philadelphia, Delaware & Montgomery.

Baltimore & Ohio.—See Pennsylvania Roads.

Belleville & Interurban.—Incorporated in Illinois with $100,000 capital and office at Belleville. The company proposes to build an electric line from Belleville south eight miles to Smithton. The incorporators and first board of directors are: J. Gundlach, Jr., B. H. Gundlach, R. W. Hofsommer, G. Hippard and T. A. Bell.

Bloomington, Pontiac & Joliet (Electric).—This company, which operates an electric line from Pontiac, Ill., northeast to Dwight, 20 miles, it is said, is now controlled by H. A. Fisher, of the Chicago & Joliet Railway. It is the intention of the company to extend the line on the north to Joliet, about 40 miles, where connection is to be made with C. & J. to Chicago. The line is eventually to be extended from its southern terminus at Pontiac southwest to Bloomington, 35 miles, where connection is to be made with an electric line to St. Louis.

Bristol & Kingsport.—Incorporated in Tennessee to build a line from Bristol, Tenn., southwest to Blountville, thence west to Kingsport, 45 miles. The incorporators include: J. L. Cox, F. H. Cathran, F. Percell, J. B. Cox and S. L. King, of Bristol.

Brookville & Mahoning.—See Pittsburgh, Shawmut & Northern.

Chicago & Milwaukee (Electric).—Albert C. Frost, President and General Manager of this company, says that the extension to Milwaukee will be finished and cars will be put in operation from Chicago to Milwaukee on December 1.

Chicago, Burlington & Quincy.—This company, it is said, has surveys made for building a line from Frannie, Wyo., northwest along Clark's Fork river to Fromburg, Mont., on the Northern Pacific, about 35 miles.

Chicago, Fox Lake & Geneva.—Incorporated in Illinois with $2,000,000 capital and office at Chicago. The company proposes to build a line from Chicago, northwest through Cook, Lake and McHenry counties to the Illinois-Wisconsin state line, with branches to Fox Lake and to Woodstock, a total of 90 miles. The incorporators include G. H. Soward, H. R. Yaryan, L. E. Starr, S. E. Malette and M. L. Louis.

Canadian Pacific.—This company, it is said, has been making surveys for several weeks for an extension of its Nicola, B. C., branch, south to Princeton in the Similkameen Valley, about 72 miles.

Chicago & East St. Louis Short Line.—Incorporated in Illinois to build a line from East St. Louis, Ill., northeast to Chicago, 275 miles. The proposed route runs through coal fields and is almost parallel to the Chicago & Alton all the way. Surveys are to begin at once. The incorporators and first board of directors include: H. C. Osterman, W. M. Dronnan, H. C. Dolph, T. W. Flynn and W. Anderson, all of Chicago.

Chicago & Joliet (Electric).—See Bloomington, Pontiac & Joliet.

Cincinnati Belt Line.—The proposed belt line around Cincinnati, Ohio, is to be double-track and will be about 20 miles long. Right-of-way is being secured and surveys made. The promoters say that necessary capital has been secured. E. E. Williamson, Union Trust Building, Cincinnati, is interested. (July 26, p. 111.)

Eastern Pennsylvania (Electric).—J. G. White & Co., operating managers and purchasing agents for this company, have ordered $200,000 worth of electric supplies for the Tamaqua and Middleport connecting link between Mauch Chunk, Pa., and Pottsville. The order includes all the material required for the permanent way and overhead electrical work. Considerable grading has already been done.

Gilmore & Petersburg.—The Gilmore Mining Company, it is said, is making surveys for a line from Gilmore, Idaho, on the Lemhi Valley northeast through a pass in the Rocky mountains to a point

in Beaverhead county, Mont., about 10 miles W. A. McCutcheon, Gilmore, Idaho, is Manager.

ILLINOIS CENTRAL.—This company, it is said, will spend about $10,000 improving its yards at Duquoin, Ill.

MILWAUKEE NORTHERN (ELECTRIC).—This line was opened from Milwaukee, Wis., north via Cedarburg to Port Washington, 30 miles, November 2. The company will occupy jointly with the Chicago-Milwaukee Electric Railway a large station to be built at Second and Wells streets, Milwaukee, at an estimated cost of $100,000. (Sept. 20, p. 339.)

MISSOURI & NORTH ARKANSAS.—This company will let contracts for 650,000 cu. yds. of side borrow, and three miles of pile trestle on its extension from Kensett, Ark., southeast to Cotton Plant 28 miles. (Sept. 27, p. 371.)

MISSOURI PACIFIC.—The report of this company for the year ended June 30, 1907, shows that the branch of the St. Louis, Iron Mountain & Southern from Eudora, Ark., south to Calvit, La., 37.49 miles, was finished, and put in operation June 1. On the Gurdon & Fort Smith, which extends from a connection with the Arkansas Southwestern near Antoulne, Ark., northwest through Clark and Pike counties to Caddo Gap, on Caddo river, 3.85 miles, grading, bridging and track laying has been finished and ballasting is now under way. The continuation of this line, the Gurdon & Fort Smith Northern, from Caddo Gap north to the Ouachita river, 23 miles, has the grading, bridging and track laying finished on the first 5.74 miles to a point near Black Springs. Its further extension is not now contemplated. On the Springfield Southwestern from Crane, Mo., to Springfield, regular service was begun last April. Work on the extension through the city of Springfield is now in progress. On the Illinois division second main track has been finished from Valley Junction south for 8.9 miles, and at the yards at Dupo, Ill., grading for 38 miles of tracks, culverts, bridging, drainage system, coaling station, 18 stall engine house, power house and employees' hotel is finished, and yard tracks aggregating 21.61 miles have been laid. Track laying and ballasting is now in progress. On the Wabash Southern, grading, bridging, track laying and some of the ballasting on nine miles from Ziegler, Ill., to Benton is finished. The Coal Belt Railway lines in Williamson county, Ill., to the Cartersville District Coal Company's mines and to the Chicago & Big Muddy Coal & Coke Company, aggregating 5.01 miles, have been finished and are now in operation. Grading for an extension of the Coal Belt Electric on Park avenue, Herrin, Ill., north 4,935 ft. to a connection with the Herrin Railway is finished. The main line of the Herrin & Johnson City from Herrin, Ill., to a point near the west limits of Johnson City, 4.5 miles, is finished, and 2.5 miles of side tracks have been laid to the various mines. The Marion & Harrisburg, which diverges from the Coal Belt Electric west of and extending east through the city of Marion, Ill., 1.95 miles, has been finished and is now in operation. The Marion & Johnson City, a continuation of the Marion & Harrisburg, from a point east of Marion north 5.87 miles toward Johnson City with connections and yards approximating 6.81 miles to various coal properties, is finished. Work is now under way extending the line to Johnson City. The Natchez & Western has been changed to standard gage, the work of widening embankments and filling and reconstructing bridges is now in progress.

NEWPORT & SHERMAN'S VALLEY.—This company, which operates a 29-mile line in Pennsylvania, intends to change its track from narrow to standard gage.

NEW YORK, NEW HAVEN & HARTFORD.—Contractors double-tracking the Naugatuck and Highland divisions of this road have received orders to rush the work as fast as possible.

OKLAHOMA CENTRAL.—This company, it is said, has finished eight miles of the extension it is building from Blanchard, Okla., west to Chickasha. (Aug. 9, p. 164.)

OKLAHOMA, MEXICO & PACIFIC.—Incorporated in Oklahoma with $500,000 capital and office at Oklahoma City. The company proposes to build a line from Oklahoma City southwest through Oklahoma, Canadian, Caddo, Washita and Kiowa counties to Hollis, in Greer county, 200 miles. The estimated cost of the proposed line is $35,000 a mile. The incorporators include: J. E. Kirkes, O. S. Rice and T. H. Lindlay, of Oklahoma City; F. D. Kroeger and J. M. Kroeger, of Guthrie.

OMAHA, NEWPORT & NORTHERN.—Under this name a company is reported being organized in South Dakota with $8,000,000 capital to build a line from Omaha, Neb., northwest, traversing the counties of Douglas, Washington, Dodge, Colfax, Platt, Boone, Wheeler, Holt, Rock and Keyapaha in Nebraska, to a point in South Dakota, 250 miles. C. A. Miller, of Minneapolis, Minn.; O. W. Boyd, P. M. Banning, of Chicago, and M. P. Goodner, of Pierre, are interested.

PENNSYLVANIA.—This company has put in operation its new yard at Pitcairn, which has a capacity for 3,300 cars.

PENNSYLVANIA ROADS.—Final surveys, it is said, are being made for a line from Ohio Pyle, Pa., on the main line of the Baltimore & Ohio south to coal fields in West Virginia. Grading work will probably be begun next month. The project is backed by capitalists interested in the recently organized Preston Coal Company which is to develop the coal lands along the proposed line, and it is thought that the Baltimore & Ohio also is interested.

PITTSBURGH, SHAWMUT & NORTHERN.—Work, it is said, has been finished on the Brookville & Mahoning, building the southern extension from Brookwayville, Pa., south via Brookville to Ramseytown, and the line is ready for operation. (Aug. 30, p. 247.)

PHILADELPHIA, DELAWARE & MONTGOMERY (ELECTRIC).—A number of New York and Philadelphia capitalists have secured control of this company, organized by B. A. Hughes and associates to build an electric line from Lafayette, Pa., on the Schuylkill Valley division of the Pennsylvania, south to the Delaware river in Delaware county, at which point a two track tunnel to cost $2,000,000 is to be driven under the river. East of the river at Woodbury, N. J., the line is to connect with the West Jersey & Seashore or a new line is to be built to Atlantic City. Surveys to the Delaware river have been made. The following are officers of the Atlantic City Railway, which, it is said, will build over the same route: W. J. Thompson, President; G. A. Muller, Treasurer, and Edward Butler, Secretary, Philadelphia.

ST. LOUIS, ROCKY MOUNTAIN & PACIFIC.—Surveys reported made for building the Cimarron & Northwestern from Cimarron, N. Mex., northwest up the Ponil river to Ponil Park, 22 miles. Grading finished on 15 miles, and three miles of track laid. General contract reported let to the Whitescarver Construction Company, of Trinidad, Colo., and sub-contracts to Maney Bros., of Oklahoma City, Okla. (May 3, p. 632.)

SASKATOON, SASKATCHEWAN, PEACE RIVER & DAWSON.—Application will be made at the next session of Parliament for the incorporation of this company, which proposes to build a line from Saskatoon, Sask., northwest via Langham, Athabasca Landing and Peace River Landing in Alberta to the crossing of the Dease river, B. C., about 15 miles west of its outlet into Laird river, thence by the most direct route to Dawson, in Yukon territory. Smith & Britton, Confederation Life Building, Ont., are the attorneys.

SOUTH & WESTERN.—This company, building from Elkhorn, Ky., south to Rutherfordtown, N. C., has 75 miles in operation; 7.4 miles from Dante, Va., south to Fink, and 67.6 miles from Johnson City, Tenn., south to Altapass, N. C. Contracts are let for 82 miles from Johnson City north to Fink, Va., on the north end, and from Altapass south to Bostic, 62 miles. An extension is also to be built under the name of the Spartanburg & Northern, from the southern end, south to Spartanburg, S. C., 40 miles. It is said that the contractors who are most advanced in their work have begun to lay off men. This is being done to allow the contractors who are behind with their work to catch up. About 10,000 men are at work on the southern line, and about two-thirds will be kept at work. (March 15, p. 392.)

SOUTHERN PACIFIC.—Twenty-four sidings between Roseville and Truckee are being lengthened, so that after this month trains of 45 instead of 30 cars can be sent across the Sierra Nevada mountains. These 700-ft. additions to 24 sidings had to be built mostly on mountain ledges, an enormously difficult and expensive undertaking. One-half the sidings are in the 46 miles of snow-sheds which enclose the road between Blue Canyon and Truckee. The extension of the snow-sheds alone required 7,000,000 ft. of lumber. At Summit an entirely new track 3,100 ft. in length was put in. The company is laying a second main track between Truckee and Winsted, and also between Elvas and Loomis. This work is almost completed, and with the terminal improvement at Roseville will double the capacity of the division. In the new Roseville classification yard 50 miles of track will be laid. Work is also being pushed on additional roundhouse facilities and repair shops at Roseville.

TACOMA-SEATTLE SHORT LINE (ELECTRIC).—Incorporated in Washington with $6,000,000 capital to build an electric line from Tacoma north to Seattle, 30 miles. Most of the right-of-way has been secured, and it is expected to have the line finished early in 1909. The proposed line is to be six miles shorter than the present interurban line belonging to the Stone & Webster Syndicate of Boston. T. Coleman Dupont, President, of Wilmington, Del., and A. C. Degraw, of New York, represent Eastern financial interests, which are back of the project.

TEMISKAMING & NORTHERN ONTARIO.—This company expects to finish the branch it is building from Cobalt, Ont., to Kerr Lake, four miles, about the first of next month. (March 15, p. 396.)

TEXAS MIDLAND.—See Texas Roads.

TEXAS ROADS.—Plans are being made for building a line from Ennis, Tex., the southern terminus of the Texas Midland, southwest to Waco, 75 miles. This is supposed to be a project of the Texas

Midland, as D. Quill and W. J. Newcom, of that company, are interested.

Topeka-Southwestern.—An officer writes that contracts have been let to the Southwestern Construction Company, of Topeka, Kan., for building this proposed line from Topeka, Kan., southwest to Council Grove, with a branch from the main line just west of Topeka north to the Kansas river, 60 miles. There will be a steel bridge at Dover. Maximum grades will be 1 per cent. and maximum curvature 4 deg. The company has preliminary work under way for building extensions and branches as follows: From Topeka north to Willis, 45 miles; from a junction with this north extension at North Topeka east to Leavenworth, 32 miles; from a point seven miles southwest of Topeka south via Scranton and Lyndon to Burlington, 60 miles, and from Council Grove, to which the main line is now being built southwest via Diamond Springs to Marion, 40 miles. W. L. Taylor, President; V. R. Parkhurst, Chief Engineer, Topeka. (April 5, p. 500.)

Union Central.—This company proposes to build a line from Dallas, Tex., southeast to New Orleans, La., 500 miles (225 miles in Texas and 275 miles in Louisiana). It is reported that contracts are to be let about Jan. 1. The proposed route is via Wortham, Palestine and Nacogdoches, Tex., and Pickering, La., with a branch from Wortham, Tex., northeast to Tyler, 90 miles. Surveys on the main line are under way from Dallas to the Louisiana state line, and surveys for the branch from Wortham to Tyler have been made. Grading is finished on the first 20 miles from Wortham. J. A. Lucas, Edgewood, Tex., is Secretary and Treasurer.

West Penn Railways (Electric).—Rights-of-way, it is said, have been secured by this company for a new line from Hunkers, Pa., west to Scotthaven, 10 miles.

RAILROAD CORPORATION NEWS.

Baltimore & Ohio.—See Chicago Terminal Transfer.

Boston & Worcester Street.—The Massachusetts Railroad Commission has given this company permission to issue $300,000 new stock to shareholders at par to retire floating debt incurred for construction, equipment and the purchase of property. The company had asked permission to issue $500,000 new stock.

Chicago, Burlington & Quincy.—According to a press despatch, this company has taken over the operation of the Great Northern's line from Sioux City, Iowa, to O'Neill, Neb., 130 miles. The Burlington controls all the other Hill mileage in Nebraska.

Chicago Terminal Transfer.—The minority stockholders' protective committee, which represents 38 per cent. of the preferred stock and 14 per cent. of the common stock of the Chicago Terminal Transfer, has sent out a circular letter announcing that the Baltimore & Ohio has suggested that the stock deposited in accordance with the offer of the last named company to buy it at $25 a share, be left on deposit until December 31. This is because it is not considered advisable for the Baltimore & Ohio to make the purchase under present market conditions.

Cincinnati, Hamilton & Dayton.—See Pere Marquette.

Georgia Coast & Piedmont.—The Georgia Railroad Commission has given this company permission to issue $2,700,000 of its $3,500,000 authorized consolidated mortgage 5 per cent. bonds of 1947. The proceeds are to retire $1,000,000 authorized first mortgage bonds, $550,000 for construction and acquiring additional mileage and the remainder for equipment, terminals at Brunswick and to pay other indebtedness. The road runs from Darien, Ga., to a connection with the Seaboard Air Line at Collins, Ga., and is projected to Brunswick, 15 miles.

Great Northern.—See Chicago, Burlington & Quincy.

Metropolitan Street Railway.—See Third Avenue Railroad (Electric).

Mexican Central.—See National of Mexico.

Minneapolis, St. Paul & Sault Ste. Marie.—It is said that the stockholders have so far subscribed to three-quarters of the additional stock of this company, and that the Canadian Pacific will take whatever stock is not subscribed to by other stockholders. The new issues consist of $1,400,000 preferred and $2,800,000 common. One share of new preferred and two of new common are offered to holders of each 15 shares of either class of old stock.

National Lines of Mexico.—The attorney who represents the Mexican Government in the proposed merger of the National of Mexico and the Mexican Central is quoted as saying that no further steps can be taken at present because the bankers who were to underwrite the proposed bond issue cannot do so at present. (July 12, p. 54.)

New York Central & Hudson River.—Results for the last quarter and for nine months were as follows:

Quarter Ended Sept. 30, 1907.

	1907.	Change
Gross earnings	$27,069,728	Inc. $2,286,761
Expenses	18,579,635	" 1,285,494
Net earnings	$8,490,093	Inc. $1,001,267
Other income	2,523,560	" 953,774
Gross income	$11,013,653	Inc. $1,955,041
Fixed charges and taxes	5,879,277	" 358,957
Available for dividend	$5,134,376	Inc. $1,596,084
Dividend (1½ per cent.)	2,679,480	" 814,507
Surplus	$2,454,896	Inc. $781,577

Nine Months Ended, Sept. 30, 1907.

Gross earnings	$74,000,625	Inc. $6,338,431
Expenses	55,980,150	" 7,910,094
Net earnings	$18,020,475	Dec. $1,571,663
Other income	7,434,637	Inc. 2,619,615
Gross income	$25,455,112	Inc. $1,047,952
Fixed charges and taxes	17,373,369	" 797,469
Available for dividend	$8,081,743	Inc. $250,483
Dividends (4½ per cent.)	8,038,440	" 2,443,522
Surplus	$43,303	Dec. $2,193,039

New York Central Lines.—Gross earnings for the month of September were as follows:

	1907.	Change
New York Central & Hudson River	$9,035,991	Inc. $605,754
Lake Shore & Michigan Southern	4,082,327	" 312,481
Lake Erie & Western	498,825	" 33,118
Chicago, Indiana & Southern	256,667	" 55,430
New York, Chicago & St. Louis	882,117	" 69,655
Michigan Central	2,553,788	" 276,574
Cleve., Cin., Chic. & St. Louis	2,461,252	" 234,236
Peoria & Eastern	271,753	" 10,288
Cincinnati Northern	94,310	Dec. 4,709
Pittsburgh & Lake Erie	1,407,359	Inc. 209,528
Rutland	314,342	" 40,727

New York, New Haven & Hartford.—At a meeting of the shareholders, held last week, the directors were authorized to either issue $35,469,500 new stock to be offered to stockholders at $125 at the rate of one new share for every four shares already held, or instead to issue $43,121,200 new stock to be offered to stockholders at par at the rate of one new share for every three shares held. The first plan was the one originally proposed when the meeting was first called. The proceeds of the new stock are to be used for finishing the six-tracking of the Harlem River branch, the improvements at the New Haven cut and at Providence, R. I., and also to pay for new equipment costing $18,000,000 ordered some time ago. It is said that part will be used to retire $8,500,000 debenture bonds.

Oregon Short Line.—See Union Pacific.

Pennsylvania.—President McCrea announced last week that, because of the unsatisfactory outlook for raising new capital in 1908, the company would not begin any new work except when absolutely necessary for handling traffic. Work on the New York tunnels and terminals would not, therefore, be pushed as rapidly as heretofore and their completion will probably be six months later than has been expected.

Pere Marquette.—The meeting held on October 28 to approve the reorganization plan was adjourned without final action because the committee representing the holders of $8,500,000 C., H. & D. refunding 4 per cent. bonds protested against the plan. These bonds were given to the present holders in exchange for $11,000,000 Pere Marquette common stock which is deposited as collateral for the bonds, and the committee objected to the voting of this stock in favor of the reorganization plan, on the ground that this plan, which provides for the issue of two classes of preferred stock, would hurt the holders of the common stock.

Rutland Railroad.—At the annual meeting the minority stockholders' committee voted 22,826 shares of 7 per cent. preferred stock out of the total of 69,750 shares voted. The Directors passed a resolution to take up the question of accumulated dividends on the preferred stock, which now amount to 17½ per cent. In 1906 and 1907 1½ per cent. annually was paid. (Nov. 16, 1906, p. 138.)

Southern Pacific.—See Union Pacific.

Third Avenue Railroad (Electric).—The quarterly dividend of 1½ per cent. on the $15,995,800 outstanding stock of the Third Avenue Railroad, which is the rental paid by the lessee, the Metropolitan Street Railway, has been defaulted by order of the receivers of the last-named company. The Third Avenue was leased to the Metropolitan in 1900 for 999 years, and the lease provides that six months after a dividend default the property shall be returned to its stockholders.

Union Pacific.—The lines of this company from Green river, Wyo., to Ogden, Utah, will hereafter be operated by the Union Pacific, and the Southern Pacific lines between Ogden, Utah, and Sparks, Nev., will be operated by the Southern Pacific. Hitherto the Oregon Short Line has operated these lines.

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EDITORIAL ANNOUNCEMENTS.

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CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.

ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

OFFICERS.—In accordance with the law of the state of New York, the following announcement is made of the office of publication, at 83 Fulton St., New York, N.Y., and the names of the officers and editors of The Railroad Gazette:

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W. H. Boardman, *Pres't. and Editor*
E. A. Simmons, *Vice-President*
Ray Morris, *Secretary*
H. S. Chilcott, *Treas.*
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Braman B. Adams
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Hugh Rankin
Bradford Boardman

CONTENTS

Vol. XLIII., No. 20. Friday, November 15, 1907.

The Stahlwerks-Verband, the association which fixes prices and controls the sale of about 95 per cent. of the product of the steel works in Germany, in answer, apparently, to charges that it is using its power to maintain monopoly prices, says that while it has concluded contracts with the State Railroads to supply rails at 120 marks per kilometric ton (=$29.05 per 2,240 lbs.) and ties at 111 marks, for the next three years, this is only $1.90 per ton more for rails and $1.43 more for ties than in 1904, which is not nearly so much as the increase in wages and raw materials. It has sold 20,000 tons to Japan and 16,000 to Holland at prices higher than the above. Meanwhile rails cost $32.50 to $33 per ton in England; the Belgian State Railroads recently contracted to pay $31.19 to Belgian works; and the Austrian State Railroads are paying the Austrian works $36.82 per ton.

These parlous times in railroad financing bring in some singular situations—one of them just revealed in the case of the New York, New Haven & Hartford Railroad. That corporation's board of directors some months ago voted to issue about $35,000,000 of new stock at $125 a share to its shareholders and its convertible debenture holders, subject to ratification of the plan by the stockholders at the annual meeting on Oct. 30, 1907; and that recommendation, usually in such cases final, definite and antedating a fact, was published in the annual report of the corporation. On the strength of it a considerable number of shareholders sold their new stock rights to be delivered "when, as and if issued." Suddenly during the panic period the stock fell to a point which made the issue inadvisable and it has been shifted by the directorate into an issue of $10,000,000 new 6 per cent. convertible debentures put out at par. Where does such a change leave the original "personal" contracts in which, say, A sold his rights to B a broker, and B sold the same rights to C, a customer. The New Haven company is obviously not responsible legally, whether or not, morally, as it merely made a recommendation which the stockholders might or might not approve, though in fact they did so and gave the directors permission to issue, should they see fit, an even larger numberof shares than had been recommended. But how stand legally the private contracts of A, B and C, the interests of whom vary according as the market values of the rights may be higher or lower? Are the contracts vitiated by the change of the stock issue to a debenture issue? Are the contracts at the contractors' risks and, if so, what are the legal scope and limitations of those risks? And would the courts decide such contracts a mere "gamble" and therefore invalid? In not a few cases nowadays "rights" are, as one may say, sold under similar conditions and by contracts based on good faith and resting on official announcement. The legal status of contracts of the sort as fixed by an authoritative finding of the courts would have a moral as well as a material significance.

The railroad superintendent must see that the discipline of enginemen is well maintained, in spite of anything or everything tending to impair it, instead of asking that signals or signal practices or rules be so designed or arranged as to make discipline easy. This would seem to be the lesson of the increasing use of overlaps and automatic stops. One time-honored argument against these two adjuncts is that they make an engineman less watchful of the visual signals because they assure him that watchfulness is unnecessary (as with an automatic stop) or less necessary (as with the overlap). To tell him to stop at a place where he knows that there will be no danger in keeping on is like crying "wolf" when no wolf is near, which puts in contempt the one who cries. But whatever there may be in our theories, practice is changing. The New York Central has had 800-ft. overlaps in its Park avenue tunnel, New York City, for over four years. It has now established longer ones throughout its electric zone, 10 or 12 miles of very busy four-track railroad, which will be increased to three times that mileage. The New York subway has had automatic stops in use for three years, and the officers believe them to be a useful, important and satisfactory safeguard. The same arrangement is in use on the Boston Elevated, and has been installed on the Philadelphia Rapid Transit lines. The Philadelphia & Western has the overlap, with signal arrangements similar to those on the New York Central just mentioned; and the railroad under the Hudson River, between Jersey City and New York, to be opened within a month or two, will have a similar arrangement. Many roads whose lines are neither elevated nor underground seem to be showing increased favor to new devices, such as torpedo machines, cab signals and automatic stops, although, according to the theory, the use of such things must result in weakening discipline. And the roads thus encourage inventors, while yet the inventors' devices are designed and operated according to the objectionable plan of acting to indicate stop, and remaining inactive to indicate proceed. The only thing to do, under these new conditions, of course, is to see that enginemen do stop at stop signals. Theirs not to reason why. Surprise checking will do it. Surprise checking seems to be becoming more

general, and some of the roads on which it is practised allow their press agents to use the records as an advertising text. If those roads need it to prevent collisions, roads with overlaps would seem to need it to restore to their discipline the vigor which the overlaps have taken out of it. Possibly we may wake up some morning and find our discipline reformed. It is true that the motive for introducing the overlap has been the same as that which has retained the flagman and his torpedoes; and that in thus continuing to sit on two stools, we must look sharp that we do not fall to the ground. There remains, however, this important difference, that with the overlap we have a stool which can be watched and can be rationally managed. The flagman, however, defies all discipline, and the flagging rules not only defy systematic treatment, but are absolutely inconsistent with the short time interval which is necessary to the economical use of a railroad which carries a large passenger traffic.

WHEEL PRESSURES ON CURVES.

In the *Railroad Gazette*, Sept. 20, 1907, George L. Fowler reported the results of some tests made with a special track dynamometer which registered the actual pressures against the outside rail exerted by the flanges of the wheels of a consolidation locomotive when running around a 4½ deg. curve. Through the courtesy of the Schoen Steel Wheel Co. we reprint elsewhere in this issue a chapter from a forthcoming book by Mr. Fowler, which gives an account of the complete series of experiments made with this instrument to determine primarily the lateral thrusts exerted by the wheels under loaded cars. The experiments were made as nearly as possible under ordinary running conditions and covered a fairly wide range of moderate speeds. They were not carried far enough to obtain complete data from which a general formula could be derived which would take into account weight, wheel base, speed, curvature and superelevation. Nevertheless interesting conclusions have been drawn as to the effect of some of these factors, which seem to be supported by the records of the dynamometer.

The commonly accepted theory of the relative pressures exerted by the four outside wheels of a double truck car is corroborated by the average pressures recorded at all speeds. The front wheel of the first truck exerts the greatest pressure; the front wheel of the second truck is next in order, followed by the rear wheel of the first truck and the rear wheel of the second truck. The front truck exerts approximately 60 per cent. of the pressure required to turn the car around the curve. There are, of course, wide variations in the pressures, but in general when either wheel on a truck exerts an excessively high pressure, the other wheel exerts a correspondingly lower pressure.

The effect of speed is given by the tentative formula $T=333V-800$, but this holds good only between 7 and 16 miles an hour, where a series of nine records lie in approximately a straight line. Inasmuch as these records represent less than 30 per cent. of the total, not much reliance can be placed on an equation derived from them. The fact that the thrust varies directly with the speed and not with the square of the speed is explained by the fact that the curve was super-elevated for a speed of 36 miles an hour and hence at the low speeds at which the pressures were recorded, centrifugal force was more than balanced by the super-elevation. The force required to deflect the car from a tangent in rounding the curve varies directly as the rate of deflection or, in other words, as the velocity, and it is this force which is exerted between the wheels and rail. However much the exact form of the equation given is criticized, it must be remembered that it gives values which are conservatively low and on the safe side for comparing the relative factors of safety of wheels.

The relation of weight to thrust cannot be worked out from the data at hand because all of the experiments were made with one weight of car. It is probable, however, that the thrust varies directly as the weight, if it is true that the only forces acting are those tending to deflect the car from the tangent. Similarly, the thrust would probably vary inversely as the radius of curvature at speeds below that for which the outer rail was elevated. It is evident that only a long and complete series of experiments would establish the exact relation between all of these factors, if such a relation exists. The effects of impact and other forces due to slight variations or imperfections of the cars and track may be so great as to prevent the formulating of a general equation which would be anything more than a rough approximation.

As a result of his experiments, Mr. Fowler estimates the maximum lateral thrust of car wheels in ordinary service to be 30,000 lbs. at 45 miles an hour. The tests of breaking strength of cast iron wheel flanges, made in 1905 by Prof. Goss, gave a minimum of 47,750 lbs., a maximum of 109,900 lbs., and an average of 80,440 lbs. This would indicate an average factor of safety of 2.5 and a minimum of 1.5 for new wheels. Wear and brake-shoe heating would undoubtedly reduce these values, possibly as much as 25 per cent. It is not to be wondered at, in view of these facts, that flange breakages under high capacity cars have been so frequent.

MAINTAINING LOCOMOTIVE POWER BY A STANDARD OF EFFICIENCY

A method designed to systematize and regulate the shopping of locomotives in order to maintain a certain standard condition of power is described elsewhere in this issue. Entire novelty is not claimed for the ideas set forth, although certain features, including the plan for recording graphically the condition of power, as illustrated in two of the figures shown, are new so far as we know. Neither are radical or revolutionary results, evidenced by an immediate marked improvement in the condition of power, expected to follow its application to a division. It is being introduced gradually on the road with which the author of the article is connected, the Atchison, Topeka & Santa Fe, without any desire to upset suddenly the existing order of things, it being considered that the fact that the divisions to which it has been applied know they are under this constant surveillance and that careful comparative graphical records are being kept at headquarters, is of itself a sufficient advantage to make it worth while, as they are thus spurred to make as good a showing as possible.

Establishing a standard, as described, places the condition of power on an efficiency basis; the average of all of the engines on a division must therefore be 100. If it is less than this they are dropping back, while if it exceeds this they are in highly satisfactory condition. It follows then that in order to maintain the standard, a certain percentage of the engines must be shopped each month. The article explains how this percentage is determined, the resulting figure being the "standard per cent. to be overhauled" forming part of the graphical record of condition of power accompanying the article.

The limit for light repairs is $500; therefore if the cost of work on an engine exceeds this amount, the engine loses its mileage and must start afresh. Naturally, where the figure for cost of work runs close to this dividing line, the master mechanic will try to keep under the limit in order to save his mileage. Some juggling of figures will doubtless result in such instances, but granted that it does, it is regarded as a hopeful feature rather than the reverse, indicating a striving after a good record.

As an educational feature, and for application where conditions warrant, the general scheme has much to commend. The practical motive power man might object that the life insurance comparison used in the article is hardly a true one from the power standpoint, since the latter must include, not "selected risks," but all locomotives which happen to fall to the lot of a division, regardless of age, inherent weaknesses and other physical disabilities; therefore, that the matter of average condition of such a group of engines and the laws for its care are hardly susceptible of the exact mathematical treatment of life insurance, claimed near the end of the article. But it must be borne in mind that the outline given is made up in part of theoretical considerations and must be examined from this standpoint. Of course, all sorts of complicating factors can be enumerated which will militate against the practical application of any scheme having in view the objects of this one. Conditions are seldom if ever the same on any two roads, and are constantly changing on every road, influenced by traffic fluctuations, labor conditions, changes of policy, and other such forceful elements.

Transferring locomotives between divisions is another disturbing factor, especially where the operating conditions differ greatly. The two divisions may be totally unlike. One may be single track, on which a freight engine starts and stops its train 20 or 30 times in a trip, while the other may be double track, and engines of the same class and in the same service will stop only for water and make the same mileage in one-half the time. There is no reason, however, why the plan cannot be adjusted to suit such conditions.

The system is capable of being extended in a number of ways. One, which has been partially worked out in theory, is the adjustment of repair activity to traffic needs. To do this the periods of light and heavy tonnage on each division must be studied. By plotting these for a series of years it is possible to say well in advance, in a general way, when the engines on a particular division

will be needed for heavy service. In preparation for this demand the condition of power would need to be brought above standard, so that during the period of heavy movement it would not fall too far below the normal level, and a balance thus be maintained.

SOME PROGRESS TOWARD GETTING BETTER RAILS

At the October meeting of the American Railway Association the rail committee reported unanimity on all except two points in the proposed specifications. But these exceptions—the percentage of phosphorus and the percentage of discard—are of high importance, and two members, Mr. Isaacs, of the Southern Pacific, and Mr. Richards, of the Pennsylvania, submitted minority reports. Because of these differences of opinion the report was not received for discussion by the association, but was returned to the rail committee with instructions to continue its work, with authority to make such expenditure as may be required to secure the assistance of a number of experts of the highest standing.

Although it comes as a severe disappointment to those who hoped for an immediate reformation of thoroughly bad practice in making rails that break and wear out too soon, nevertheless the committee has accomplished much in having agreed among themselves, and having secured assurance of acceptance by the rail makers, on nearly all the propositions involved in making safe rails. If the railroads will insist on observance of these agreed clauses in the specifications in their rail orders for 1908, it will save some lives and some money. They have a basis for requiring that the ingots be kept vertical until solidified; that no bled ingots be used; that "at the final pass the temperature of the rail will not exceed that which requires a shrinkage allowance at the hot saws, for a 33-ft. rail of 100-lb. section, of 6 1/16 in., and 1/16 in. less for each 5-lb. decrease of section"; that the drop tests (a 2,000-lb. weight dropped 22 ft. on a 100-lb. rail) shall be made on a sample from each blow of steel; that the process of hot straightening shall leave the rails substantially straight; and that the facilities for the inspectors shall be such as to secure good product.

The recommended adoption of two standard sections, instead of one, for service under differing conditions is a result of the highest importance. The redistribution of the metal in the head and base so as to make a nearly balanced rail, and the reformation of the base so as to reduce the strains developed in cooling, will meet the approval alike of the makers and the users. With these practicable sections, with inspection fully as thorough as can be expressed in words, with competent inspectors and plenty of them, so that the processes can be watched from beginning to end, and with the specified tests rigidly adhered to, good rails can be got by those railroads who can afford to refuse to be baffled. It would be well, too, to mark the rails in such a way that each rail can be identified in relation to its place in the ingot.

There are two plain results so far secured from the agitation of the subject and the work done by the American Society of Civil Engineers, the Maintenance of Way Association, the Society for Testing Materials and the American Railway Association: The absolute necessity for better rails is recognized by all, and the chief executive officers of the railroads and the rail mills are now in closer touch than they ever have been, and they will do their utmost to secure sound material. It is now to be expected that those who buy and those who sell, realizing that a great responsibility rests on them, will treat the subject in a dignified but very thorough fashion.

Concerning the percentage of phosphorus: Mr. Kruttschnitt's supplementary report is so clear that it is a great pity that a construction of the rules of the American Railway Association prevents its publication in these columns. He admits the claim of the manufacturers that there is not enough American ore of such composition as to supply all American railroads with rails with a maximum of .085 phosphorus, but shows that the manufacturers are now filling Canadian and foreign orders from this best quality ore. He justly demands that the manufacturers use this best quality ore, as far as it will go, in supplying American railroads.

The important specification for a fixed percentage of discard from the ingot is far from acceptance. It has been shown by reports and photographs of broken rails to be the overwhelmingly important specification in the present state of the art of making ingots. The manufacturers firmly oppose it, and are technically right in saying that this is a crude and wasteful way of attempting to correct an evil. Although it cannot be denied that a fixed minimum cut of the inferior metal from the top of the ingot is the only present known way (after complying with all the other specifications) of improving quality, nevertheless this received final support in the committee of nine from the representatives of the Pennsylvania and the Southern Pacific only. This is however a time for suspending judgment. The committee is authorized to employ the best talent in the world and we may hope for some better solution than an arbitrary rule for this one specification.

Further discussion of this subject is invited.

The fine of $25,000 which was imposed on the Michigan Central at Toronto, Ont., recently for criminal negligence in connection with an explosion of dynamite in a freight car, killing two persons and injuring many, was based on circumstances which the judge declared made his "blood run cold." A car containing boxes of the explosive, also other freight, was so roughly handled that some of the boxes of dynamite shifted in their places and were found on edge. Besides this, the liquid explosive leaked from the boxes and ran from the floor to the ground, so that while the car was being switched crackling noises were heard. This condition lasted a day or more while the car was moved in two different local freight trains. Even when the conductor finally righted the boxes he did not wash the floor or the running gear on which the liquid had leaked. A suitable placard was tacked to the outside of the car, and this was considered by the Railway Commission a compliance with the law, or at least enough of a compliance so that the commission declined to prosecute the road; but the court (Mr. Justice Riddell) holds that the company was grossly negligent in not instructing its trainmen or taking the special care which was obviously necessary in handling explosives. A common carrier need not accept explosives, but if it does accept them it must take all necessary precautions. A grand jury had exonerated the trainmen, but the judge says that the question of the guilt of those men is not before him in the present case. The railroad company pleaded guilty. It was claimed that the explosive had not been correctly described by the shipper, but the judge does not accept that as an excuse. He deplored the lack of a public officer to watch for such offenses against the law, the evidence convincing him that the bad practice here shown had been of long standing. The amount of the fine was fixed (apparently smaller than otherwise it would have been) after the road had stated that it would have to pay at least $15,700 in damages, besides settling with other parties who are asking for $50,000. Justice Riddell finds that no officer or employee of the road (except the trainmen, whose chief fault is ignorance) is within the jurisdiction of the court. If any such officer or employee could be found he would recommend his indictment.

The Railroad Commission of Wisconsin has rescinded an order, issued by it early in September, requiring the Marathon County Railroad, owned by the R. Connor Company, lumbermen, to provide weekly passenger service. The report of the railroad for the period of September 5 to October 22 showed that the entire passenger revenue was $1.10. Trips were made on Tuesdays of each week. The cost of each trip, including only the wages of the trainmen and the fuel, was $4 for each trip. The road charged 2 cents a mile, although not required to do so under the Wisconsin 2-cent fare law, which applies only to roads earning more than $5,000 a year. The Wisconsin commissioners seem to lean toward conservatism. Why didn't they order two trains to be run daily each way, so as to "develop" traffic?

Kansas City Southern.

The Kansas City Southern has had a memorable year. The twelve months ended June 30, 1907, covered a period in which the road not only found itself and secured the most favorable results in its history, but in which the Kansas City Southern led the other railroads of the country in its gains in operating results. This last comparison, of course, is not altogether a fair one, for no large well equipped system had the same opportunity to progress. Two years ago the Kansas City Southern, cheaply built to begin with, had been allowed to run down and rust out. The independent management which took hold in May, 1905, began at once to improve and rehabilitate. These improvements began to show their effect during the past year. This was one reason for the favorable results. Another was the great prosperity of the Southwest, through the heart of which the road runs following roughly the boundary lines between Kansas and Missouri, Indian Territory and Arkansas, and Texas and Louisiana. A third influence, perhaps most important of all, though not so obvious, was the election in June, 1906, of L. F. Loree as chairman of the executive committee. His wide experience in railroad operation was actively used in meeting the problems of the Kansas City Southern.

The road's gross earnings for the year were 20 per cent. larger than those of 1906, yet operating expenses decreased 3 per cent. As a result, net earnings were $3,700,000, against $2,000,000 in 1906,

an increase of 83 per cent. Fixed charges were 20 per cent. greater as a result of the larger amount of 5 per cent. negotiable gold notes outstanding, leaving a net income of $2,450,000, against $930,000 in 1906, an increase of 163 per cent. The most remarkable feature of this showing is that in a year when railroad expenses generally grew almost as fast or faster than gross earnings, the Kansas City Southern's operating ratio dropped from 73.10 to 58.78 per cent.

The traffic of the road is largely made up of forest, agricultural and mineral products, which move in large quantities in full carloads but at low rates. The largest single article of traffic is lumber, which comes from great tracts of southern pine timber which it is estimated will last for a generation. Large bodies of hard wood timber are also now just beginning to be developed.

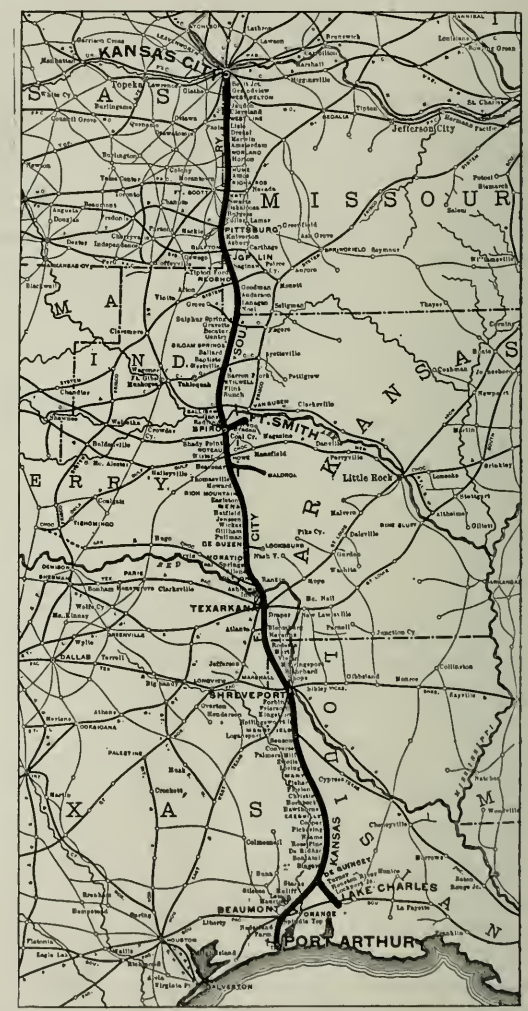
The next most important traffic group is agricultural products. Yet south of the Missouri state line, only about 18 per cent. of the land tributary to the road is under cultivation. The lands in Indian Territory and in Kansas are rapidly filling with new settlers and will soon be made much more productive. The principal agricultural tonnage, however, must always come from Kansas City and its tributary agricultural territory. Kansas City is the second primary grain market of the United States. In 1905, of the 358,000,000 bushels of grain produced in its territory, over 66,000,000 bushels centered on Kansas City for trans-shipment. This is the region to which the advantages of the Gulf ports for export over the Atlantic seaboard harbors are greatest. The southbound grain movement from this section is constantly growing and is likely to receive still greater impetus when the Panama canal is built.

This traffic is at the moment especially valuable to the Kansas City Southern because it tends to balance its traffic. The principal traffic movement has been the lumber tonnage from the southern and central parts of the line, north to the Kansas City gateway. Much of this in the past has been unbalanced traffic resulting in a large southbound empty car movement. The southbound grain movement is highly competitive but, nevertheless, because it is southbound traffic, is especially profitable. When it grows so much that it becomes necessary to load more cars south than north, the margin of profit will be greatly reduced. If it should grow still further so as to necessitate a considerable northbound empty car movement, the profit may be entirely wiped out.

Coal is the third most important article of traffic, though the Kansas City Southern's possibilities of mineral tonnage are, as yet, little developed. The district bounded by the Mississippi river, the Gulf, the Rocky mountains and Canada, is an area 900 miles wide and 1,300 miles long, approximately equal, excluding Russia, Norway and Sweden, to continental Europe. There are in it only three fields of commercial coal. Of these, the Indian Territory-Arkansas field is the most important. The Kansas-Missouri field comes second and the Missouri-Iowa field third. The first is about 30,000 square miles and the second 20,000 square miles in area. The Kansas City Southern crosses both of these two principal coal fields, but for a number of reasons, principally for lack of branch lines, this traffic has not been developed. Coal furnishes only about 18 per cent. of the Kansas City Southern's total tonnage while on comparable railroads it makes up from 40 to 50 per cent. The road's share in this business is so small that in 1906 it carried only 3.2 per cent. of the total output of these two most important fields. Besides these three principal sources of low grade traffic there are the zinc mines in the Joplin district of Missouri and the Pittsburg district of Kansas, the oil fields in southern Kansas and Indian Territory which are now being rapidly developed, and many stone and slate quarries.

These are the principal traffic resources of the railroad. The profits which it can gain from the rich resources of its territory depend on the extent to which it is able to rise to its opportunities. The Kansas City Southern is to-day one of the most striking examples of a railroad which could make money by spending money. It is probable that it could profitably use from $10,000,000 to $25,000,000, or from about one-ninth to one-fourth of the sum at which all its properties are carried on its combined balance sheet, in betterments, improvements and extensions. With funds to that extent at its command, a sweeping campaign of improvement could be applied to the whole property, the rich sources of its local territory protected by building branch lines, and an extension to New Orleans, already surveyed, carried out. Barring a severe industrial depression in the Southwest, every one of these expenditures would not only pay a reasonable return on their cost, but would earn profits besides.

In the present state of the investment market it is out of the question to secure any such sums. Nevertheless, the company was fortunate in getting enough money to provide for considerable improvements before railroad securities became unsalable. On April 2, 1906, an issue of $5,100,000, six-year 5 per cent. notes was underwritten. On June 30, 1907, $4,806,000 of these were outstanding, from which the Kansas City Southern had received $4,443,612 as net proceeds. Of this sum $3,949,537 had been spent; $3,400,000 for general improvements, the rest for equipment, real estate and advances to Port Arthur Canal & Dock Company for improvements. Including the $294,000 notes unissued which will net $270,950, the unexpended balance of about $500,000 of the net proceeds earlier received, and the sum of $263,115 which is the unexpended balance from track and bridge materials taken out of service in the course of improvements and available as a fund for further improvements, the Kansas City Southern had on June 30, 1907, $766,000 still available as an improvement fund. There was required $1,780,000 to finish the authorized improvements not completed on that date. It will therefore be necessary to provide $1,014,000 from surplus earnings from operation. This is to be and can be done. Thus, it is within the power of the road to carry out the first and most important section of the improvement expenditures. This definite statement of the sources of the funds for improvements



and their application informs the stockholder of exactly what has taken place in this most vital and at the same time uncertain department of a railroad's finances instead of giving him incomplete figures or no figures at all. It takes him into the confidence of the management instead of making it difficult or impossible for him to know the facts.

The improvements now authorized when finished will not make the Kansas City Southern an efficient operating property. They are made up mostly of improvements to freight stations, new sidings, reconstruction of bridges, ballasting, widening embankments and terminal betterments. The next vital need of the road is for grade reduction. The work of investigating such possibilities was vigorously carried on during the year. Thorough examination of the whole territory from Kansas City to the Gulf was made both by reconnoissance and by instrument surveys. It was found that

the grades on the 433 miles from Kansas City to DeQueen, Ark., which is at the southern foot of the Ozark mountains, can be revised to a maximum of one-half of one per cent. and no lower. From DeQueen to Port Arthur, Tex., 353 miles, it is feasible to reduce the grades to three-tenths of one per cent. With the existing volume of traffic, however, it is for the present preferable to plan for a revision on the same basis as on the northern end of the line. At present the road has grades of 1 per cent. or steeper on every operating division. As a result, train operation is most costly, particularly because most of the business, as already described, is low-grade heavy traffic. Grade reduction is vitally important both for this reason and because of the highly competitive nature of the southbound grain traffic from Kansas City to the Gulf. When the line betterments which are planned are carried out, the expenses of moving the traffic are to be cut in half and the export grain business, now profitable, will come to be a source of much larger profit.

The Kansas City Southern is considerably shorter from Kansas City to tidewater than any other railroad under single ownership, and President Edson states that the changing rate conditions, due to legislation and commercial activity, are giving the factor of relative distance more value than heretofore. If the Kansas City Southern can add to its advantage in distance over its competitors, an advantage in grades, its command over the export grain traffic, potentially enormous in volume, will be greatly strengthened. While it is not possible for the company to begin at once all of the grade improvement, arrangements have been made to begin this work on the heavy mountain division of the road between Spiro, Ind. T., and Shreveport, La. This is a territory where the traffic is heaviest and growing most rapidly. This stretch when improved will give a low-grade line for the development of the Arkansas-Indian Territory coal field, and will also greatly reduce the cost of operation.

The next work of this sort which is likely to be undertaken, but which as yet is not authorized or arranged for, is a change of line for 41 miles in the neighborhood of Fort Smith, Ark. The importance of this place as the commercial center of the middle Arkansas valley its situation in the coal and natural gas fields and its rapid growth in population and manufactures, are all arguments for putting it on the main line of the Kansas City Southern. This can be done by building a new line from Stilwell, Ind. T., to Fort Smith, and using the branch from Fort Smith to Spiro to complete the new line, which would be 40.79 miles long, 2.55 miles longer than the present line. In case this were done the old line between Stilwell and Spiro would be abandoned as a through line.

The necessity of carrying out these various betterments of the operated line arises from the character of the Kansas City Southern as a trunk line from the grain producing states to the gulf of Mexico. The road lies surrounded by powerful neighbors and competitors, aggressive in their development. Its profitable future depends on so improving its facilities as to put it in a commanding position for inviting business and economically handling it.

It is fair to attribute the splendid showing of the road during the past year largely to the management. Mr. Loree and President Edson have a record of which they may well be proud. The railroad improved not only in earnings, but in operating efficiency. The most obvious way to increase the efficiency of operation was by reducing grades and curvature but as this relief was not at hand, other means were used. Largely as a result of the weak position which the road occupied in competitive traffic, shippers had been allowed to be slow in handling their cars. This general laxity had a serious effect on the operation of the road, for largely on account of it the average car movement in the first half of 1906 was about 20 miles a day. As a result, freight moved slowly and the road was handicapped as against other railroads. During the last fiscal year more prompt handling by shippers was insisted on. As an immediate result the average car movement was increased in three months to 34 miles a day. The resulting quicker movement of freight attracted southbound traffic. This was the traffic which was especially valuable on account of the back haul. The increase in the revenue trainload from 289 tons to 332 tons, or 15 per cent., came as a result not of using heavier power, but of filling out the southbound trains. The same cause is largely responsible for the increase in the revenue carload from 14 tons to over 15 tons and in making 120,000,000 more ton-miles with a decrease of 22,000 train-miles. Conducting transportation increased only $31,000 not because the Kansas City Southern did not have to pay larger prices for its materials and labor, but because of these operating economies.

There was a decrease of $160,000 in cost of maintenance of way and of $76,000 in maintenance of equipment, but both of these expenditures are to be compared with a year whose expenses included large amounts spent for rehabilitation. Furthermore, as a result of the "bonus" system adopted in the maintenance of way department, which was described in the *Railroad Gazette* of August 2, 1907, in an article describing in detail the methods employed by the management to bring about the results of the year, it is probable that the lower maintenance of way figure represents almost as much actual improvement of the line. The unit maintenance charges for the two years were as follows:

	1907	1906
Maintenance of way per mile	1,095	1,201
Repairs and renewals per locomotive	2,713	2,850
Repairs and renewals per passenger car	740	883
Repairs and renewals per freight car	50	65

The amount spent on freight car repairs seems too small for a year when cost of materials increased but there is no doubt that the freight cars are generally in good shape, which is quite the opposite of their condition on June 30, 1905.

No table of commodities carried is included in the report probably because in the case of this road such information would be of great value to competitors. It is, therefore, not possible to analyze the traffic except by the three large groups already described.

The Arkansas Western, which runs from Heavener, Ind. T., east to Waldron, Ark., 33 miles, is owned by the Kansas City Southern but operated separately. It had gross earnings of $88,000, against $75,000 in 1906. It is shown on the accompanying map.

The Kansas City Southern is an unusually interesting railroad because it is a trunk line, independent, and small and compact enough so that its operations stand out clearly instead of in totals so large that the individual tendencies are obscured. The road has, largely from the development of its local resources, reached a self-supporting position. Its future success depends largely on the amount of money which it can command to improve its property and extend its influence. It has a magnificent opportunity. With a return to normal conditions in the security market this opportunity is not likely to be wasted.

The following table summarizes the operating results:

	1907.	1906.
	$16	$16
Mileage worked		
Passenger earnings	$1,343,354	$945,208
Freight earnings	7,018,633	5,058,153
Gross earnings	9,084,332	7,568,332
Maint. way and structures	819,859	980,104
Maint. of equipment	1,108,521	1,184,080
Conducting transportation	2,885,780	2,854,696
Operating expenses	5,339,519	5,532,275
Net earnings	3,744,813	2,036,057
Fixed charges	1,367,608	1,131,900
Net income	2,455,339	933,055
Dividends	840,000	
Year's surplus	1,615,339	933,055

Louisville & Nashville.

President Milton H. Smith, of the Louisville & Nashville, evidently does not consider an annual report to stockholders a desirable publicity medium for his opinions, which are by no means mild, on the subject of railroad legislation. The Louisville & Nashville, though hard-pressed by legislation, makes no reference, directly or indirectly, to the subject, in the report for the year ended June 30, 1907. Yet in Alabama, in which it has an especially large mileage, it is at the moment facing a special session of the legislature called largely because of its refusal to acquiesce as the other railroads of the state had done in the reduced rates passed by the legislature at its last regular session. In connection with this special call of Governor Comer of Alabama, President Smith is making his opinions known at some length. The following quotation is a fair summary of his position:

"Will the citizens of Georgia or other states or other countries invest their savings, on which they may desire to receive a satisfactory return, to create railroads in a state or country where the remuneration received for the transportation of persons and property is fixed by the agents of the state, without the state's assuming any responsibility for the result, and where, in addition to fixing the rates and exacting onerous taxes, the state enacts laws regulating the conduct of business and the relations between the carrier and its patrons in a manner that, if enforced, will greatly harm and probably financially embarrass the carrier?"

The sphere of influence of the Louisville & Nashville lies between a line drawn from Cleveland, Ohio, south to Jacksonville, Fla., and another line drawn from St. Louis, Mo., south to New Orleans, La., the whole bounded by Chicago on the north and the Gulf on the south. The bulk of its lines lie in an even narrower north and south belt, bounded on the east by a line from Toledo south to Cedar Keys, Fla., and on the west by a line from Chicago south to Mobile, Ala. It owns or controls, directly or indirectly, 6,891 miles of line, of which 4,306 miles are directly operated. Its own northern terminals are at Cincinnati, Louisville, Evansville and St. Louis, but jointly with the Southern Railway it controls the Chicago, Indianapolis & Louisville, which gives both of the southern roads a Chicago connection. The annual report of this road is reviewed in another column. The Louisville & Nashville itself owns the majority of stock of the Louisville, Henderson & St. Louis, 218 miles, which runs from Louisville west to Evansville, and of the Nashville, Chattanooga & St. Louis, 1,230 miles, which runs from three terminals on the Mississippi river southeast through Chattanooga to Atlanta. With the Atlantic Coast Line, of which it is itself a subsidiary, it leases the Georgia Railroad and its dependencies, the Atlanta & West Point and the Western of Alabama, these three roads together forming a line from Selma and Montgomery, Ala., east through At-

lanta to Augusta, Ga., with branches, 571 miles. The map published herewith, even though it does not bring out the subsidiary and controlled roads, gives an indication of the widespread influence of the road in its particular territory. With the other lines brought out in full relief, this showing would be even more striking.

Last year's operations were affected by the influences of higher costs and congested traffic, which seem to have been stronger in the South than in any other part of the country. The Louisville & Nashville also suffered especially from the heavy damages of the Gulf storm of September, 1906. However, the company was not as hard hit by the other difficulties as the Southern Railway, for instance, because it was better prepared to meet the rush of traffic. It has more double track (though the report gives no information on this point) than the Southern, and also more and better equipment. This superiority is due to large betterment expenditures out of earnings during recent years.

Gross earnings were $48,200,000, against $43,000,000 in 1906, an increase of $5,200,000, or 12 per cent., but straight operating expenses rose almost $42,000,000, or 16 per cent., leaving net earnings of $16,100,000, against $15,000,000 in 1906. The increase in earnings came from both the freight and the passenger departments. Freight earnings increased 11 per cent., and passenger earnings 16 per cent. The operating ratio was 74 per cent., against 72 per cent. in 1906.

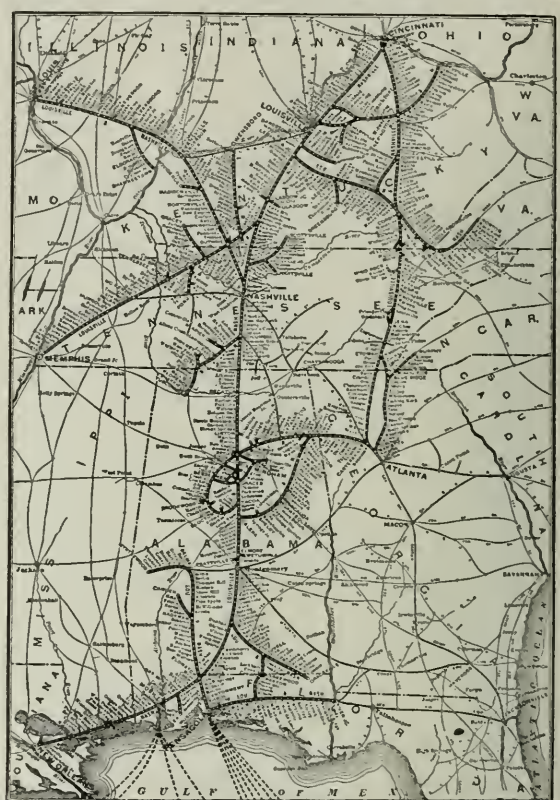
The large increase in operating expenses was in conducting transportation. The operation branch of this account in itself was $1,400,000 larger than the conducting transportation expense for both operation and traffic in 1906. Owing to a rearrangement of the conducting transportation expenses, including the separation of the account into the two separate branches, accurate comparisons cannot be made of most of the separate accounts, but where the same accounts appear in both years the increased cost is very noticeable. Among the individual accounts which can be thus compared are engineers and firemen; fuel, water supply, oil and waste for locomotives; switchmen, flagmen and watchmen; telegraph expenses; clearing wrecks; loss and damage-freight; damage to stock; injuries to persons, and stationery and printing, all of which largely increased. Under general expenses there was a large increase in the salaries of clerks and attendants. Thus the ordinary, necessary non-productive expenditures cost a great deal more than in the previous year.

Like the Lake Shore & Michigan Southern, the Louisville & Nashville includes in its maintenance operating expense accounts money spent for betterments and improvements. Including such improvement costs, the total amount spent on maintenance of way was 23 per cent. larger than in 1906. In 1906 it was 15 per cent. larger than in 1905. The part of this cost which went for improvements was $2,545,988, against $1,785,196 in 1906 and $1,574,428 in 1905. Including these, maintenance of way cost $1,873 per mile, against $1,583 in 1906 and $1,490 in 1905. Straight maintenance of way, excluding betterments, cost $1,282 last year against $1,150 in 1906 and $1,079 in 1905.

Equipment expenditures are described in great detail. Repairs cost $3,080 per locomotive, against $3,844 in 1906; repairs and renewals, $3,188, against $4,031 in 1906. Besides this $337,500 was charged to operating expenses under improvement account for new locomotives, $216,000 to the capital accounts, "improvements and betterments" and "South & North Alabama Railroad" and $895,000 to cost of road and equipment for the same purpose. There were 865 locomotives owned on June 30, 1907, against 745 a year earlier. Repairs cost $924 per passenger car, against $1,003 in 1906. Including renewals, the passenger-car cost was $1,004, against $1,039 in 1906. At the same time there was $57,560 charged to improvement account and $68,000 to cost of road and equipment for new passenger cars. Freight car repairs cost $67 per car, against $56 in 1906. Repairs and renewals were $91 per freight car, against $761 in 1906. At the same time $656,520 was charged to improvement account and $1,400,000 to cost of road and equipment for new freight cars. These are very liberal charges. When a road spends as much as this on each unit of its equipment it is not easy to make careful comparisons between different years. The decrease in locomotive repairs, however, follows a year when this expense increased over 50 per cent., due to a number of special causes, including the repairing of old locomotives taken over with the Atlanta, Knoxville & Northern and repairs postponed during the time of removal from the old to the new shops at South Louisville. The increase in freight car repairs, on the other hand, reflects the greatly increased cost of materials and labor.

During the year reduction of grades between Saxton, Ky., and Corbin, on the Cincinnati-Atlanta line, was finished and work begun on grade reduction and double-tracking from Corbin north to Livingston. When finished, this will give a double track for 35 miles north of Corbin, with a maximum grade from Saxton north to Sinks, 61 miles, of 0.65 per cent., compensated in both directions, except for one southbound pusher grade four miles long.

In order to provide funds for finishing construction work and improvements under way and authorized, the company in February issued $6,500,000 three-year 5 per cent. notes, which were sold at 95¼, a net return to the company of $6,207,500. As a result, the Louisville & Nashville is to-day in a better position, from the standpoint of cash resources, than many other railroads. Within the past few years it has come to be one of the strongest of the country's railroads. This is indicated by the fact that at the extreme low prices now prevailing Louisville & Nashville stock sells little lower than New York Central. Both are 6 per cent. stocks, but the New York Central has a long record of dividend payments behind it and tremendous equities in controlled companies, while the Louisville &



Louisville & Nashville.

Nashville paid no dividends in the five years from 1894 to 1898 and is a minority stock.

The following table shows the income results of the last two years:

	1907.	1906.
Mileage worked	4,306	4,131
Passenger earnings	$10,417,470	$8,985,216
Freight earnings	35,235,787	31,536,207
Mail earnings	883,434	907,339
Express earnings	1,078,601	958,886
Gross earnings	48,263,945	43,008,996
Maint. way and structures	5,510,910	4,752,501
Maint. of equipment	7,628,006	6,623,706
Conducting transportation.	17,972,348	15,639,420
Operating expenses	32,153,711	27,982,111
Net earnings	16,110,235	15,026,888
Net income	10,078,114	9,299,728
Dividends	3,600,000	3,600,000
Improvements:		
Maintenance of way	2,545,988	1,785,196
Maintenance of equipment.	1,081,604	1,166,157
Year's surplus	2,850,522	2,748,375

Wabash.

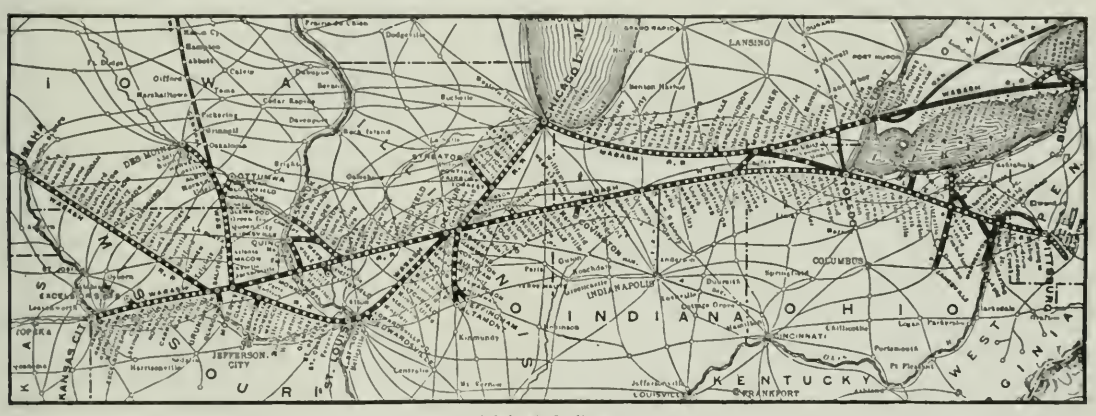
Last year was the second year in which the present management of the Wabash, with Frederic A. Delano as President and Henry Miller as Vice-President and General Manager, was in charge of the road. The 1906 report told of the introduction of many changes in organization and operation. Last year these changes had a chance to show their effect. In general it was a very favorable one.

The handicaps of the road may be considered first. It lies in highly competitive territory surrounded by competitors stronger in traffic advantages and financial resources. As a result it receives low freight and passenger rates. To get a satisfactory profit from such competitive business a railroad needs to have facilities as nearly perfect as possible. The Wabash has lacked much in this respect

and still lacks a great deal. The bright promises of its future cannot be carried out until its general financial plan is successful. This was delayed by opposition of some of the holders of the debenture B bonds, but has since been postponed far more decidedly by the depression in the financial markets. How hard this has hit the financial plan of the Wabash is shown by the price of 10 at which the new 4 per cent consolidated mortgage bonds, of which a few have been put out are selling.

In passenger earnings the Wabash is especially hard pressed by the competition of the most highly developed system of interurban lines in the country. The effect is clearly shown in a reduction last year of the number of passengers carried, but an increase in the number of passenger miles. President Delano frankly says that the electric lines are being used more extensively for the shorter trips, leaving to the steam railroads only the long haul business. The Wabash is also in particular a sufferer from 2-cent fare laws which are now in effect in Ohio, Iowa, Indiana, Illinois and Missouri. Except in Ohio the new laws have not had time to fully show their effect. Passenger earnings showed only a slight increase last year and are still more than $2,000,000 less than in 1905, which was the year of the heaviest traffic to and from the World's Fair at St. Louis.

The work of the past year has been toward the improvement of the property to the extent of funds available and the attraction of traffic by more efficient operating methods. The report of the Traffic Manager which was included in the 1906 annual report is not published this year, so that changes in traffic methods can be seen only indirectly. The train and mileage statistics are given in exceptional detail. One important feature closely associated with the growth of traffic, however, is not included—the average distance haul of each passenger and each ton of freight, nor is any list of



Wabash Railroad.

tonnage by commodities included in the report. Probably these facts are not made public for the same reason as in the case of the Kansas City Southern, reviewed in another column; because this information would be of considerable value to competitors.

Among the more important measures which have been taken toward more efficient operation of the property, the new car shops which have been built at Decatur, Ill., are important. These are run by electric power and have a capacity of building 25 new freight cars and one new passenger car a day. They are, however, now being used for repairs. These shops were described in the *Railroad Gazette* of January 25, 1907. There has also been established at Decatur a new fireproof supply depot, material and scrap yard to concentrate the material and supplies of the lines east of the Mississippi river which heretofore have been at various scattered points in frame buildings. At Moberly, Mo., the principal division and shop point west of the Mississippi river, a new reservoir with a capacity of 65,000,000 gallons has been finished. More than 200,000 gallons of water are used daily at Moberly and for nine months of the past year before completion of the reservoir, it was necessary to haul water by train to that point. Terminal improvements were made at Chicago, St. Louis, Detroit, Decatur, Kansas City, Council Bluffs and Moberly. Second track for 25 miles was built on the Decatur division between Decatur and St. Louis. A complete change of grade and alinement for five miles with new double track and a large concrete bridge over the Sangamon river will be finished this fall between Decatur and Sangamon, the next station east. This bridge was described in the *Railroad Gazette* of December 21, 1906. There were 80 miles of 80-lb. rail laid in the main line and 200,000 yards of ballast. This completes the ballasting or reballasting of all the main line and important branches. There are now being delivered 60 additional heavy freight locomotives and 10 large switching engines which will be important in cheapening the cost of operation.

Arrangements have been made for the use of about 56 miles of track of other companies on the St. Louis-Kansas City line as new double track. The Chicago & Alton track between Mexico, Mo., and Clark, 26 miles, and the Wabash track between these points are to be operated as double track. A similar arrangement has been made with the Santa Fe between Carleton, Mo., and Camden, 30 miles. A double track arrangement was already in force with the Burlington between Birmingham, Mo., and Harlem, 10 miles, so that by the small investment necessary for new crossovers and interlocking at junctions, the Wabash will have the use of 66 miles of double track between St. Louis and Kansas City. As a further operating economy, on July 1, 1907, the division headquarters of the Detroit-Chicago line was moved from Ashley, Ind., to Montpelier, Ohio, thus doing away with one of two division points which were located within 24 miles of each other.

Gross earnings were $27,400,000, an increase of $2,400,000 and the largest in the history of the road. Operating expenses increased $2,000,000, leaving net earnings larger by $300,000 than in the previous year. This is after eliminating the amounts shown in the maintenance accounts as spent for improvements in the two years. Besides the larger costs of labor and material the operating expenses were increased by strengthening bridges and turntables, raising coal chutes and water tanks, extending engine houses for larger engines and increasing siding accommodations for the resulting heavier trains. The use of metal instead of wood in renewing box car roofs and draft attachments of freight cars and the equipping of freight cars with air brakes also added to the operating costs. From the net income of the year a 6 per cent. dividend was paid on the debenture A bonds and a 1 per cent. dividend on the debenture Bs. There was also $3,000,000 appropriated in one way or another for improvements, against $3,500,000 in 1906. The advance in operating results is shown in the statement that gross earnings per mile increased from $9,938 to $10,904 and net earnings per mile from $2,756 to $3,151.

The maintenance expenditures are analyzed in detail in the report so that on these points it is unusually clear. Maintenance of way expenses both with and without improvement costs are shown. Straight maintenance of way cost $927 per mile, against $983 in 1906. Including additions and improvements, the figures were $1,093 last year and $1,235 in the previous year. The 1905 costs were $1,360 per mile and, including improvements, $1,592, but this was an exception because of the disorganization of the road by the World's Fair traffic. On the line from Moberly, Mo., east to Hannibal, 70 miles, maintenance of way cost $2,644 per mile last year, against $1,377 in 1906. This stretch of line was relaid with heavy rail, completely ballasted and embankments and cuts widened to take care of the heavy traffic which increased from 33,000 tons per mile of road in June, 1905, to 86,000 tons per mile of road two years later.

Repairs of locomotives cost $2,460, against $2,037 in 1906; of passenger cars $612, against $597 in 1906, and of freight cars $57, against $50 in 1906. These figures are based on straight maintenance and do not include any payments for new equipment. The number of locomotives, passenger cars and freight cars is computed from the average number in use on and maintained by the Wabash. These are the ideal conditions for working out these unit figures, but most roads not only do not do it themselves for the information of their stockholders, but give no figures which make possible such accurate averages.

Increased operating efficiency is shown in a number of different

ways. Earnings per freight train-mile increased from $1.89 to $2. With an increase of 353,000,000 revenue ton-miles there was a decrease of 4,400,000 empty freight-car miles. Including caboose cars, the empty freight-car mileage was only 24 per cent. of the total, against 27 per cent. in 1906. The revenue trainload increased from 348 tons to 360 tons. Gross earnings per loaded freight-car mile were 10 cents, against 9½ cents in 1906. The average miles run to one ton of coal, however, decreased from 15.8 in 1906 to 14.1 last year, probably owing to the heavier traffic.

The Wabash is steadily progressing under the present management which, though limited in its opportunities, is making a splendid record. This, after all, is the greatest test of ability, to produce good results from insufficient materials.

The following table, rearranged according to our usual method, summarizes the results of operation for the last two years:

	1907.	1906.
Mileage worked	2,517	2,516
Passenger earnings	$6,891,289	$6,723,658
Freight earnings	18,465,286	16,138,466
Gross earnings	27,432,474	25,015,379
Maint. way and structures	2,329,510*	2,475,560*
Maint. of equipment	3,379,648†	2,739,283†
Conducting transportation.	12,153,324	10,629,921
Operating expenses	18,551,377	16,503,760
Net earnings	8,881,096	8,511,618
Net income	3,505,046	4,057,613
Dividends on debenture bonds	475,000	...
Improvements, etc.	3,043,381	3,548,280
Year's suplus	13,335‡	509,333

*Maintenance of way betterment expenditures, included by the Wabash in operating expenses, amounting to $418,157 in 1907, and $633,462 in 1906, are incinded in "Improvements, etc.," below.

†Expenditures for new equipment included by the Wabash in operating expenses amounting to $535,613 in 1907, and $940,665 in 1906, are included in "Improvements, etc." below.

‡Deficit.

New York, Ontario & Western.

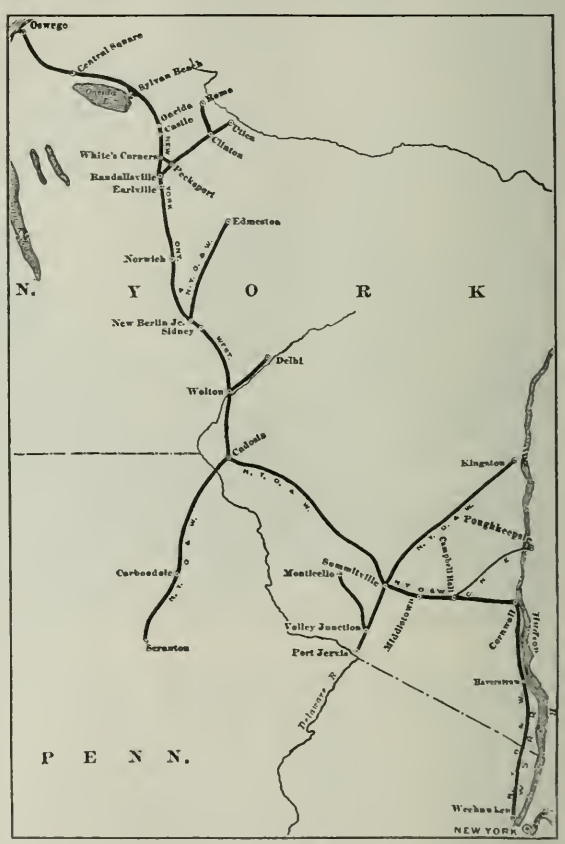
The New York, Ontario & Western was organized in 1880 as the successor of the New York & Oswego Midland, an unimportant line which ran from Middletown, N. Y., to Oswego, on Lake Ontario. The road was little more than a struggling competitor for odds and ends of trunk line traffic until the middle of 1890, when the Scranton division was acquired, which brought the New York, Ontario & Western into the northern anthracite field. Through purchase of the Scranton Coal Company, in 1899, and the Elk Hill Coal & Iron Company in 1900, a large anthracite tonnage was assured. Since then the road has prospered. Gross earnings per mile, which were $5,188 in 1890, the year before the Scranton division was acquired, rose in ten years to $10,331 per mile, and last year were $15,026. Net earnings were $1,020 per mile in 1890, $3,233 in 1900 and $4,686 last year. Net income per mile during the 17 years, during which the Scranton division has been included in the mileage of the road and its cost in the fixed charges, has increased from $210 to $3,031.

As may be judged from this showing, the Ontario & Western's main dependence is on its coal traffic. Out of total freight earnings of $6,300,000 last year, earnings from the transportation of coal were $3,600,000. The total shipments over the Scranton division were 2,700,000 gross tons, of which 200,000 tons were company coal. Of the total output of 55,700,000 tons of the anthracite fields, the Ontario & Western therefore carried 5 per cent. The bulk of this coal was shipped to tidewater, either at Cornwall, 60 miles up the Hudson river, or at Weehawken. There were handled over the company's docks 1,440,000 tons of coal, 761,000 tons at Weehawken, 531,000 tons at Cornwall and 148,000 tons at Oswego. The explanation of the fact that nearly as much was handled at Cornwall as at Weehawken, with its advantages of the New York market and the longer haul, is that the Ontario & Western owns no track south of Cornwall. For the 52 miles between Cornwall and Weehawken it uses the West Shore tracks, paying as rental a proportionate share, based on train mileage, of the cost of maintenance, and a like proportion of interest at 4 per cent. on $2,000,000, plus the amount spent since the contract went in force on January 1, 1886, for necessary improvements to the line. It is therefore profitable for the Ontario & Western to limit its freight traffic over this stretch of track. Instead of carrying its whole anthracite tonnage to the New York market it distributes a great deal of it at Cornwall by barges and canal-boats, besides what it ships northbound over the West Shore.

The New York, New Haven & Hartford, in October, 1904, bought control of the majority of the common stock as a protection of its sources of coal supply and also as a potential club with which to resist possible severe demands of the trunk lines for new divisions of earnings on through business to New England. The New York, Ontario & Western connects with the Central New England at Campbell Hall, N. Y., from which there is access over the Poughkeepsie bridge to the New Haven system in New England. The extensive improvement of the Poughkeepsie bridge, to put it in shape for heavy traffic, is still under way, as well as improvements to the New Haven's lines east of the river, so that there has never yet been a full test of the new line. However, even with the inadequate facilities, there has been a largely increased movement of coal traffic over this route since the New Haven bought control. Besides this there was established a year or more ago the Ontario Central Despatch, a fast freight line between the West and New England, operating over the New York, Ontario & Western and the Poughkeepsie bridge, and this has increased merchandise shipments through this gateway.

When the New Haven bought control of the Ontario & Western the common stock was not paying dividends. The $2,000,000 preferred stock—all but $4,000—having been exchanged for mortgage bonds, was deposited in a voting trust which elected a majority of the directors. In order to get actual control it was necessary to pay a dividend on the common stock. A dividend of 3 per cent. was paid on January 16, 1905. The voting trust was therefore terminated and the New Haven elected a majority of the directors. In July, 1905, 1½ per cent. was paid and in each of the two succeeding years 2 per cent. has been paid on the common stock.

Next to coal and local freight, through freight and milk furnish the most important sources of freight revenue. Each of these classes of traffic brought in between $700,000 and $800,000 last year, while



New York, Ontario & Western.

local freight earnings were $1,177,196. Passenger earnings were $1,550,000, against $1,380,000 in 1906, of which $1,288,000 came from local passengers and $267,000 from through and immigrant business. There is a large business from New York to summer resorts in Orange, Sullivan, Ulster and Delaware counties, which last year was so large that few passenger coaches could be spared for excursions. There were, however, 52 excursions run, carrying 17,881 passengers, with a revenue of $20,067, or $5.29 per train mile.

Gross earnings were $8,200,000, against $7,300,000 in 1906. Operating expenses increased $400,000, leaving net earnings of $2,750,000, against $2,200,000 in the previous year. The surplus of the year was $490,000, against $25,000 in 1906.

Conducting transportation increased only 5 per cent., while more was spent on both classes of maintenance. Maintenance of way cost, $2,035 per mile, against $1,810 in 1906. Repairs and renewals cost $2,636 per locomotive, against $2,568 in 1906; $789 per passenger car, against $594 in 1906, and $68 per freight car, against $58 in 1906.

President Fowler records that the physical condition of the

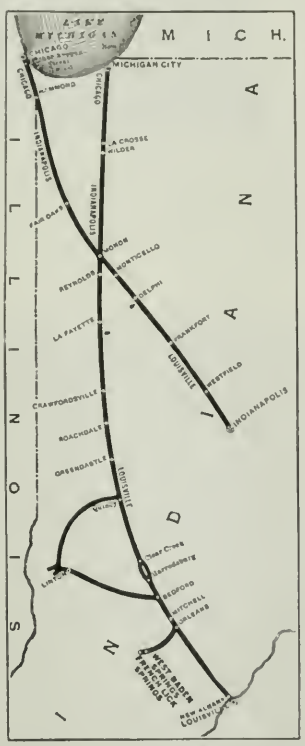
property is much better than at any time in the previous history of the company. Except for about six miles in the vicinity of Liberty, N. Y., which is under construction, and certain tunnels, second track from Catlosta to Cornwall, 108 miles, is in operation. New equipment was bought during the year to meet the increasing requirements of the summer passenger traffic. Eight or ten new coaches should be bought during the present year for this same purpose. The rest of the rolling equipment is said to be in excellent condition and sufficient. In order to increase the boat equipment used for carrying coal from terminal points, 10 small boats for river and harbor deliveries and 3 barges for use to more distant parts were bought. Two tugs are also under contract for the same service. With this increased floating equipment it is expected to make coal deliveries more satisfactory and economical.

The operations of the last two years are shown below.

	1907.	1906.
Mileage worked	546	546
Passenger earnings	$1,553,997	$1,376,043
Freight earnings	6,326,642	5,589,444
Gross earnings	8,202,361	7,265,058
Maint. way and structures	1,002,729	892,100
Maint. of equipment	1,250,562	1,104,855
Conducting transportation	3,027,418	2,895,393
Operating expenses	5,449,968	5,059,090
Net earnings	2,752,393	2,205,968
Net income	1,654,782	1,187,501
Dividends	1,162,302	1,162,296
Year's surplus	492,480	25,205

Chicago, Indianapolis & Louisville.

This railroad has a line from Indianapolis to Chicago and another north from Louisville, Ky., to Michigan City, Ind. The two cross at Monon, Ind., whence the familiar name of the road, the "Monon Route." Except for two short branches to reach the coal fields south of Terre Haute and a branch to the pleasure and health resort of French Lick Springs, the road has through lines and nothing else. The branch from Quincy southwest to Shirley Hill was finished in September, having been built under the name of the Indianapolis & Louisville Railway. Locally, stone, sand and other like articles furnish the largest proportion, 28 per cent., of the tonnage. For miles the road runs through the Bedford stone region. Bituminous coal comes next with 11 per cent. of the total tonnage. On through business the greatest strength of the road lies in the fact that it is controlled jointly by the Louisville & Nashville and the Southern Railway and furnishes both of them, from Louisville, a northern outlet to Chicago. For this reason it gets an added share of traffic destined to and from both of these great southern systems.



Chicago, Indianapolis & Louisville.

The past year's record is not a particularly encouraging one from the standpoint of earnings. Gross earnings increased only $68,000,000, or 1 per cent., a small increase for so generally prosperous a year. Operating expenses increased $182,000, or 5 per cent., leaving a decrease of $114,000 in net earnings. An increase of $41,000 in taxes made a total decrease in net earnings after operating expenses and taxes, of $158,000. In this connection President McDoel states that the valuation of the main line has been increased by Indiana 39 per cent. in two years. Net income was $995,000, against $1,198,000 in 1906. As the dividend disbursement was the same in each year, the year's surplus was $480,000 last year, against $683,000 in 1906.

There were small increases in each of the operating expense accounts, the largest being in conducting transportation, which rose from $1,987,000 to $2,082,000. This, however, was an increase of only 5 per cent., which is not a bad showing in a year of largely increased costs. There was spent for maintenance of way $1,369 per mile of road, against $1,328 in 1906. Repairs and renewals of equipment cost $2,958 per locomotive, against $2,632 in 1906, $1,044 per passenger car, against $1,087 in 1906, and $62 per freight car in both years. These are liberal figures, particularly for locomotives and for passenger cars. The company owned, on June 30, 1907, 300 less freight cars than a year earlier.

The rate received per ton of freight per mile has shown a steady increase during the last three years. It was 0.790 cents in 1905, 0.796 cents in 1906 and 0.810 cents last year. The passenger-mile rate, on the other hand, decreased from 2.074 cents to 2.027 cents during the year owing to the 2-cent-a-mile law in Indiana, which was in force for several months. Next year it is likely to show a further decrease. There were less tons of freight carried and more passengers. The train-load fell off from 312 tons to 307 tons.

The total tonnage is divided by general groups as follows: Agricultural products, 14 per cent.; animal products, 4 per cent., mine products, 41 per cent.; forest products, 11 per cent., and manufactures, merchandise, miscellaneous, salt, ice and fertilizer, 30 per cent. Of this last group, manufacturers make up 14 per cent., miscellaneous 8 per cent., and merchandise 5 per cent. The interchange traffic with the southern roads is here reflected. It was this group of traffic, too, which specially increased last year, while there was a falling off in bituminous coal, stone and sand tonnage.

Of the 518 miles of line owned, 428 miles are laid with 75-lb. rails, the rest with 67- and 60-lb. steel. During the last year 63 miles of new 75-lb. rail were laid. There were other improvements such as extensions of sidings, new bridges, a new 9-stall engine house and co-ordinate facilities at New Albany, which is across the river from Louisville, new interlocking at crossings with other railroads and new track scales.

President McDoel speaks as follows in regard to the railroad legislation of the past year:

"All laws passed by the last session of the legislature of Indiana with reference to railroads and their operation, notably the Railroad Commission Act., the Shippers' Bills, the Railroad Passenger Rates, Two Cents per Mile, Railroad Baggage Act, Employees' Act, etc., have the effect of decreasing our earnings and increasing our expenses, to what extent we are not yet able to determine."

The following is a summary of the income account for the past two years:

	1907.	1906.
Mileage worked	600	591
Passenger earnings	$1,432,978	$1,402,347
Freight earnings	4,199,673	4,166,413
Gross earnings	5,988,867	5,921,002
Maint. way and structures	837,805	785,278
Maint. of equipment	839,466	812,278
Conducting transportation	2,081,946	1,987,334
Operating expenses	3,899,595	3,717,924
Net earnings	2,089,273	2,203,078
Net income	995,027	1,197,637
Dividends	515,000	515,000
Year's surplus	480,027	682,637

NEW PUBLICATIONS.

Strength of Structural Timber. Circular No. 115 of the Forest Service. Published for free distribution by the Department of Agriculture, Washington, D. C.

Before putting a timber into a structure every builder must know the strength of the timber and the maximum load it will have to carry. Building laws generally require that the material used shall be from three to six times as strong as is actually necessary.

Loblolly, longleaf and Norway pines and tamarack are among the principal structural timbers of the eastern United States, and Douglas fir and western hemlock of the western states. In the trade, loblolly pine is classed both as Virginia pine and as North Carolina pine. Virginia pine is made up principally of timber from the northern part of the loblolly pine belt, and is inferior in quality to the North Carolina pine, so that the distinction is one of grade rather than one of locality. Longleaf yellow pine, as known on the market, may include the better grades of shortleaf pine and Cuban pine. It has for a long time been the standard construction timber of the East. Norway pine, also known as red pine, is cut principally in Michigan, Wisconsin and Minnesota, where it is marketed with white pine as northern pine. Douglas fir, called in different localities yellow fir, red fir, Oregon pine and Douglas spruce, is cut most extensively in Washington and Oregon. Western hemlock, which is obtained from the same region, is far superior to the eastern hemlock for structural purposes. On account of the prejudice against it, it is often sold under such names as Alaska pine and Washington pine, spruce or fir.

Recent tests made by the Forest Service on full-size structural timbers of commercial grades show longleaf pine to be the strongest and stiffest of all the timbers named, with Douglas fir a close second; while western hemlock, loblolly pine, tamarack and Norway pine follow in the order given. Fortunately, Douglas fir and western hemlock, of which there are comparatively large supplies, have high structural merit, as has also loblolly pine, the chief tree on which the southern lumber companies are depending for future crops.

Much of the information hitherto available concerning the

strength of timber has been secured from tests of small pieces without defects. This cannot safely be assumed to hold good for large-sized timbers as found on the market, since these commonly contain such defects as checks, knots, cross grain, etc. The location of the defects varies the extent to which they lessen its strength; and the proportion of heart and sap wood, and the state of seasoning, must also be considered.

Freight Car Bulletin No. 8.

The Committee on Car Efficiency of the American Railway Association, Arthur Hale, Chairman, has issued its statement of freight car balance and performance for May, 1907. The introduction summarizes the results as follows:

With a lessening demand for cars during the period covered by this report, the tendency was toward home movement. The increase in the "Average Miles per Car per Day," in the face of a marked reduction in the shortages which had existed for some months on a majority of the roads, can also be partially accounted for by the homeward movement of foreign cars, as indicated by the decrease in the "Per Cent. of Loaded Mileage." That there was a net improvement in performance, however, is denoted by the increase in the "Average Ton Miles per Car per Day" and the "Average Earnings per Car on Line." With an increased empty haul and a stationary "Average Loading per Car" the credit for this improvement must be given to the "Miles per Day."

While the percentage of cars in shop shows an increase over April, this is by no means a discouraging sign. In fact, a noticeable decrease in this figure at this time would be an indication of the retrenchment which too frequently follows a falling off of business, especially toward the close of the fiscal year.

This policy, when persisted in, results in neglect of car and engine repairs during periods of comparative plenty, and has a serious effect on efficiency when business picks up and cars are in demand. Cars which have been allowed to deteriorate while not needed soon give way under the strain of heavy traffic, and the result is a high percentage of cars in shop when they can least be spared from revenue service.

Similarly, a failure to keep the motive power in first-class condition further impairs the efficiency of cars. In many cases the cause of a local shortage may be traced directly to poor car performance, which in turn is frequently due to inadequate motive power.

The committee, in its work of transferring equipment from roads which are over to others which are short, has encountered instances where a lack of motive power has prevented the short roads from promptly handling empty cars offered them by roads which held a surplus. The results in these cases were loss of earnings on the one hand and increased per diem charges on the other.

If all railroads would avail themselves of the opportunity which a slack season affords to put their equipment and power in the best of condition, the result would be apparent on the resumption of heavy business, in a higher efficiency and increased earnings.

There is one feature of the shop situation which has a marked effect on car efficiency but which does not appear in the performance statements except as it affects the results. We refer to the practice of routing cars home on account of bad order.

The committee has frequently observed that even during times of extreme shortage, large numbers of cars with defects which prevent their use under load but do not render them unsafe for empty movement, are carded home, involving long hauls, in many instances over roads which are short of cars for loading in the same direction or which could furnish them to their connections for loading if the necessary repairs were made.

This condition is largely under the control of the individual roads whose earnings and expenses are affected. Possibly as the common use of cars is extended there will be less distinction made in the matter of repairs as between foreign and home cars.

Grain Shipments in Russia.

At a conference of railroad managers in Russia recently to consider the best means of forwarding the last crop of grain and to avoid the blockades and accumulations at stations which have been great in many previous years, it was decided to require the shippers to deliver the grain sacked, so that open cars might be used. It is something like 30 years since the American system of shipping grain in bulk was introduced into Russia, with important saving to the shippers; and it is not probable that the shippers can possibly obtain sacks in time for this year's crop.

Audible Distant Signals on the Great Western.

The audible distant signals installed on the Witney & Fairford line of the Great Western Railway of England, acting in the cab of the locomotive, have now been in use more than six months since the provisional approval issued by the Board of Trade, and their behavior is reported as highly satisfactory. In this apparatus connection is made from the signal tower or cabin to the apparatus on the locomotive without the use of any movable parts on the road-

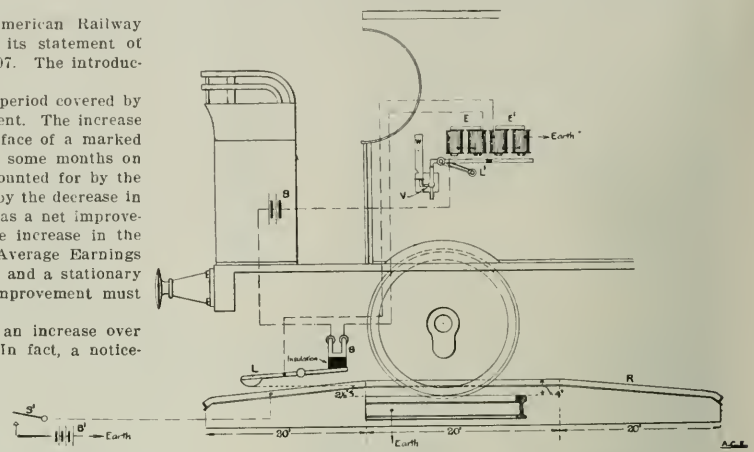


Fig. 1—Audible Cab Signal; Great Western Railway.

way. A bell is rung in the cab to indicate all-clear, and a whistle is blown to indicate caution. The arrangement is depended upon for actual service, the visual signals formerly in use having been taken down. The approval of the Board of Trade was given with this understanding; that is to say, the audible signals are used as a substitute for the visual distant signals and not merely as an adjunct. The clear signal is given by the closing of an electric circuit in the signal cabin, and the circuit closer, by which this is effected, is interlocked with the home signal levers the same as in

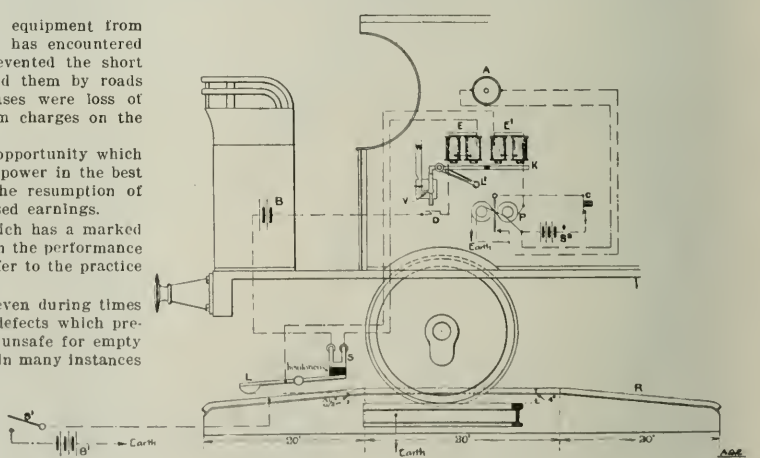


Fig. 2—Audible Cab Signal with Polarized Relay.

the case of an ordinary distant signal. The line on which this device is used is in Gloucestershire, and is 22 miles long.

The arrangement of the principal parts of the apparatus is shown in the accompanying drawing, Figs. 1 and 2. There is a single contacting device on the engine. The "caution" signal is given by the destruction of a local electric circuit on the engine, through the lifting of a lever or plunger, which invariably occurs at each signaling position. The "clear" signal is actuated by an electric current, picked up from the ground apparatus by the lever or plunger. The current in addition to causing the bell to ring prevents the giving of the "caution" signal. Since the operation of the "caution" signal depends upon the lifting of the shoe, while the suppression of this signal depends upon the successful picking up of an electric current, it will be seen that neither snow

Fig. 3—Ramp Between Rails.

nor electrical failure can have the effect of preventing the giving of a caution signal.

At each signaling position there is fixed in the center of the track a ramp R, Fig. 1, consisting of a bar of T-iron, suitably mounted and insulated on a timber base, the highest point of which is 4 in. above rail level. The iron bar is electrically connected by means of a telegraph wire to a switch S^1 in the signal cabin. By means of the switch, a battery B^1 is put in connection with the ramp when it is desired to give the "clear" signal on the engine. Normally, the switch S^1 is not closed. The contacting shoe L on the engine is insulated from the mass of the engine, and the switch S, which is mechanically connected to the shoe, is insulated both from it and the mass of the engine. The normal position of the shoe is such that its lowest point is $2\frac{1}{2}$ in. above rail level. When it comes in contact with the ramp it is raised $1\frac{1}{2}$ in.

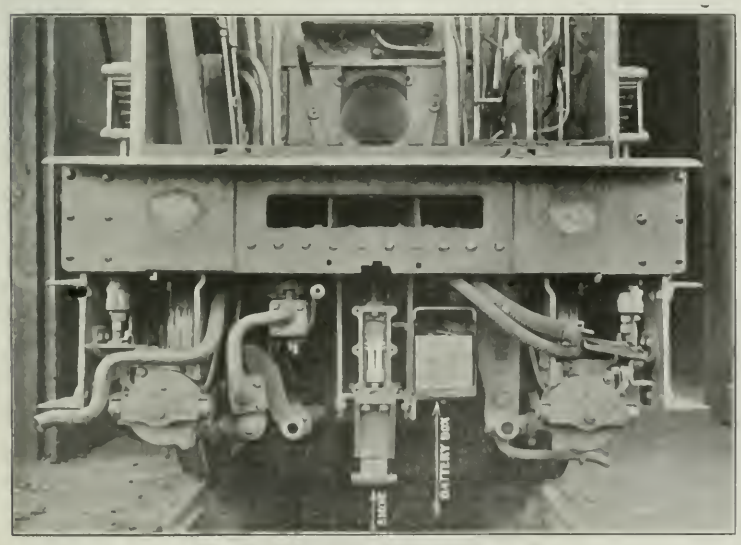


Fig. 4—Contact Shoe on Locomotive.

The electro-magnets E and E^1 on the engine have armatures yoked together and the compound armature K (Fig. 2) thus formed, when held up by either magnet keeps closed the valve V of the whistle W. The whistle valve is constructed on the principle of a safety valve, and is normally prevented from opening by the armature being held by the electro-magnet E. This electro-magnet forms part of a local circuit on the engine, which includes the battery B and the switch S. When shoe L is in its normal position switch S is closed, the local circuit then being complete, the electro-magnet holds the compound armature and keeps the whistle valve closed. The lifting of the shoe L less than $\frac{1}{2}$ in. above its normal position will open the switch S, and electro-magnet E being no longer energized, the compound armature will drop. Thus, when the shoe passes over the ramp (the ramp not being electrified), and is raised $1\frac{1}{2}$ in., the local engine circuit is opened and the whistle sounded, indicating caution. On the shoe clearing the ramp and the local circuit being again completed, the electro-magnet is once more capable of holding the compound armature, but in order that it may do so, the engineman must lift the armature near to the poles of the electro-magnet, for which purpose a small lever L, is provided.

So much for the "caution" signal. To suppress this and give an all-right signal, the signalman, having cleared his home and starting signals, closes the circuit of battery B^1 at switch S^1. Electro-magnet E^1 is electrically connected on one side to the shoe L and on the other side to earth through the mass of the engine and the running rails. The shoe, in passing over the ramp will then, in addition to opening the switch S, also complete the circuit from battery B^1 to the electro-magnet E^1. Consequently the latter will be energized and be capable during the passage of the shoe over the ramp, of holding the armature and keeping the whistle valve closed.

The suppression of the "caution" signal is not in itself a positive "clear" signal, this consisting, as already mentioned, of the ringing of a bell. Fig. 2 is an amplification of Fig. 1, showing on the engine in the circuit of the electro-magnet E^1 one winding of a polarized relay P. When current is picked up from the ramp, it will, in addition to energizing the electro-magnet E^1, also energize the polarized relay, the armature of which will close a local circuit and ring bell A. The second winding of this relay is for the purpose of keeping the local bell circuit closed, so that the bell may continue to ring after the shoe has passed over the ramp and until the bell circuit is momentarily opened by the engineman pressing on circuit-breaker C.

Switch D is controlled by a steam-operated valve, so arranged as to open the circuit when the boiler pressure falls to about 20 lbs. This automatically opens the circuit of battery B, and prevents waste of current when the engine is not in running condition.

Battery B^2 consists of about 16 No. 2 Lechlanché cells; battery B of two large dry cells, and battery B^2 of four small dry cells.

For fast-running lines a ramp 60 ft. long has been found suitable; for moderate speeds 40 ft. The ramp must be long enough to ensure the switch S being open a sufficient time to de-energize electro-magnet E.

In connection with the Witney & Fairford line installation, two short ramps are provided in the locomotive yards at Oxford and Fairford, so that the signals may be tested before an engine passes out for use. The highest point of the "caution" testing ramp is only 3 in. above rail level, therefore the "caution" signal sounds when the shoe is lifted $\frac{1}{2}$ in., or one-third of its working lift. The shoe is 7 in. wide and its face is case-hardened. A strong spiral spring is provided to ensure prompt return of the shoe to the normal position on leaving the ramp.

Single-Track Working.—An engine in passing from one station to another, say from A to B, will pass over two ramps, one applying to trains coming from B, the other to trains going to B, and it is desirable that it should only receive a signal at the latter. Referring to Fig. 2, it will be seen that the ramp is electrified by the signalman connecting the negative end of the battery B^1 to the ramp. If, instead the positive end of the battery were to be connected to the ramp, the "caution" signal would still be suppressed, but the bell would not ring, since the armature of the polarized relay would

tend to move away from instead of toward its contact post. Thus when an engine passes over a ramp applying to the opposite direction to that in which it is running, provision is readily made for suppressing both the caution and the clear signal. In order that it shall not be possible for the signalman to wrongly electrify a ramp when a train is approaching his station, the levers in the locking frame controlling the hand switches used for electrifying the ramp are interlocked with the electric train staff or tablet circuit, so that the wrong lever cannot be thrown.

The apparatus is covered by patent No. 12,661/05, granted to Messrs. Jacobs, Insell, Newton and Bowden, and patent No. 25,955/05, granted to Messrs. Insell and Jacobs, all of the company's staff. The installation has been made under the direction of Mr. A. T. Blackall, the company's Signal Engineer.

Interurban Fares.*

BY THEODORE STEBBINS.

The subject of interurban fares is one of immediate interest because matters connected with the transportation of persons and property by railroads have been the subject of very active and even violent popular discussion. The state legislatures have been taking blind actions and state executives have been advocating and adopting arbitrary measures with the railroads. Twenty state legislatures have passed restrictive legislation on passenger rates, and fourteen states now limit passenger rates to two cents a mile. In this situation, it is important to understand the position of the interurban railway.

All interurbans are anxious to serve the public and to earn reasonable dividends for stockholders. It is not so clear, however, how rates shall be adjusted to satisfy these ends. It is customary to measure the service and its cost on the basis of cents per passenger-mile. The charges range from three cents per mile in unsettled sections down to half a cent per mile for commuters in thickly settled districts, who use the cars twice each working day, or where excursions are handled in bulk. The ordinary range of fare, however, is between two cents and one cent per mile. We find the two cents per mile charge prevailing in the Middle West, and the one-cent rate common in thickly settled districts, mostly in the East. Tables have been published showing the charges made by various roads. For example, the convention issue of the *Street Railway Journal* for October, 1906, on page 672, gives the rates for various classes of tickets charged in Ohio and adjoining states, and shows that the average single trip fare in this locality is upward of two cents per mile. It will also be observed, however, that other and lower rates are made on such roads for regular daily passengers down to about one cent per mile. These western roads sell forms of tickets and make rates corresponding in a variety of forms and variation of rates with the steam roads.

At the other extreme we find certain interurban roads charging one cent per mile, and the majority of such roads make this a uniform charge to all adults, and their character of travel approaches that of the ordinary street railway company.

Tables can be prepared, giving the rate charged by the various companies, but these are meaningless without knowing at the same time the coaditions under which such roads are operating, and so we will seek to indicate the justification for these variations in fares.

The cost per car-mile of operation does not afford a direct measure of the rates that should be charged to passengers. The density of travel has a far greater influence on rates. The road must be built and furnish a service to suit the distribution and density of population, and the fares that can be collected follow as a consequence of this environment. The cost per car-mile may not vary much between properties quite different in character, but it is the commercial and social habits of the people which determine the quantity and times of traveling as well as the percentage of the car-load (that is, passenger-miles divided by seat-miles) and thus the passenger rates are determined.

COST OF SERVICE.

The seat-mile cost can be figured as shown for illustration in the following table, which indicates also the effect on such cost of more frequent service:

	A	B	C
Annual cost per mile of track	60	30	15
Headway (minutes)	15,000	30,000	60,000
Car miles (plus extras)	$1,800	$3,600	$7,200
Cost of operation	2,700	3,600	4,500
Interest and depreciation	$4,500	$7,200	$11,700
Cost per car mile (cents)	30	24	20
Car seating capacity	40	40	40
Car seat-mile cost (cents)	75	6	5

The actual passenger rate per mile must be more than the car-seat cost as a minimum in proportion, as the passenger-miles are less than the car-seat miles. If the passenger load averages 40 per cent. of the seating capacity then, on a 60-minute headway, the average cost would be $^{100}/_{40}$ times 0.75 cents, or 1⅞ cents per mile. This indicates how much rates might be decreased if full loads were constantly carried, and why some roads can afford to make mileage rates less than other roads.

The distribution and occupations of the population along the line are the powerful elements affecting the percentage of load. Assume two roads, each fifteen miles long; the first joining two cities of large size with little intermediate population, and the second leaving a city and traversing a succession of villages growing smaller and terminating in a country hamlet. The first road may prosper on one cent per mile and the second starve on two cents, even though operating the same number of cars with the same number of passengers to and from the principal terminal. In the first, the loads are carried through; in the second case, two-thirds of the load may be dropped within the first four miles. Assume a third case where a succession of towns of equal importance are traversed. The cars may load and unload several times in the course of the trip, and this makes for an intermediate policy on rates.

DENSITY OF TRAVEL.

To give some idea of the variation in density of travel on electric railways, the following figures are given:

Territory.	Passenger per mile.	Average fare	Receipts per mile.
United Kingdom	939,658	2.26 cents	$21,240
United States	333,862	3.76 cents	12,553
Indiana	133,000	5.6 cents	7,500

The above figures for the United States and Indiana include all electric railways; that is, both city and interurban. The density of travel on the Ohio interurbans is indicated in the following table, grouping them together according to principal terminal:

Extending centrally through the building from main waiting

Principal Terminal.	Its population.	Receipts per mile.
Cleveland	500,000	$5,045
Columbus	200,000	3,829
Toledo	225,000	3,257
Dayton	90,000	3,137
Miscellaneous	.....	3,542

Twenty-eight interurbans in this same section are classified in annual receipts as follows:

0	$2,000	4	8	19
2,000	2,500	4		
2,500	3,000	7	11	
3,000	3,500	4		
3,500	4,000	1	4	9
4,000	4,500	3		
4,500	5,000	1	5	
5,000	up	4		
		28		

Most of these roads furnish hourly service, so that by making some additions for limited and excursion cars, the receipts per car-mile can be calculated, and assuming the average rate to be 1.5 cents per mile, the number of passenger-miles and its relation to the car-seat mile capacity can be determined.

As indicating the variation in car-miles per mile of road, it may be stated that the elevated roads in New York operate 1,635,000 miles per mile of road, as against 15,000 or less for the ordinary interurban road in the Middle West, while the expenses per car-mile on the elevated are nine cents per mile, as compared with about 14 cents for the Middle West interurban.

The expenses per car-mile and per seat-mile for a known service are capable of calculation with mathematical precision, but the density of the traffic can only be learned by experience, and this experience indicates how much the rates charged must be increased beyond the basic seat-mile cost.

WESTERN INTERURBANS.

For the average conditions prevailing throughout the Middle amount of testimony is available to show that the basic single trip rate should be upwards of two cents per mile. If less is charged, not enough additional travel is secured to increase the gross receipts. If more is charged, travel is curtailed and the gross is reduced. In stating this it must be understood that mileage, commuter and other lower rates are granted and maintained at proper relation to the single trip rate.

The widest consensus of opinion on the subject is found in a resolution passed by the Ohio Interurban Railway Association on May 25, 1905. This association represented about 2,000 miles of interurban roads and the matter was given earnest consideration in private discussion between the members and in the open meeting. The resolution reads as follows:

"Whereas, A demand for improved service on interurban roads has very largely increased the operating expenses of such roads, and many roads have met this demand; and,

"Whereas, In order to obtain their share of the business many other roads contemplate improving their service in like manner; and,

"Whereas, The prevailing low rate of fare on most interurban roads will not permit of such improvement in service, therefore, be it

"Resolved, That the Ohio Interurban Railway Association recommend a uniform base rate of two cents per mile, and a minimum charge of 10 cents."

Mr. A. H. Royce, secretary and treasurer of the Canadian Street Railway Association, writes:

"Since the reduction to two cents a mile (by legislative act) the

*A paper read before the American Street & Interurban Railway Association at its Atlantic City Convention, 1907.

companies have done away with all commutation tickets and charge a flat rate of two cents a mile. We find that it is impossible to operate a road properly and keep up the rolling stock and equipment even at that rate.

"In the other provinces of Canada, the rates of fare are regulated by agreements with the municipalities through which they operate. There is no legislation affecting these rates, and as a rule the charge is three cents a mile."

Mr. J. McM. Smith, General Manager of the Southern Michigan Railway Co., writes:

"We started out a year or two ago on the rate basis of 1½ and 1¾ cents per mile, but we found this to be entirely too low, and accordingly we made a uniform raise. It is my belief, based on long years of experience in this business, that a road must be exceptionally well located if it can be made profitable on a rate less than two cents per mile."

Mr. S. Hendrie, General Manager of the Grand Rapids, Holland & Chicago Railway, writes:

"I am inclined to think that all our interurban passenger fares in Michigan are too low in view of the increase in the wages and in the cost of all materials which enter into the construction and operation of electric roads to-day. In 1894-96 I took franchises for a road on the average of one cent per passenger mile, but new steel then cost $16 per ton, copper 13 cents per pound, number one standard ties 35 cents each, common labor $1.50 per day, etc. At that time, conductors and motormen were paid 17.5 cents per hour, and other labor in proportion. The same road could not be built to-day for twice its cost, and although the fixed charges are low, the present owners are not satisfied with its net earnings."

Mr. H. H. Polk, President of the Inter-Urban Railway Company of Des Moines, Iowa, writes:

"The rates generally charged are as follows: Two cents a mile for single trip tickets; 1.5 cents for round trip tickets, good for one day; 1.25 cents for mileage. (These mileage books are for any three people, and good until used.) However, I am of the opinion that our round trip and mileage rates are too low, and we are seriously considering the raising of these rates. With the universal two cent fare now forced on the steam railroads by state legislatures, I am of the opinion that it will be rather up-hill work for interurbans to exist at the present rates."

Mr. C. N. Wilcoxen, general manager of the Cleveland & Southwestern Traction Company, writes:

"There are very few roads in this state operating at less than two cents per mile, with the usual reduction for commuters' tickets, etc. The average rate obtained by the Ohio roads is approximately 1.65 cents per mile. To attempt to operate on a 1.25 cents per mile basis would mean bankruptcy to the interurban roads of this state."

Mr. H. A. Nicholl, of the Indiana Union Traction Co., writes:

"Our single trip tickets are 1.5 cents per mile. This is as low a rate as I believe any electric road can carry passengers with a reasonable profit."

EASTERN INTERURBANS.

From the average conditions prevailing in Massachusetts, New Jersey, some parts of Pennsylvania and other sections with considerable density of population, a large amount of testimony is available to show that the heavier travel, the more frequent trips, the shorter rides, and repeated loading and unloading in a trip, make profitable and advisable no variety of tickets, but only a single adult rate.

Mr. M. C. Brush, Vice-President of the Newton Street Railway Co., and associated companies, writes:

"I find upon careful investigation that on about 50 per cent. of our lines our fares vary from 1 cent per mile to 1.5 cents per mile. On the remaining 50 per cent. it varies from 0.4 to 0.9 of a cent per mile. The average New England street railway manager does not believe that under present operating conditions it is possible to carry a patron more than five or six miles for 5 cents. That is, I think you will find that the average New England manager believes that 1 cent per mile is a fair charge in this territory."

NOTE.—The Massachusetts law requires half rate for school tickets.

Mr. F. L. Fuller, Vice-President and General Manager of the New York & Queens County Railway Co., writes:

"The rates on Long Island are 1 cent per mile, collected in 5-cent zones."

Mr. F. W. Bacon, General Manager of the New Jersey & Hudson River Railway & Ferry Co., writes:

"I do not think the rates in New Jersey on interurban roads are in excess of 1.25 cents per mile, and our average rate is 1.15 cents per mile, but we do not issue commutation tickets or other forms at any cheaper rates, and only make 25 per cent. reduction on school tickets."

CALIFORNIAN INTERURBANS.

The extremes on rates seem to exist in California. Mr. Schindler, of Chico, Cal., makes most interesting statements. His line, in the Sacramento valley, has steam railroad conditions, and charges 3 cents per mile and his patrons are well satisfied. In the southern part of the state business is done mostly on round trip tickets at 0.6 of a cent per mile. He states:

"It is a curious fact that in the southern territory where existing rates are already extremely low, there is a strong movement toward a further reduction of rates, while here where the highest rates exist, the public is generally well satisfied."

The above quotations are taken from letters on the subject of rates, addressed to our secretary, Professor Swenson, to whom I am much indebted for this and some statistical information.

Examination shows a clear distinction in conditions and practice between the 2 and 1 cent rates per mile.

The 1 cent rate applies to conditions approaching those of the city railway, 5 cent zones, no tickets, a succession of towns, with contiguous population limits.

The 2 cent rate applies to cities and towns considerably separated, where passengers may travel 25, 50, 100 or 200 miles, and this rate applies to occasional travelers on single trip or interline tickets. Tickets are also sold and gradations of adult rates for commuter and school travel are made down to 1 cent per mile. For interurbans of this character, we will describe the kind of tickets sold.

KIND OF TICKETS.

1. The single trip ticket (good between specified points for an adult) is the basis of maximum charge on each interurban line. Occasionally, a higher rate is charged for fare paid on the cars, but this practice is diminishing, because it entails a greater variety of fares and discriminates against the farm community boarding the cars where ticket offices cannot be maintained, and this farm community is often the most important class of customers for the road. To increase the sale of tickets in order that cash may be taken at the offices and not by the conductors, it has been proposed to charge higher cash fares on the cars and give receipts with a redeemable value to any ticket office the same as some steam railroads do, but this is impracticable for interurban conditions and in one case only to my knowledge has been adopted.

2. The round trip ticket, good for an adult, is the most common form of ticket, in fact is sold by some roads where single trip tickets are not sold, and is ordinarily sold at a 10 per cent. reduction over double the single trip rate. In a few cases the reduction is 20 per cent.

3. Interline tickets are those sold by one road for transportation over its own line and one or more connecting lines, usually not more than three. Such a ticket, when sold for a round trip may be nearly a yard long and practically correspond in form and appearance to the familiar steam railroad ticket. The interurbans of the Central West sell large numbers of these tickets and they are essential in competition with the steam railroads.

4. Mileage books, so-called, are sold at 16⅔ per cent. to 33⅓ per cent. reduction from the base rate. If such books are good for a specified number of miles, 500 or 1,000, then the conductor must carry a sheet of mileage distances between points and detach coupons accordingly. The reservation is commonly made that no less than five coupons shall be detached. Since the rates per mile charged on different roads and often on various sections of the same road vary for franchise or other reasons, it has therefore been found expedient to issue "Mileage Books" not for a specified number of miles but containing a certain number of 5 cent coupons. This avoids the necessity of conductors carrying mileage cards, permits detaching coupons of a face value equal to the single trip ticket; reduces the complexity of accounting and in general is practical where mileage coupons are impracticable. Properly these are called Coupon Ticket Books and if good on one road "Local"; if good on a group of roads, "Interchangeable"; but we continue to speak of them in common parlance as "Mileage Books." Such interchangeable books issued by certain members of the Central States Interurban Association contain 240 5-cent coupons, face value $12, sold at a net price of $10. These books are good for use over some 37 railways and their underlying companies all operating several thousand miles of track. This book is good for one person only, usable within one year and not less than two 5-cent coupons are detached for any ride, no matter how short. Each individual company is free to issue, also, mileage books good over its own line under such conditions as it may see fit. In some cases these are good for use without restriction as to name and number of persons and at a slightly lower rate.

5. Commuter books are also sold, good commonly only for either 30 days or a calendar month, and containing 40, 50 or 60 rides, each book limited to one name. Such books are not in as common use now as the writer believes they will be in the future, as they form a means of building up a steady suburban travel, the same as steam roads operate so profitably out of our large cities and without interfering with higher charges for occasional travelers.

6. Book tickets are sold for 10, 20, 30, 40, 50 or 100 rides, with or without limitation as to name or family, or length of use and on some roads serve the same purpose as commuter books.

7. Excursion tickets are sold by almost all roads for special occasions, usually limited to one day and issued for summer riding to

parks, church picnics, political meetings, city shopping and a great variety of purposes.

8. Half rate tickets are sold for single and round trips of children from 5 to 12 years of age.

9. Party tickets are sold for a specified number of persons traveling together between specified points within a time limit.

10. Special carload rates are made for excursions at the lowest rates. The car is permitted to carry a full seated load and usually a limited additional number of standing persons.

Twenty-six interurbans in Ohio, Indiana and Michigan are reported by the *Street Railway Journal* to sell these kinds:

Tickets.	No. of Companies.
Single trip	24
Round trip	24
Commutation (individual)	13
Commutation (family)	11
School tickets	14
Mileage books	10
Interchangeable coupons	15
Sunday	7
Week-end	4
Not selling tickets	2

All the above and many more forms of paid transportation are used in the development of the interurban business. The writer, on undertaking the management of an interurban system, found in use tickets of as many as 400 kinds; that is, differing in form and points between which they were usable.

GRADATION OF RATES.

The gradation of price between these various forms of tickets must follow a consistent sequence in order that each ticket may find its proper use. To illustrate: If the mileage book price is less than the commuter rate, there would be no sale for commuter books. The gradation is commonly something like this: Assume the base rate for a single trip ticket is 2 cents per mile, round trip ticket will be 10 per cent. off, or 1.8 cents; the interline single trip ticket will be the sum of the single trip rates of the connecting roads and the interline round trip ticket will likewise be the sum of the round trip rates of the connecting roads, or less if there is a competitive route; the mileage book will be 16⅔ per cent. off or 1⅔ cents per mile net; the commuter book ticket rate will be about 1.25 cents; the school rate will be 1 cent and the excursion rate and party rate will vary from 0.5 of a cent to 1.5 cents, according to distance, size of excursion and other conditions. This gives a general idea of the consistent relationship between these various rates, but, of course, there are considerable departures from this practice in individual cases.

The average gradation of rates in cents per mile, in three Western states, is shown in figures from the *Street Railway Journal*, May 5, 1905, as follows:

	Issued by Ohio.		Issued by Michigan.		Issued by Indiana.	
Cash fare	1.84	23	1.58	5	1.68	8
Single trips	1.77	17	1.48	4	1.68	6
Round trip	1.63	20	1.34	4	1.45	6
Commuters (family)	1.45	12	1.10	2	1.23	3
Commuters (individual)	1.09	17	1.00	2	1.20	5
Mileage	1.37	6	1.25	1	1.22	2
Interline coupons	1.48	10	1.30	1	1.67	1
School	1.03	12	0.87	2	0.94	4

THE ESTABLISHMENT OF RATES.

Mr. C. L. S. Tingley, Vice-President of the American Railways Company of Philadelphia, speaking of Pennsylvania conditions, states:

"The whole thing is a matter of ordinance regulation and not a question of scientific rate making."

This is true for many roads elsewhere.

For the short interurban with the dense traffic, 5 cent zones and no tickets are clearly indicated.

For the long interurban, experience has clearly indicated the expediency of a mileage basis of charge with tickets and a graduation of rates for different classes of travel. The western interurban connection with other interurbans and having steam or electric competitors will need (a) cash receipts for use on the car, (b) single and round trip tickets, (c) interline single and round trip tickets, (d) interchangeable coupon books, (e) commuter or book tickets, (f) school tickets, and (g) excursion tickets. A consistent relation in rates for each kind of ticket has been specified in the preceding sections.

The interline tickets and interchangeable coupon books are required for steam competitors. The commuter tickets are required to build up a travel of wage earners working in one place and living in another. Excursion tickets are required for those who might not otherwise ride, and school tickets are ordinarily an unprofitable concession to education.

The profit from traffic should not be estimated too narrowly on a cents per passenger-mile basis. If a car receives all its load at the terminal and does not pick up passengers along the way, the space taken by the passenger is worth as much whether he rides all or part of the trip; or to make specific application, commuter rates should be determined more by what the passenger can afford from his daily wage and by seat-trip cost than by mileage rates.

Excursion rates and carload rates are subject to the greatest variation and the cost of such business may be figured progressively lower as one in turn omits interest, depreciation, general expense, track maintenance and other items that are not affected sensibly by the operation of an additional car over the road. If platform wages, power and car repairs are figured as the only cost of the additional service, very low mileage rates may be made. Such reduction of excursion rates is justified within limits to the extent upon which the largest annual receipts may be secured.

A company may make money on excursions at half a cent a mile where it is losing on regular travel at 2 cents a mile. For the same reason, commuter travel at a cent may be a desirable addition to the business where general travel will hardly yield a profit at 1½ cents. By commuters we mean those persons traveling back and forth between work and home every working day. The lower rate enables certain people to take employment in the city when they could not afford to pay fares at full rates out of their daily wage, and enables workmen in the city to move to the country when otherwise they would locate along some city line reached by a 5 cent fare.

Roads differ greatly in regard to the possibilities of commuter travel. On some a large feature can be made of this business; on others, it is not worth while to even put the books on sale. In conclusion we may state the rate which may be profitable for one road may be unprofitable for another and, in each case, the distribution of the population along the road and the character of the travel must be studied carefully to determine the rates charged. The heavier the travel and the more miscellaneous its character, the greater reason for making a uniform and low rate for all classes of travel. On the other hand, the less the density of the population, the greater reason for making an initial single trip high rate for the occasional traveler and creating, in addition, a large regular travel by other forms of lower rate tickets.

In conclusion we may state that, before attempting to fix rates, the first thing is to study the density of the population along the line, and its location, to estimate how much will be through travel, how much short ride travel out of the terminals, how much loading and reloading of passengers will occur in the course of the trip, what pleasure resorts exist, or may be built up, what commuter travel will be created, that is, working people in the city drawn into the country to live, and country people secure employment in the city, and all of these and other elements are more vital in determining the rates of fare than the car-mile cost, trip-seat cost, or the seat-mile cost. In fact, the character of the travel should determine the kind of road built and the choice of rolling stock. After a study of all the conditions a determination must be made of various kinds of tickets to be sold and the gradation of rates between them.

Ticket offices should be established wherever ticket sales will justify it, and in the Middle West about 60 per cent. of receipts are collected through such offices. Reasonable care will insure that such receipts reach the treasury of the company. Tickets have the advantage of keeping money out of the conductors' hands, but, as a considerable amount will be collected by the conductors, it is of vast importance to secure a proper account of it.

West and other sections of medium density of population, a large

Large sums remain to be collected by the conductors on the cars from passengers boarding them where ticket offices cannot be maintained and from passengers failing to buy tickets where they are sold. Every safeguard should be provided for such collections in order to check fully the work of the conductors.

The cash fare receipts issued on the cars should show at least from what point to what point fare is paid, and the auditor's stub must give corresponding information. The tickets and stubs turned in by the conductor will then show how many passengers should be in the car at each point along its trip. An actual count of passengers at one or more points thus affords an exact check on the conductor's returns.

Accident Bulletin No. 24.

The Interstate Commerce Commission has issued Accident Bulletin No. 24, giving the record of railroad accidents in the United States during the three months ending June 30, 1907, and yearly tables for the 12 months ending with June. The number of persons killed in train accidents in the quarter was 250, and of injured 4,124. Accidents of other kinds bring the total number of casualties up to 19,711 (1,065 killed and 18,646 injured). These reports deal only with (*a*) passengers and (*b*) employees on duty.

TABLE No. 1.—*Casualties to Persons—April, May and June, 1907.*

	Passengers.		Employees		Tot'l persons reported	
	Kil'd.	Inj'd.	Kil'd.	Inj'd.	Kil'd.	Inj'd.
Collisions	7	728	96	991	103	1,719
Derailments	41	1,293	83	673	124	1,966
Miscellaneous train accidents*	..	33	23	406	23	439
Total train accidents	48	2,054	202	2,070	250	4,124
Coupling or uncoupling	..	.....	72	973	72	973
Doing other work abt. trains or switches	..	.....	76	4,243	76	4,243
In contact with overhead bridges, etc...	1	7	40	377	41	384
Falling from or getting on cars or engs..	49	558	191	3,024	243	3,582
Other causes	13	572	370	4,768	383	5,340
Total (other than train accidents)..	63	1,137	752	13,385	815	14,522
Total, all classes	111	3,191	954	15,455	1,065	18,646

*Including locomotive boiler explosions.

The quarter ending with June usually shows lighter accident records than any other quarter of the year, and this is generally

true in the present instance, but the principal totals are all larger than in the same quarter one year ago. This may in large measure be accounted for by the marked and constant increase in railroad traffic. The number of passengers killed in train accidents, which fluctuates more than any other item, is very much larger than one year ago, but there is a marked diminution from the high figure reported three months ago. In the present bulletin, derailment No. 6* (Table 2a), killing 33 and injuring 19 and collision No. 1,† killing eight and injuring 37, are the extraordinary items.

Comparison of Principal Items with Last Bulletin and With One Year Back.

	Bulletin No. 24	Bulletin No. 23.	Bulletin No. 20
1 Passengers killed in train accidents	48	129	25
2. Passengers killed, all causes	111	184	81
3. Employees killed in train accidents	202	295	167
4 Employees killed in coupling	72	62	68
5 Employees killed, all causes	954	1,109	852
6. Total passengers and employees killed, all causes	1,065	1,293	934

The total number of collisions and derailments was 3,777 as follows:

TABLE NO. 2.—*Collisions and Derailments.*

	No.	Loss.	Persons Killed.	Persons Injured.
Collisions, rear	402	$472,031	26	419
" butting	228	368,239	45	717
" trains separating	144	63,521	3	44
" miscellaneous	1,032	427,453	29	539
Total collisions	1,806	$1,331,244	103	1,719
Derailments due to:				
Defects of roadway, etc.	426	$394,970	13	625
Defects of equipment	821	672,783	15	276
Negligence of trainmen, signalmen, etc	106	63,682	10	178
Unforeseen obstruction of track, etc.	91	154,640	16	112
Malicious obstruction of track, etc.	11	67,480	3	40
Miscellaneous causes	516	547,874	67	729
Total derailments	1,971	$1,901,429	124	1,960
Total, collisions and derailments	3,777	$3,232,673	227	3,685

The following, Table 2a, is a list of train accidents in which the damage is reported at $10,000 or over, and other notable cases:

TABLE 2a.—*Causes of Thirty-two Prominent Train Accidents (Class A).*

(NOTE.—R., stands for rear collision; B., butting collision; M., miscellaneous collisions; D., derailment; P., passenger train; F., freight and miscellaneous trains.)

COLLISIONS.

No.	Class.	Kind of train.	Killed.	Injured.	Damage to engines, cars & roadway.	Reference to record	Cause.
1	B.	P. & F.	8	37	$695	91	Disregard of telegraphic orders. See note in text.
2	M.	F. & F.	0	0	2,100	42	Collision on side track; train moving only 1 mile an hour, but enginemen fell asleep and slept 2 minutes; had been on duty 21 hours.
3	B.	P. & F.	0	13	6,800	11	Eastbound freight encroached on time of westbound passenger train (1 a.m.). Engineman did not know road; had taken this run by making misrepresentation; conductor and 2 brakemen asleep.
4	B.	F. & F.	1	4	7,000	16	Runaway on steep grade 3 a. m. See note in text.
5	B.	P. & F.	4	33	8,000	68	Engineman of westbound freight (who was killed) evidently forgot regular eastbound passenger train; passenger train scheduled for only 2 days in the week—Saturday and Sunday.
6	R.	F. & F.	0	2	10,000	7	Flagman of pushing engine failed to signal following train.
7	R.	F. & F.	0	5	10,000	45	Operator, 20 years 10 months of age, neglected to deliver meeting order. Cleared signal for another train and forgot to restore it to the stop position.
8	B.	F. & F.	0	2	10,220	1	Operator, 17 years of age, accepted order after train had left.
9	B.	P. & F.	4	5	10,400	36	Flagman failed to signal following train; 5 a. m.; foggy.
10	B.	F. & F.	0	4	10,600	72	Freight train entered yard 1 a. m. with speed not under control.
11	B.	F. & F.	1	2	10,935	33	Butting collision at water station; engineman asleep.
12	R.	P. & F.	2	21	12,000	5	Failure of block signaling and flagging. See note in text.
13	R.	F. & F.	0	2	13,000	9	Runaway, due to failure of air pump; neglect to slacken speed on passing over summit, and failure to apply hand brakes.
14	B.	P. & F	1	7	13,000	12	Empty engine encroached on time of passenger train. Engineman's watch slow, not having been wound; engineman's experience as a runner, six months.
15	R.	F. & F.	0	1	16,000	18	Signal cleared when track was not clear. This was made possible by the breakage of a connection at an interlocking cabin. Signalman held negligent.
16	B.	F. & F.	0	4	36,670	14	Operator accepted order after train had passed. See note in text.
17	R.	F. & F.	0	2	56,889	6	Rear collision of freight trains in tunnel. A comparatively light train overtook a heavier one. Time interval at last station 10 minutes. Leading train held blameworthy for not signaling by fusee, and the following train for running too fast. Tunnel lining took fire and was damaged $50,000.
Total			27	144	$234,309		

DERAILMENTS.

No.	Class.	Kind of train.	Killed.	Injured.	Damage to engines, cars & roadway.	Reference to record	Cause.
1	D.	P.	2	0	$5,400	31	Excessive speed on curve running ten miles per hour.
2	D.	F.	1	2	11,000	52	Spread of rails; engineman killed by rails.
3	D.	P.	0	26	11,000	86	Unknown.
4	D.	P.	1	20	13,000	51	Train diverted to siding; broken switch.
5	D.	F.	0	0	14,000	82	Broken flange. Derailed cars smashed a bridge.
6	D.	P.	33	19	14,200	63	Unknown. See note in text.
7	D.	F.	0	1	15,000	88	Unknown; damage due mainly to explosions of naphtha and gunpowder.
8	D.	F.	1	1	19,930	59	Failure of bridge; bridge damaged by blasting near by at the moment the train entered upon it.
9	D.	P.	0	26	20,032	62	Rails maliciously loosened.
10	D.	F.	1	1	25,000	28	Landslide in the night. Inspector had detected no indication of trouble.
11	D.	P.	2	26	30,000	23	Roadbed undermined by water from springs not before known to exist.
12	D.	P.	2	5	32,000	30	Switch maliciously misplaced.
13	D.	F.	1	10	34,000	58	Rock slide; this occurred on an old railroad. It is believed that blasting 1,000 ft. distant had fractured the rock so as to permit vegetation to disintegrate it.
14	D.	P.	0	35	61,224	75	Defective track. See note in text.
15	D.	P.	3	21	84,560	32	Unknown. See note in text.
Total			47	193	$391,186		
Grand total.			74	337	$625,495		

Derailment No. 6, by far the worst accident in the present record, causing the death of 33 persons and the injury of 19, is reported as due to some cause undiscovered. A passenger train, running at regular speed, was derailed at a facing point split switch and the two cars next behind the engine were completely wrecked. When these came to rest they were lying close to the engine, so that steam escaping from the boiler scalded the occupants of the cars. The engine appears to have passed over the switch in safety, and the two cars next following evidently were thrown off by the partial movement of the switch. Of the seven cars in the train the two at the rear passed over the switch without being derailed. It would appear that some part of the engine broke and fell to the track, causing the movement of the switch rails, but it was impossible to discover any positive evidence of this. The side track leading from the switch diverged to the left, and the switch rail on the left side of the track was found after the accident in proper position and undamaged. The engine and tender, though they passed over the switch without being derailed, were knocked off the track in some way, presumably by the derailed car next behind them, and the tender was pushed against the engine in such a way as to overturn it. It is possible that the leading truck of the tender was the one that caused the damage to the switch and that first left the track. The switch was fitted with a circuit breaker so adjusted as to set an automatic block signal against an approaching train if the switch point were more than one-quarter of an inch away from the stock rail. This circumstance affords additional evidence that the switch was in proper position when the leading wheels of the engine ran onto it.

Collision No. 1 was between a westbound passenger train and an eastbound work train, and all of the victims were employees, except three passengers slightly injured. All of the eight killed and 32 of the injured were laborers riding in the leading car of the work train, the engine of this train being at the rear end. The collision occurred on a line where, although the railroad is double-tracked, one of these tracks for a few miles is used for suburban trains in both directions and the other one for other trains. On the day in question, which was Sunday, the suburban trains were run on the track usually used by other trains, in order to facilitate repairs on the suburban track. This temporary arrangement was to last from 7 a.m. to 7 p.m. The collision occurred at 6.50 p.m. A supplementary order had just been issued extending the temporary arrangement, but it appears to have been misunderstood. The passenger train was made up on the proper track, but it was run through a crossover to the other track, the conductor adjusting the switch himself, and it proceeded on the wrong track in disregard of the special orders, which were clear and which no one claims to have misunderstood. The collision occurred before the passenger train had run more than a half mile. The conductor of the passenger train is reported as having left for parts unknown soon after the accident.

Collision No. 4, causing the death of a fireman 21 years old and the serious injury of one other trainman, was due to inefficient management of the air-brakes on a heavy freight train descending a 2½ per cent. grade at 3 a.m., the engineman at that time having been on duty about 21 hours. The grade in question is 26 miles

*Honda, Cal., May 11, *Railroad Gazette*, May 17 and July 12.

†Hartford, Conn., June 23; *Railroad Gazette*, July 26. In this case the conductor and engineer were tried for manslaughter, convicted and sentenced to imprisonment for 9 months.

long, and the train had been run safely for 23 miles when the engineman appears to have allowed the speed to increase to such a rate that there was not sufficient time to recharge the air-brake main reservoir. He had made repeated applications of the brakes, and finally was unable to apply them with sufficient force. The train consisted of 18 cars, weighing about 600 tons, and after it became uncontrollable it collided with an engine standing at a water tank. The engineman at fault had been in the employ of this company about two months, but had been an engineman elsewhere three and one-half years and had served as a fireman, before that, for over five years. One of the cars in the train had no air-brakes working, and two others had leaky brake cylinders. Although the engineman had been on duty 21 hours, he avers that he did not feel sleepy. This crew had been assigned to a work train during the day, and the men had had some time to sleep while the engine was at rest waiting for the laborers to load material. The report says that the brakeman on the forward end of this train was intoxicated at the time of the runaway, so that his services were of little or no value in controlling the speed of the train.

Collision No. 12 was due to an erroneous signal given by a block-signal operator and to the failure of the conductor and the rear brakeman of a freight train to flag a following passenger train. The collision occurred at 2.20 a.m. The freight train was standing partly in a yard, and the block-signal operator reported it as having gone out of the block section, thus allowing the passenger train to come on from the block station in the rear, when in fact a part of the freight train had not cleared the block. The signalman, who had been in the service three years, offered the inadmissible excuse that he had been assured by the yardmaster that the block section was clear. The rear brakeman of the freight endeavored to excuse himself by asserting that the conductor had passed the rear end of the train, apparently going to signal the passenger train. The conductor, who had been in the service four years, refused to attend the hearing on the accident. He, as well as the brakeman and the block signalman, was dismissed from the service, as was the engineman also, for not sounding a whistle signal to notify the rear brakeman to go back with a red signal.

Collision No. 16, causing six deaths and four injuries, occurred at 3 a.m., and was due to wrong information given by a telegraph operator to the train despatcher. This operator was 18 years 8 months of age, and had been in the service 11 months. The train passed his station at 2.50 a.m., and he made the proper entry in his book; but 10 minutes later, when the despatcher inquired if that train had passed, the operator, without looking at the book, replied that it had not, whereupon the despatcher sent an order for this train to meet another one, and a few minutes afterwards permitted the opposing train to proceed from the other station. The operator at fault soon discovered his mistake, but not in time to prevent the collision.

Derailment No. 14 is reported as due to defective track. An eastbound passenger train, running about 35 miles an hour on an easy curve, ran off the track, and the whole train, consisting of an engine and eight cars, fell down a bank about 20 ft. high. As soon as the train left the track a gas tank attached to the bottom of the dining car exploded, setting fire to the train, and all of the cars, except the mail car, were burned up. Another passenger train had gone over this track in the opposite direction about 30 minutes before the occurrence of the accident, and the engineman and fireman of that train say that they felt a slight irregularity in the track, apparently a low joint, but did not deem it dangerous. It is believed, however, that as there was not quite enough ballast to the track on the outside of the curve the rails were thrown out of line by the rear end of the westbound train. One 75-lb. rail, nine years old, was found broken, but it is not certain that this break occurred before the train ran off the track.

Derailment No. 15, causing the death of three passengers and the injury of 19 passengers and two trainmen, is reported as due to some cause unknown. The train consisted of an engine and eight passenger and baggage cars, and it was running at about 50 miles an hour. The derailment occurred at 1.20 a.m. The wreck took fire from an explosion of illuminating gas, and was destroyed by fire, with the exception of one sleeping car. The report says that the track, which consisted of rails weighing 75 lbs. per yard and sleepers in first class condition, was in good line and surface, and that there were no indications either of a broken rail or of loosened spikes.

YEARLY TABLES.

This bulletin completes the publication of the accident records under the law of March 3, 1901, for six years, and the double column table (A) gives the aggregates for the year ending June 30, 1907, of the items which are given in Table No. 1 of the quarterly returns. There have been heavy increases in all of the items, except accidents in car coupling and from striking against overhead obstructions. The number of passengers killed and injured in collisions and derailments has increased to an alarming degree. (See Table B, first item.) In this item the very large total reported in 1905 is now exceeded by 17 per cent. The disastrous record of casualties to passengers in train accidents (410 killed) is due in large measure to 10 accidents which caused the deaths of 291 persons. These have been explained in the four quarterly statements. Nine of the 10 accidents occurred in six states—California, Indiana, Kansas, New Jersey, New York, North Carolina—and one in the District of Columbia.

Following is a list of these 10 cases:

Ten Prominent Accidents in the Year Ending June 30, 1907.

Quarter.		Killed.	Injrd.	State.
First ...	Collision—Confusion of despatcher's orders...	17	56	N. Car.
Second..	" —Disregard of rules and signals....	43	63	D. of C.
" ..	" —Neglect in connection with whistle signals.	43	155	Ind.
" ..	Derailment—Defective or unfastened track at drawbridge.	57	36	N. J.
Third ...	Collision—Operator failed to deliver meeting order.	32	75	Kan.
" ..	" —Engineman disregarded bl'k signal	9	8	Ind.
" ..	Derailment—Unexplained	19	149	N. Y.
" ..	Explosion—Unexplained	16	39	Ind.
" ..	Derailment—Misplaced switch	22	116	Cal.
Fourth..	Derailment—Unexplained.	33	19	Cal.

TABLE A.—*Summary of Casualties to Persons, Year Ending June 30, 1907.*

	Passengers ((*a* and *b*))		Persons carried under agreement, etc. (*bb*).		Total, (*a*, *b* and *bb*).		Trainmen.		Trainmen (switching crews) in yards.		Yard trainmen (switching crews).		Other employees.		Total employees.		Total all persons.	
	Kill'd.	Inj'd.	Kill'd.	Inj'd.	Kill'd.	Inj'd.	Kill'd.	Inj'd.	Kill'd.	Inj'd.	Kill'd.	Inj'd.	Kill'd.	Inj'd.	Kill'd.	Inj'd.	Kill'd.	Inj'd.
Collisions	193	4,227	16	506	209	4,733	364	2,702	73	850	48	504	82	752	567	4,808	776	9,541
Derailment	159	3,718	26	466	185	4,184	259	1,786	22	218	18	232	31	275	330	2,511	515	6,695
Miscellaneous train accidents	15	134	1	19	16	153	84	1,052	4	266	13	160	13	127	114	1,605	130	1,758
Total train accidents	367	8,079	43	991	410	9,070	707	5,540	99	1,334	79	896	126	1,154	1,011	8,924	1,421	17,994
Coupling or uncoupling	..	...	..	...	..	...	88	1,130	57	718	135	1,985	22	115	302	3,948	302	3,948
Other work about trains or switches	..	...	..	...	..	...	91	8,430	45	3,012	69	3,182	105	3,087	310	17,711	310	17,711
In contact with bridges, structures, &c.	7	31	1	13	8	44	93	797	13	288	23	445	5	61	134	1,591	142	1,635
Falling from or getting on cars or eng.	146	2,044	16	69	162	2,113	319	5,077	120	2,466	206	3,525	145	1,497	790	12,565	952	14,878
Other causes	50	2,096	17	274	67	2,370	209	780	125	372	118	453	1,354	16,345	1,806	17,950	1,873	20,320
Total (other than train accidents)	203	4,171	34	356	237	4,527	800	16,214	360	6,856	551	9,590	1,631	21,105	3,342	53,765	3,579	58,292
Total, all classes	370	12,250	77	1,347	647	13,597	1,507	21,754	459	8,190	630	10,486	1,757	22,259	4,353	62,689	5,000	76,286

From Table B, next following, comparisons may be made for the last three years.

TABLE B.—*Casualties for Three Years.*

	Years ending June 30. 1907. Killed.	1907. Injured.	1906. Killed.	1906. Injured.	1905. Killed.	1905. Injured.
Passengers: In train accidents	410	9,070	182	6,778	350	6,498
Other causes	237	4,527	236	4,407	187	3,542
Total passengers	647	13,597	418	11,185	537	10,040
Employees: In train accidents	1,011	8,924	879	7,483	798	7,052
In coupling accidents	302	3,948	311	3,503	243	3,110
Overhead obstructions, etc.	134	1,591	132	1,497	92	1,185
Falling from cars, etc.	790	12,565	713	11,253	633	9,237
Other causes	2,116	35,661	1,772	31,788	1,495	24,842
Total employees	4,353	62,689	3,807	55,524	3,261	45,426
Total, pass'gers & employees.	5,000	76,286	4,225	66,709	3,798	55,466

TABLE C.—*Collisions and Derailments for Two Years.*

	Years ending June 30—1907. No.	1907. Persons—Killed.	1907. Persons—Inj'd.	1906. No.	1906. Persons—Killed.	1906. Persons—Inj'd.
Collisions, rear	1,957	233	2,423	1,722	169	2,427
" butting	1,065	327	3,616	866	251	2,733
" train separating	695	13	322	901	9	375
" miscellaneous	4,309	203	3,180	3,705	175	2,379
Total collisions	8,026	776	9,541	7,194	604	7,914
Derailments due to:						
Defects of roadway, etc.	1,528	58	1,083	1,287	38	1,608
Defects in equipment	3,178	59	926	2,811	42	802
Negligence train & signalmen, &c	495	130	756	391	54	494
Unforeseen obstructions, etc.	387	68	658	300	76	456
Malicious obstruction, etc.	59	14	176	65	16	94
Miscellaneous causes	1,785	186	2,196	1,407	147	1,318
Total derailments	7,432	515	6,695	6,261	373	4,772
Total collisions and derailments	15,458	1,291	16,236	13,455	977	12,686
Damage to cars, engines, roadway	$12,865,702			$10,659,189		

Lateral Thrust of Car Wheels Against the Rail.

BY GEORGE L. FOWLER.

From advance sheets of a report made to the Illinois Steel Wheel Company, and shortly to be published in book form by that company.

It is generally admitted that cast-iron wheels under high capacity cars are giving unsatisfactory service and because of their inherent lack of strength are a source of danger. Prior to 1905 little was known of the strength of these wheels except that they had a shorter life and gave far more trouble from flange breakage under the high capacity cars than under cars with a capacity of only 60,000 lbs. In that year, Prof. Goss made some tests in the laboratory of Purdue University to ascertain the strength of the flanges of cast-iron wheels.

Track Apparatus for Testing Lateral Thrust of Wheel Against Rail.

Six new wheels and one wheel which had broken in service were tested. The wheel to be tested was mounted on a strong mandrel secured to the base of the testing machine in such a manner that it could not slip and a punch was forced down against the flange in the same way that the rail presses against it in service. Pressure was applied until the flange broke. The general arrangement of the apparatus is shown in Fig. 1. The punch A was bolted to the head of the machine. It was prevented from springing away from the flange by a roller bearing against a bracket which was bolted to the platen of the machine.

Three of the wheels tested, Nos. 19,413, 19,410 and 19,251, were new wheels of M. C. B. dimensions. The fourth, No. 10,558, was a piece of a wheel which had broken in service. In addition to these specimens, three new wheels were tested which were especially designed to give increased flange strength. These were marked (e) 650 lbs., (f) 700 lbs. tape 1, (g) 700 lbs. tape 2. Wheels (e) and (f) were the American Car & Foundry Co.'s reinforced flange design and wheel (g) was the then proposed standard of the M. C. B. Association with reinforced flange.

Four tests were made with each of the M. C. B. standard wheels and from two to four tests with each of the others. Three of the tests made on the American Car & Foundry Co.'s wheel (e) showed a flange strength of approximately 100,000 lbs., while the fourth test gave only 68,200 lbs. In view of this wide difference an attempt was made to get a fifth test from this wheel by applying pressure to the flange midway between two of the breaks previously made, with the result that the wheel broke through the rim at 105,000 lbs.

These tests showed that not only were there wide variations in the strength of flanges of wheels of similar design but in different parts of the flange of the same wheel. Reinforcing the flange added to the strength, but even in wheels thus reinforced there was a variation from 68,200 lbs. to 105,900 lbs. in the breaking strength.

These tests cover practically all that is known of the strength of the cast-iron wheel to resist the thrust on the rail. In order to ascertain approximately the relative strength of the steel wheel under similar conditions a Schoen wheel was tested in the same way. The work was done under a powerful hydraulic press and the flange broke off under a load of 526,612 lbs. This was more than 4.7 times the load required to break the strongest part of the flange of the American Car & Foundry Co.'s or the M. C. B. reinforced flange cast-iron wheels and more than 11 times the load required to break the weakest of the M. C. B. plain flanges.

The ratio of 4.7 to 1 corresponds fairly closely with the ratio of the tensile strength of the two metals. The tensile strength of the steel of the Schoen wheel is about 124,000 lbs. In some tests of cast-iron that have been made it was found that samples of gray iron made from first class wheel mixtures broke at from 16,000 lbs. to 17,000 lbs., while test specimens, carefully ground from the white chilled iron of a car wheel, broke under loads as high as 36,000 lbs.

The total lack of any data on the stresses to which wheels are subjected in service other than that based on theoretical calculations necessitated the carrying out of a series of investigations which would throw some light on the subject from a purely practical standpoint. The object of this part of the work was to determine the lateral thrust to which the wheels under high capacity freight cars may be subjected, when moving over curves at different speeds and, if possible to develop the law in accordance with which the thrust increases as the speed of the car is increased.

As an investigation of this kind had never before been undertaken, it was necessary to design and build a special piece of apparatus. The method pursued was to place in the track at some point on a curve an instrument which was capable of registering the lateral thrust against the outside rail of each wheel of a car or a train of cars as it passed. To do this it was necessary that the short section of rail which came in contact with the wheel, together with its supports, should have a strength sufficient to sustain the lateral thrust of the heaviest locomotives and that the registering apparatus should be so sensitive and rapid in its action that it would register the thrust of a passing wheel and come back to zero pressure in time to register the next wheel. At the same time, the registering apparatus had to be so light that the effect of the inertia of its moving parts was reduced to a minimum. The registering apparatus was designed to give a record of each wheel of an ordinary freight car, with a truck wheel base of 5 ft. 2 in., moving at a speed of 40 miles an hour. The interval elapsing between the passage of two such wheels over a given point is .088 sec.

The apparatus as a whole may be divided into two parts: the track apparatus and the recording instrument.

The track apparatus consisted of a section of rail 3 ft. long fastened so that it was firmly held in position in the track and yet was free to move outward by an amount sufficient to exert a pressure on a hydraulic cylinder, in proportion to the lateral thrust against it.

The recording instrument was set on a small table placed about 7 ft. from the track and was connected with the cylinder of the track apparatus by a ¼-in. brass pipe. It consisted of an ordinary pressure gage, having a maximum registration of 200 lbs. per sq. in., a recording pressure gage and a pressure pump by which an initial pressure could be put on the whole system of piping. The ordinary pressure gage was made by the Utica Steam Gage Co. and was fitted with a diaphragm spring. It was carefully tested and the dial calibrated before being put in service.

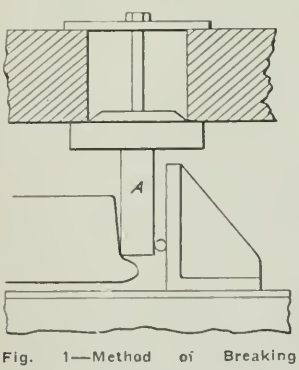


Fig. 1—Method of Breaking Wheel Flanges in Testing Machine.

The recording pressure gage was a modification of the Metropolitan recording gage, made by Schneffer & Budenberg. The clockwork in it was removed and the paper drum driven by hand, so that a record of indefinite length could be obtained. The fact that this paper was driven by hand explains the irregularity of the intervals elapsing between the passage of the several wheels of the cars. This gage also had a maximum registration of 200 lbs. per sq. in. with a pen travel of 4 in., the width of the paper. A Bourdon tube was used as the spring for this gage. It was calibrated for each set of tests by the Utica gage and its indications marked on the paper on which the record was taken.

The piping and all spaces filled with liquid were so arranged that air pockets were entirely eliminated and before work was commenced it was definitely ascertained that the whole

space was completely filled with liquid free from bubbles of air.

The speed of the experimental car as it passed the instrument was registered by means of two trips placed alongside the track and arranged to be struck by one of the journal boxes of the car as it passed. The trips closed an electric circuit passing through one of the coils of a double registering Morse telegraph instrument. When the trip was struck by the journal box, the circuit was temporarily broken and the pen lifted, leaving an opening in the line drawn on the strip of paper traveling through the instrument. The time was indicated by a clock making and breaking an electric circuit at half-second intervals. This circuit passed through the other coil of the register. The two records were made side by side and the intervals between the breaks, on the otherwise continuous line, showed the time elapsing between the striking of the two trips. These trips were spaced 66 ft. apart so that the speed of the passing car could be readily calculated. Specimens of these records are shown in the accompanying engraving, Fig. 2, where the car was moving at 9.14, 13.26, 14.21, 12.81 and 30.61 miles per hour, respectively.

Through the courtesy of the Pittsburgh, Cincinnati, Chicago & St. Louis, facilities were supplied for making this investigation of wheel stresses on the Hickory Branch extending south from Burgettstown, Pa. The instrument was placed in the outer rail near the northern end of a curve of 1,307 ft. radius, or about 4 deg. 25 min. The elevation of the outer rail was 3⅞ in., which is correct for a speed of 36.66 miles per hour. As the trips for registering the speed could work for only one direction of motion, they were set for the northbound traffic, which was the direction of the loaded trains. At the point where the records were taken the car was well in on the curve, with the trucks set in the normal position, and all the elements of entering the curve were removed. It may be added that the curve had no easement at either end.

On the approach of a train, or the experimental car, an initial pressure was put on the piping system, in order that the movement of the registering pen might be reduced to a minimum and with it the effect of the inertia of the parts. This initial pressure was varied according to the speed. In operation, the actual movement of the floating rail was imperceptible. The levers divided the actual movement by five at the diaphragm, which yielded only enough to take the expansion of the Bourdon tube and the diaphragm of the pressure gage, when delivering from a cylinder 6 in. in diameter.

Records were taken of a number of passing trains, and also a special series of measurements was made with a loaded coal car run at different speeds over the apparatus. Some of the records are shown in the accompanying diagrams, Figs. 3 and 4.

In the records of the loaded coal trains, taken as they passed, no memorandum of the weights of the cars was obtained. The weights were, however, approximately the same, and yet there were wide variations in the lateral thrusts of the wheel against the rail. For example: In the train moving at 9.35 miles per hour, these thrusts varied from 2,260 lbs. to 7,210 lbs., with an average of 4,835 lbs. On another train, moving at 12.05 miles per hour, the thrust varied from 7,070 lbs. to 10,605 lbs., with an average of 8,205 lbs.; while on another, moving at 4.04 miles per hour, the average was 5,543 lbs., with a range from 4,450 to 6,635 lbs. In one case a car registered a thrust of 16,175 lbs. when moving at 14.35 miles per hour. This wide variation in the lateral thrust of different cars in the same train at the instant of passing the apparatus was still more strikingly shown in the series of tests made with a single car.

The tests with a single car consisted of 33 runs over the apparatus, at speeds varying from 4.57 to 31.25 miles per hour. The car used was a hopper-bottom coal car, No. 210,512, of 100,000 lbs. capacity and weighing, when empty, 39,500 lbs. It was designated as of the G1 class by the Pennsylvania Lines West. The total weight of the car loaded with coal was 142,300 lbs.

This car, after being started some distance from the apparatus, was cut loose from the engine and allowed to drift over the track instrument. The accompanying table gives the records that were made.

The column headed "Wheel No." indicates the order in which the wheels passed over the apparatus. Thus: 1 indicates the front wheel of the forward truck; 2, the second wheel; 3, the front wheel of the rear truck, and 4, the rear wheel. The blank spaces in the column of lateral thrust indicate no record obtained, because of the fact that the initial pressure put on the apparatus was greater than the wheel thrust, so that the thrust produced no movement of the pen. Throughout the whole series of tests the weather was fine and the rail dry.

For convenience of reference and comparison, the lateral thrusts of the front wheel of the forward truck have been plotted on the accompanying diagram, Fig. 5. This diagram shows graphically the wide variations in the lateral thrust of the wheel. From it, it is impossible to deduce any positive ratio between the speed and the thrust, but it shows that there is a relationship and that the higher the speed the greater the thrust. There are a number of records for the first wheel, extending from about 9.60 miles an hour to 16.21 miles an hour that lie in a straight line drawn from just below the record of 31.25 miles an hour of 10,035 lbs. The line drawn through these points is represented by the equation:

$$T = 333\ V - 800$$

in which

T = Lateral thrust of wheel in lbs.
V = Speed in miles per hour.

This must be regarded as a tentative formula only and one which evidently will not hold for very low speed. But from the records that have been obtained, it gives the lowest values and therefore it cannot be criticized as being too high.

Attention is also called to the fact that the pressure seems to increase directly as the speed and not as the square of the speed which is the rate of increase of the centrifugal force. The probable reason for this is that none of the speeds recorded were equal to or exceeded the speed corresponding to the superelevation of the outside rail. Therefore, centrifugal action has no effect. In running around a curve, the car must be deflected from the tangent at a certain rate, and this requires a certain definite amount of power. If, then, this power is exerted in a short period of time, a higher pressure will be put against the rail than if the time was longer, and, therefore, the pressure will vary inversely as the time. So that if the car passes around the curve in half a minute, the pressure will be twice what it would be if a minute was required. Hence, the pressure at 30 miles an hour would be twice that at 15 miles an hour.

When the speed exceeds that for which the superelevation is

Records of Tests with Single Car.

Test.	Speed, m. p. h.	Wheel.	Lateral thrust.	Test.	Speed, m. p. h.	Wheel.	Lateral thrust.
No. 1.	4.57	No. 1.	2,470 lbs.	No. 18.	13.26	No. 1.	8,055 lbs.
" 1.	4.57	" 2.	1,415 "	" 18.	13.26	" 2.	7,775 "
" 1.	4.57	" 3.	1,695 "	" 18.	13.26	" 3.	7,635 "
" 1.	4.57	" 4.	1,415 "	" 18.	13.26	" 4.	6,645 "
" 2.	7.63	" 1.	1,695 "	" 19.	13.66	" 1.	10,460 "
" 2.	7.63	" 2.	..... "	" 19.	13.66	" 2.	7,490 "
" 2.	7.63	" 3.	1,415 "	" 19.	13.66	" 3.	..... "
" 2.	7.63	" 4.	..... "	" 19.	13.66	" 4.	..... "
" 3.	10.43	" 1.	2,545 "	" 20.	13.27	" 1.	7,210 "
" 3.	10.43	" 2.	1,770 "	" 20.	13.27	" 2.	6,645 "
" 3.	10.43	" 3.	1,695 "	" 20.	13.27	" 3.	6,500 "
" 3.	10.43	" 4.	1,695 "	" 20.	13.27	" 4.	..... "
" 4.	7.39	" 1.	2,400 "	" 21.	16.21	" 1.	4,665 "
" 4.	7.39	" 2.	1,415 "	" 21.	16.21	" 2.	..... "
" 4.	7.39	" 3.	1,415 "	" 21.	16.21	" 3.	6,220 "
" 4.	7.39	" 4.	1,415 "	" 21.	16.21	" 4.	..... "
" 5.	8.57	" 1.	2,120 "	" 22.	18.00	" 1.	7,210 "
" 5.	8.57	" 2.	1,270 "	" 22.	18.00	" 2.	6,645 "
" 5.	8.57	" 3.	1,415 "	" 22.	18.00	" 3.	..... "
" 5.	8.57	" 4.	1,415 "	" 22.	18.00	" 4.	..... "
" 6.	8.20	" 1.	1,840 "	" 23.	17.58	" 1.	6,785 "
" 6.	8.20	" 2.	1,415 "	" 23.	17.58	" 2.	6,360 "
" 6.	8.20	" 3.	1,415 "	" 23.	17.58	" 3.	7,775 "
" 6.	8.20	" 4.	1,415 "	" 23.	17.58	" 4.	6,645 "
" 7.	9.60	" 1.	1,695 "	" 24.	14.21	" 1.	9,895 "
" 7.	9.60	" 2.	1,415 "	" 24.	14.21	" 2.	9,470 "
" 7.	9.60	" 3.	1,270 "	" 24.	14.21	" 3.	10,320 "
" 7.	9.60	" 4.	..... "	" 24.	14.21	" 4.	8,480 "
" 8.	10.21	" 1.	3,250 "	" 25.	10.91	" 1.	2,825 "
" 8.	10.21	" 2.	3,110 "	" 25.	10.91	" 2.	..... "
" 8.	10.21	" 3.	4,240 "	" 25.	10.91	" 3.	3,110 "
" 8.	10.21	" 4.	3,250 "	" 25.	10.91	" 4.	..... "
" 9.	9.60	" 1.	3,535 "	" 26.	18.46	" 1.	10,320 "
" 9.	9.60	" 2.	3,535 "	" 26.	18.46	" 2.	9,190 "
" 9.	9.60	" 3.	4,240 "	" 26.	18.46	" 3.	10,605 "
" 9.	9.60	" 4.	3,195 "	" 26.	18.46	" 4.	10,320 "
" 10.	9.60	" 1.	3,535 "	" 27.	21.81	" 1.	4,950 "
" 10.	9.60	" 2.	3,250 "	" 27.	21.81	" 2.	..... "
" 10.	9.60	" 3.	4,380 "	" 27.	21.81	" 3.	7,490 "
" 10.	9.60	" 4.	3,250 "	" 27.	21.81	" 4.	5,230 "
" 11.	15.62	" 1.	3,110 "	" 28.	19.03	" 1.	16.785 "
" 11.	15.62	" 2.	2,970 "	" 28.	19.03	" 2.	..... "
" 11.	15.62	" 3.	2,970 "	" 28.	19.03	" 3.	7,350 "
" 11.	15.62	" 4.	2,400 "	" 28.	19.03	" 4.	5,090 "
" 12.	11.00	" 1.	4,950 "	" 29.	25.10	" 1.	5,655 "
" 12.	11.00	" 2.	4,240 "	" 29.	25.10	" 2.	5,655 "
" 12.	11.00	" 3.	3,960 "	" 29.	25.10	" 3.	5,655 "
" 12.	11.00	" 4.	3,815 "	" 29.	25.10	" 4.	3,675 "
" 13.	16.55	" 1.	4,525 "	" 30.	25.10	" 1.	10,745 "
" 13.	16.55	" 2.	3,535 "	" 30.	25.10	" 2.	9,330 "
" 13.	16.55	" 3.	4,525 "	" 30.	25.10	" 3.	10,180 "
" 13.	16.55	" 4.	3,395 "	" 30.	25.10	" 4.	9.615 "
" 14.	14.18	" 1.	3,815 "	" 31.	27.91	" 1.	10,605 "
" 14.	14.18	" 2.	3,535 "	" 31.	27.91	" 2	9,895 "
" 14.	14.18	" 3.	5,935 "	" 31.	27.91	" 3.	9,615 "
" 14.	14.18	" 4.	4,665 "	" 31.	27.91	" 4.	..... "
" 15.	12.63	" 1.	3,393 "	" 32.	31.25	" 1.	10,035 "
" 15.	12.63	" 2.	3,250 "	" 32.	31.25	" 2.	8,200 "
" 15.	12.63	" 3.	4,857 "	" 32.	31.25	" 3.	11,025 "
" 15.	12.63	" 4.	3,250 "	" 32.	31.25	" 4.	7,775 "
" 16.	13.33	" 1.	4,810 "	" 33.	30.61	" 1.	12,445 "
" 16.	13.33	" 2.	4,810 "	" 33.	30.61	" 2.	11,310 "
" 16.	13.33	" 3.	7,350 "	" 33.	30.61	" 3.	12,865 "
" 13.	13.33	" 4.	5,800 "	" 33.	30.61	" 4.	9,190 "
" 17.	9.14	" 1.	6,645 "				
" 17.	9.14	" 2.	5,655 "				
" 17.	9.14	" 3.	4,950 "				
" 17.	9.14	" 4.	4,240 "				

calculated, centrifugal action will then begin to manifest itself, and there will then be a more rapid rise of pressure than would be found from the equation given above. This additional increase would be in the ratio of the square of the speed. For example. At a speed of 36.66 miles per hour, the centrifugal effect is balanced by the superelevation of the outer rail on the curve on which these investigations were made. At 40 miles per hour, the centrifugal force is 1.19 times as great, and this 19 per cent additional manifests itself as additional lateral thrust above that called for by the formula.

Taking the car under consideration, weighing 142,300 lbs., the

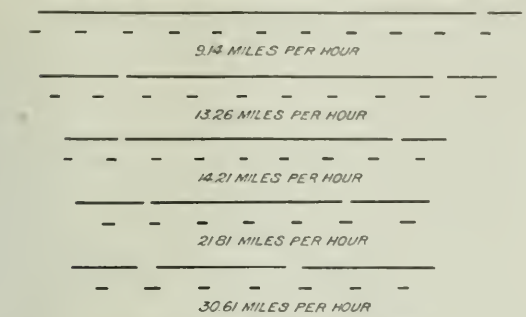


Fig. 2—Time and Speed Records.

centrifugal action would be 9,648 lbs. at 36.66 miles per hour; 11,481 lbs. at 40 miles per hour, and 14,568 lbs. at 45 miles per hour. The excess centrifugal force to be distributed among the four wheels of the car at 40 and 45 miles an hour would be, therefore, 1,733 lbs. and 4,920 lbs. respectively. If 25 per cent. of this is taken by the front wheel, which is a low estimate of what would actually be imposed, there would be an extra load of 433 lbs. and 1,230 lbs. added to the stress given by the formula for that imposed on the front wheel. This then becomes

11,408 lbs. at 36.66 miles per hour.
12,953 lbs. at 40 " " "
15,415 lbs. at 45 " " "

It must be remembered that these are minimum values, and that blows due to soft spots in the track, kinks in the curve, bent rails, low joints and cramped side bearings will greatly increase

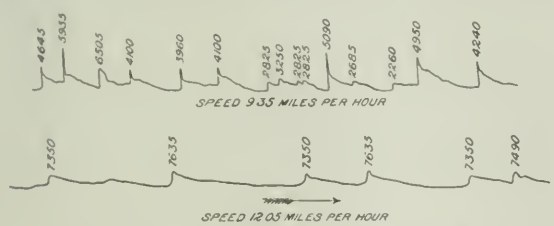


Fig. 3—Parts of Records from Passing Trains.

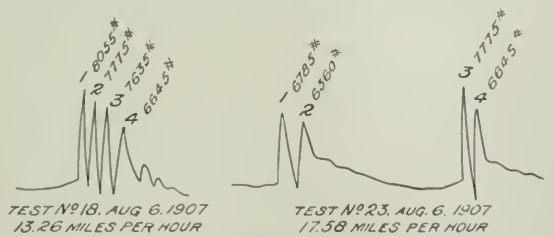


Fig. 4—Typical Records of Experimental Car.

this thrust. Sufficient data, however, has not yet been obtained to warrant any estimate of how much this increase would be. The diagram shows that stresses far above those found from this tentative formula are imposed on the wheels.

The extreme case occurred in test No. 19, where the thrust was 10,460 lbs. in excess of that found from the formula. If the blow or cramping which caused this excessive thrust at 13.66 miles per hour was to occur at a speed of 45 miles per hour, the thrust that might be expected would be 20,886 lbs., and if it were to be increased in proportion to the speed it would become more than 36,000 lbs. This may be an extreme and exceptional case, but the results obtained seem to indicate that at least as great a stress as this should be provided for.

Referring again to the tests of flange strength made in 1905 by Prof. Goss in the 25 tests that were made, the pressures required to break the flange ranged from 47,750 lbs. to 109,000 lbs., with an average of 88,149 lbs. This gives a possible factor of safety of a little more than 2.5 when the maximum stress is taken at 30,000 lbs., and the average strength at 80,000 lbs., but it drops to a little more than 1.5 when the strength of the weakest wheel is taken as the basis of comparison. This is for new wheels. When they have become somewhat worn, the strength of the flange is less and the factor of safety is decreased still more. If this loss of strength in the old wheel is taken at 10 per cent., because of metal worn away, the strength of the weakest wheel used in the tests referred to would be 42,975 lbs., and this would allow a factor of safety above a maximum load of 30,000 lbs. of about 1.4.

In this comparison it has been assumed that a car of 100,000 lbs. capacity will deliver the maximum thrust to the wheel on a 4½ deg. curve at 45 miles per hour. This assumption was made because the data was obtained from such a curve. It is evident that greater stresses would be imposed on curves of sharper radius. The outer thrust, where centrifugal action is eliminated, would probably vary inversely as the radius of curvature. There is no data, as yet, to support this position, but it appears probable. If, on further investigation this relation is found to hold, then, instead of a thrust of 12,520 lbs. being put on the wheel, as in the case of a car moving over the 4 deg. 25 min. curve at 40 miles an hour, there will be a thrust of nearly 22,800 lbs. when the same speed is maintained

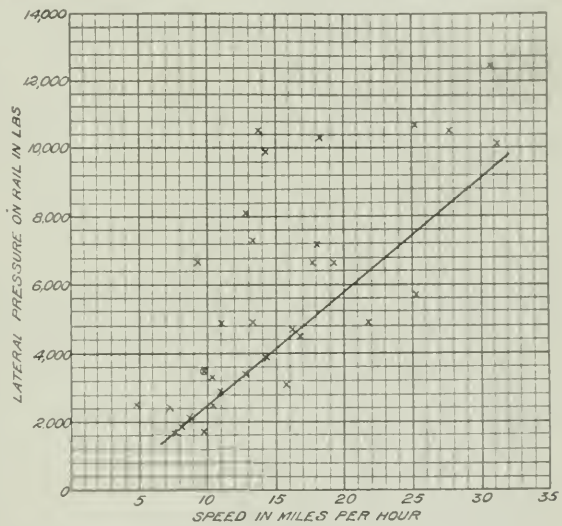


Fig. 5—Diagram Showing Relation of Thrust and Speed.

over a curve of 8 deg. To this must be added the extra stresses that may be set up by blows, cramping of the wheels between the rails, the binding of side bearings and other causes which may result in an increase in the normal stress.

But one weight of car and one arrangement of wheel base has been here considered. There is, as yet, no data to give any idea as to the effect of weight, its distribution on the wheels or the height of the center of gravity, all of which are undoubtedly important.

On the other hand, in this discussion, the whole lateral thrust is considered as resisted by the flange. Under ordinary running conditions this is not the case, for the frictional resistance of the tread of the wheel on the rail must be subtracted from the total thrust. In the car under consideration, the weight on the front wheel was 17,900 lbs. If the coefficient of friction is taken at 0.25 then 4,475 lbs. should be subtracted from the pressure given. This would reduce the maximum pressure, as it had been calculated for a speed of 45 miles per hour, to 31,525 lbs. and the probable minimum to 10,930 lbs. It must be remembered, however, that the frictional resistance is apt to fail suddenly and that, at all speeds, even where the frictional resistance of the tread on the rail is greater than the lateral thrust, there must be a pressure on the flange in order to effect the deflection of the car on the curve.

In this comparison the front wheel of the leading truck only has been considered because it is on this wheel that the heaviest lateral thrust is imposed. The table shows that, in general, the maximum lateral thrust is on the first wheel; the thrust on the

second is less; on the third it falls between the first and the second, and on the fourth it is the lowest.

In considering the advisability of using cast-iron wheels under high capacity cars, it should be borne in mind that the cast-iron wheel averages approximately one-half the life under the cars of 100,000 lbs. capacity that it does under cars of 60,000 lbs. capacity. The use of the heavy braking pressure on long grades has been the cause of many failures, because of the additional strains set up due to the heating by the brake-shoe. There is a consequent expansion of the rim, and the actual resisting strength of the flange is lowered below that shown in the laboratory tests, which were made with the wheel cold and the metal at its maximum strength. Roads having long, steep grades usually have numerous sharp curves also, and the wheels are likely to be subjected to the most severe stresses when they are least able to resist them. If the lateral thrust on the flanges of wheels, under a loaded car of 100,000 lbs. capacity runs up as high as 30,000 lbs., and the actual breaking strength of the flanges of cast-iron wheels varies from 45,000 lbs. to 105,000 lbs. under the most favorable conditions, the question may be asked whether it is safe to use cast iron wheels under cars of 100,000 lbs. capacity, especially when the breaking strength is likely to be greatly reduced by wear and brakeshoe heating? The answer to this question depends on what the railroads consider the proper factor of safety and legitimate risk in such work.

Proposed Enlargement of the Kaiser Wilhelm Canal.

The present dimensions of the Kaiser Wilhelm Canal, connecting the North Sea with the Baltic, no longer meet the needs of commerce. To make the canal adequate, not only for the present traffic but also to care for any future advances in shipbuilding, the following enlargements are proposed:

The locks are to be changed so as to permit the passage of vessels up to 984 ft. long and of corresponding draft and beam. The proposed dimensions are: length between gates, 1,083 ft.; width, 147½ ft.; depth at mean water level of canal (the same as mean water level of the Baltic Sea), 45 ft. Even at low water this depth would be 39 ft. The present canal profile at mean water level is 29 ft. 6 in. deep, 72 ft. wide at bottom, 220 ft. wide at the surface of the water. The change proposed will make it 36 ft. deep, 144½ ft. wide at bottom, and 334 ft. wide at the surface of the water. The area of the water cross-section will be increased from 4,307 sq. ft. to 8,613 sq. ft.

The line of the canal will not be materially altered. In two places it will be necessary to replace curves of a radius of 3,935 ft., which are no longer safe for modern steamships, by curves of 5,866 ft. radius, the width of the normal profile being increased at the same time. The number of passing stations is to be increased, and they are to be placed about 6 miles apart. The normal cross-section is to have a width of 440 ft. at the bottom and 624 ft. at the surface of the water. Four of these passing stations are to be expanded to serve as turning stations with a length of 3,919 ft., a width at bottom of 538 ft., and at the surface of 722 ft., and they will be connected with turning basins of 984 ft. diameter.

The Relation Between the Condition of Motive Power and Its Repair.

BY CLIVE HASTINGS.*

The life of a locomotive between shoppings may be likened to the span of a man's life, if we consider that each engine mile corresponds to each year of life. The number of years a man's condition would warrant his life expectancy to equal, added to his present age, should equal the average span of life. Any difference in this may be due to two causes: (1) The estimate of his life expectancy is not correct, or (2) his condition is not what it should be for his age, due to the manner in which he has lived or the constitution he may have inherited.

The laws of life expectancy and average age are so constant that life insurance companies with safety stake fortunes on them. An insurance company must know a man's age and also subject him to a medical examination to determine his condition.

So with locomotives. The man or master mechanic in charge of a number of these engines should know:

1. The miles each engine has made since last shopping (this corresponds to the man's age)

2. The general condition the engine is in (this corresponds to the doctor's report).

3. The miles the engine is in shape to make before it must go to the back shop (this corresponds to life expectancy).

Miles between shoppings for separate engines will vary from the average the same as the length of life of the individual man will vary from the average span of life.

Engine repairs may be divided into two classes:

1. Running and Light Repairs.—This class of repairs should include all minor and other repairs which do not include going over the entire engine and putting every part in as good condition as when new. The major part of this class of work should be done in the roundhouse.

2. Complete Overhauling.—This class of repairs is such that when properly done each part, and therefore the whole engine, is as good as new, except for depreciation. This work is done in the back shop.

When an engine is in shape to make the maximum miles expected between complete overhaulings, that engine is in first class condition; and when an engine is in such shape that it cannot make another mile before receiving a complete overhauling, that engine

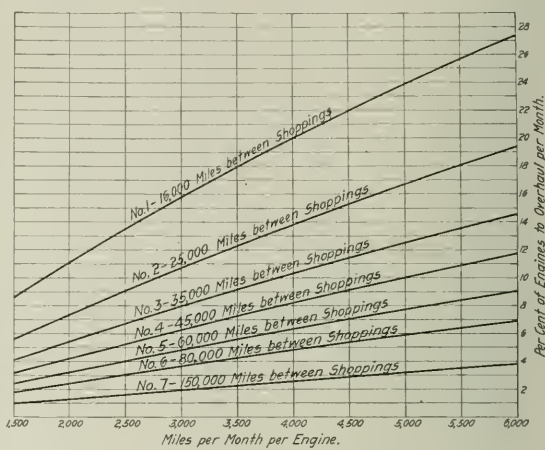


Fig. 1—Chart Showing Percentage of Locomotive Power to be Repaired Each Month So as to Maintain Efficiency of Total Power.

is in zero condition. It is desirable to have all engines as near first class condition as possible, but as on any division there will be some engines just from the shop, others just ready to go into the shop and others in all the intermediate stages, it is impossible to have every engine in first class condition. With a steady flow of engines through the shop there will be an even variation in individual engine conditions, varying all the way from those in shape to make the total miles expected between shoppings to those ready for the shop. The average miles that all engines of a particular class and service will be in shape to make should therefore be one-half the total miles expected of the individual engine between shoppings. This is standard condition and is really one-half of the impossible state of having each and every engine in first class condition.

It should be borne in mind that "condition" used in this sense does not have reference to the efficiency of the engine. Fifty per cent. condition does not mean 50 per cent. efficiency. Engines may have made almost the total of the miles possible to make between shoppings and still be in shape to haul full tonnage. Such engines would be considered good engines by the operating department, yet measured on the basis mentioned they would be in very low condition. The term "degree of wear" probably expresses more nearly what is meant by "condition of power." If the "degree of wear" is assumed to vary from 200 per cent. in the case of a new engine to 0 per cent. in the case of an engine ready for the shop, this term may be used as synonymous with "condition of power" in this article. The department having in charge the maintaining and shopping of engines is concerned with degree of wear. The department having in charge the moving of trains is concerned not with degree of wear, but with engine efficiency.

Standard condition, or 100 per cent., then exists when the average miles the engines on a division are capable of making is equal to one-half the miles expected from the individual engine between shoppings. The average miles the engines are in shape to make is a measure of the condition, hence to determine condition of power in per cent., divide the average miles all the engines are in shape to make before next shopping by one-half the miles expected of the individual engine between shoppings.

The miles the engines are in shape to make before shopping should be estimated by the master mechanics and road foremen. As a check on the estimate we have the actual record of miles al-

*Mechanical Department, A., T. & S. F. Ry.

ready made since shopping. The sum of the miles an engine has already made and the miles the engine is estimated to be good for should approximate the miles expected between shoppings. If several engines are under consideration the same applies to averages. On a division on which we expect to get 30,000 miles between shoppings out of each of a certain class of engines, an individual engine may have made 30,000 miles. If the estimate of the miles that engine is still good for is 20,000 miles we have a very close check that a proper state of affairs exists. If the sum of the average miles made and average miles good for is less than miles to be made between shoppings, it shows that the engines have not received proper treatment either in the roundhouses or on the road since last shopping (wrecks can be considered in this connection as improper treatment). If this sum is more it shows that the master mechanic, in his desire to make a good showing, has probably estimated more than he can do, or it may mean that the standard set for total miles to be made between shoppings is too low.

To determine the number of miles that should be made between shoppings it is possible to go over past records, and also take the personal opinion of division mechanical officers. The division officer will almost without exception set the mileage that his engines should make between shoppings higher than the past records will show he has attained. His figure, however, will usually be a good one to take, as it will more nearly represent what should be done than the figure obtained from past records.

The percentage of engines that should be shopped each month is a figure that can be determined to a mathematical nicety. A certain number must be shopped to make up for wear and tear. If condition of power is below standard, or 100 per cent., a greater number should be shopped so as not only to make up for wear and tear, but to improve condition also. The number of engines it is necessary to shop for complete overhaulings per month depends upon two things: (1) The number of miles made between complete overhaulings per engine, and (2) the number of miles made per month per engine. The more miles made between shoppings, the fewer engines it is necessary to shop per month. The more miles the engines run per month the faster they wear out, hence the more must be shopped per month.

The total number of engine miles made per month on any

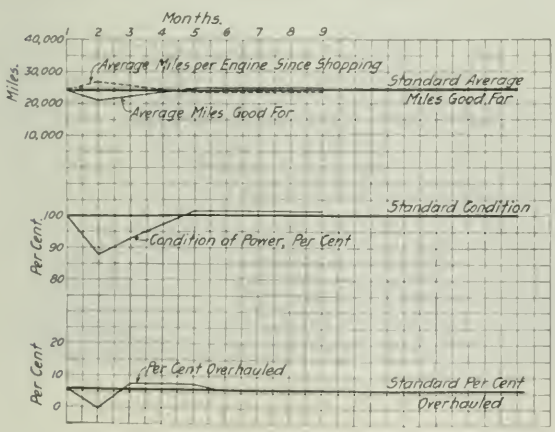


Fig. 2—L., R. & C. Division.

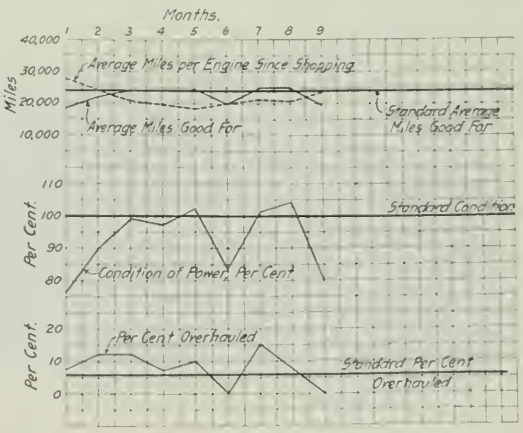


Fig. 3—X., Y. & Z. Division.

Condition of Power on First Day of Each Month; Freight Service.

division, divided by the average number of miles made per engine between complete overhaulings, will give the number of engines which it will be necessary to get from the shop each month in order to maintain power. This may be illustrated by considering that the miles all the engines are capable of making before their next shopping are like the working balance of a bank account. Each mile can be treated as one dollar. When condition of power is standard, or 100 per cent., the working balance is a satisfactory amount. Every time an engine runs a mile it is like drawing a dollar from the bank balance. Conditions are not satisfactory when this working balance is less than the standard amount. As the engines on the road use miles the account is depreciated. The only way to replace those spent is by adding to the account the miles which engines coming from the shop are good for.

If the miles which engines coming from the shop in any one month are capable of making before next shopping are equal to the engine miles used on the division during the month, the balance has been maintained and condition of power is the same at the end as at the beginning of the month. If the miles which engines coming from the shop in any month are capable of making are more than the engine miles used on the division during the month the balance has been increased or condition of power has been raised, but if the miles which engines coming from the shop in any one month are capable of making are less than the engine miles used on the division during the month, the balance has been decreased and condition of power has been lowered.

The accompanying chart, Fig. 1, shows the relation between miles made between shoppings, miles made per month and percentage of engines that must be shopped each month to maintain the condition the same at the end as at the beginning of the month. This chart can be used in several ways. For example:

1. If it has been decided what mileage should be made between shoppings and what mileage should be made per month it is possible from the chart to determine what percentage of the engines should be given complete overhaulings per month.

2. If it is known what mileage engines have averaged per month and what percentage have received complete repairs during the month, the chart can be used to determine what mileage is being made between shoppings.

These matters have to do entirely with complete overhaulings in back shops. The result of neglecting running and light repairs will be to reduce the miles made between shoppings, thus rendering figures based on a fair mileage between shoppings of little use. Checks as to whether running and light repairs are being maintained are:

1. Actual records of miles made between complete repairs. If the proper mileage is not made between these shoppings it is due to lack of running and light repairs.

2. The number of engine failures. Running and light repairs have more to do with failures than condition of power.

3. The amount of money being spent on this class of repairs. These repairs cannot be kept up unless a reasonable amount is spent on them.

Per cent. of condition of power is then an accurate figure, obtained by dividing the average miles engines are in shape to make before next shopping period by one-half the mileage expected of the individual engine between shoppings. Number of engines to shop each month can be determined by dividing total engine miles made by average miles per engine between shoppings. If condition is below standard a greater number must be shopped in order to bring condition up; or if condition is above standard, less may be shopped, thus allowing condition to fall. This method is systematic. The method of running engines until they fall down, then crowding them into the nearest shop, is not systematic. The division mechanical officer who, because his power is in fair shape, is not shopping the correct number of engines and maintaining this fair condition, is following a course which will lead to low condition of power, and necessarily to a high percentage in the shop in order to again bring the condition up to the point desired.

Thus the matter of condition of motive power and the laws for timely shopping of same may be reduced to a rational mathematical basis quite like life insurance. Individual engines and individual men may not follow the laws, but groups of engines and groups of men will be found to do so exactly.

Fig. 2 herewith illustrates the condition of power on a division which keeps very close to standard conditions. The broken line in the top record, or graph, represents the average miles run per engine since shopping for repairs costing $500 or over. The light

full line represents the average miles-good-for per engine on the first of each month as estimated by the master mechanic.

The light line in the middle graph of the figure represents the condition of power in per cent. determined by dividing the average miles-good-for by the standard average miles-good-for. The heavy line shows the standard condition, 100 per cent.

The lowest graph shows the percentage of total number of engines assigned which are repaired each month. The standard is 5.9 per cent., represented by the heavy line.

Engines in freight service on these divisions should make 3,000 miles per month, and 48,000 miles between shoppings costing $500 or over.

During the second month no engines were overhauled on account of unusually heavy traffic. As a result the average miles-good-for dropped and the condition of power went down 12 per cent. It was necessary to overhaul almost 2 per cent. more than the standard for three successive months in order to get the condition of power to where it should be. Aside from that one month the conditions are practically ideal.

Fig. 3 illustrates the condition of power on a division having a poor and irregular record. The mileage lines remain low because the mileage was not being made by the engines between shoppings. Only by repairing each month a larger number than the standard was it possible to keep the condition of power at all near 100 per cent., and even then only spasmodically. The failure of the shop to overhaul any engines in the sixth month brought about the same results as shown in Fig. 2.

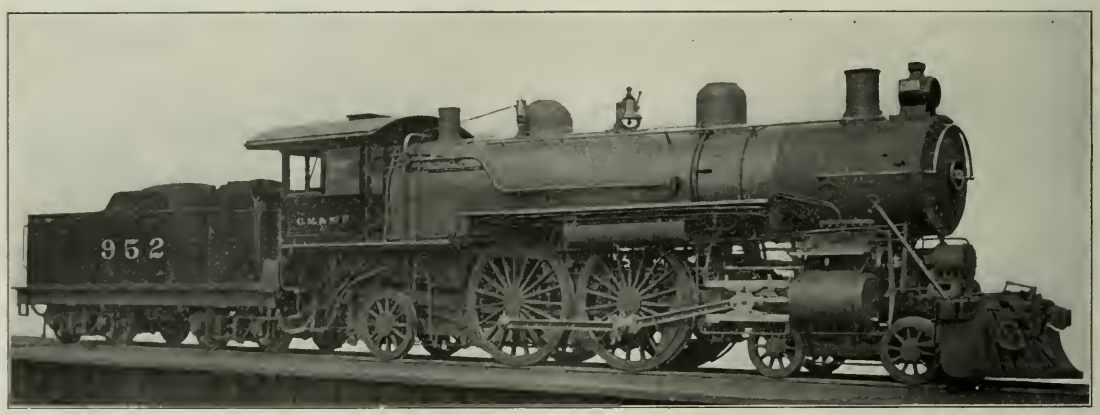
Completing the Simplon Tunnel.

The general directorate of the railroads of the Swiss Confederation has reported to its executive council recommending the completion of the second Simplon tunnel in the near future. The plan for tunneling the Simplon provided for two parallel tunnels connected by cross cuts. One of these tunnels is finished and in operation, while the second is driven through in the rough. The object of the second tunnel was to provide for a second track and also to furnish better ventilation. In its present incomplete condition at some points the floor has been forced up and falls of rock have occurred from the roof and from the sides. The principal reasons urged in favor of the prompt completion of the second tunnel are: That where heavy pressure and movement of the rocks in the second tunnel make lining of the present cross-section necessary, it will be better economy to complete the tunnel to the full cross-section rather than put in heavy temporary masonry, which would have to be removed in a few years if the completion is postponed. In a long, narrow tunnel in which the movement of trains occupies 20 hours of the 24, there is considerable difficulty in carrying on the work of repairs and of maintenance. Even with the use of electric power, under the existing conditions of moisture, the life of the 100-lb. rails used cannot be more than 10 to 12 years. As replacement of rails in the Simplon tunnel cannot be made more rapidly than at the rate of 1½ to 2 miles a year, it will be necessary to begin the work of replacement under present conditions at the end of 6 or 7 years. The heavy pressure to which the masonry of the completed tunnel is subjected at some points, and the action of the hot waters on the mortar will before long make repairs necessary. With a single tunnel these can only be made during a stoppage of traffic or at an exceedingly heavy expense. They would be materially simplified by having the use of a second tunnel.

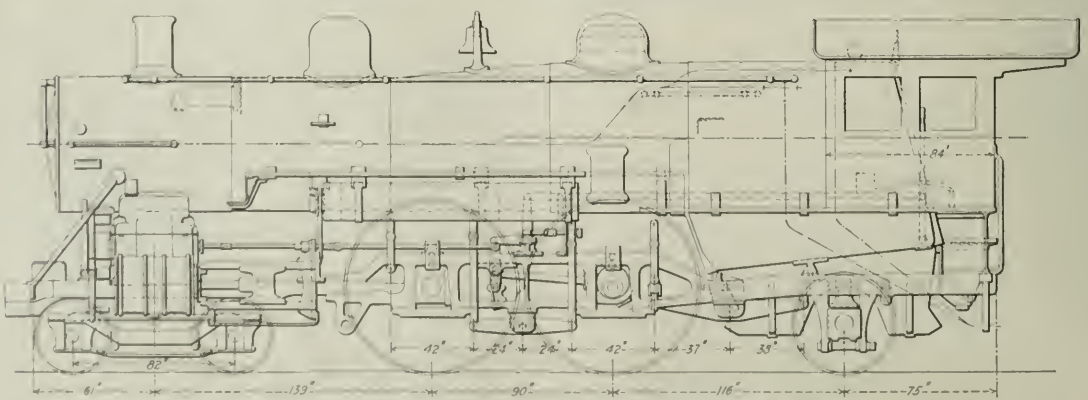
Balanced Compound Atlantic Locomotive for the Chicago, Milwaukee & St. Paul.

The Baldwin Locomotive Works has recently built two balanced compound locomotives for the Chicago, Milwaukee & St. Paul. These engines are of the Atlantic type, and have a tractive power working compound of 22,200 lbs. They will be used in fast passenger service. The maximum curves which they will traverse are of 20 deg. radius.

The principal features of the design are shown in the photograph and drawings. The cylinders are located in the same horizontal plane, and the four main rods are all connected to the leading pair of driving-wheels. With this arrangement the guides are all of the same length. They are supported by cast-steel bearers



Baldwin Four-Cylinder Balanced Compound Atlantic Locomotive; Chicago, Milwaukee & St. Paul.



Baldwin Compound Atlantic Locomotive; Chicago, Milwaukee & St. Paul.

which are bolted to a heavy cross tie. The crank axle is of the built-up type, with cast steel central web. The driving tires are secured by retaining rings.

The Stephenson link motion is used in this design, with eccentrics placed on the second driving axle. The eccentric rods are straight and the link blocks are connected directly to the rock shafts. The long valve rods are placed above the frame center lines; they are supported by the guide bearer knees, and are provided with knuckle joints to avoid springing. The valves are of the piston type 15 in. in diameter, and working in cast iron bushings.

The main frames are of cast steel 4½ in. wide, with single front rails of wrought iron. Above the rear truck wheels the frames are in the form of slabs, 2¾ in. wide by 10 in. deep. Bosses are cast on the frame ahead of the leading pair of driving wheels, thus providing supports for the driver brake shaft. The brake cylinder is placed immediately back of the front bumper, and the brakes are operated by a push rod which passes through a 3½ in. hole located on the center line of the cylinder saddle. This arrangement avoids the necessity of placing the brake cylinder support above the inside guides. The leading truck is of the usual swing bolster type, while the rear truck is of the "Bevoy" design, built in accordance with drawings furnished by the railroad company. The truck boxes and cross frame are of cast steel in one piece and the weight is transferred to the spring seats through roller bearings. The method of equalization is shown on the accepting card.

The boiler is of the wagon top type with butt jointed longitudinal seams having diamond welt strips. A notable feature is the ample depth of firebox especially at the throat. The depth from the bottom of the mud ring to the under side of the barrel is 30 in. and to the center of the lowest row of tubes 24½ in. The mudring, which is of cast steel and double riveted, is supported by sliding shoes in front and a bumkin plate at the rear. Two rows of T irons support the front end of the crown sheet, otherwise the staying is radial. The brick arch is supported on four water tubes. The fire door opening is circular, 16 in. in diameter.

The construction of the tender calls for no special comment beyond the fact that the frame is built of oak.

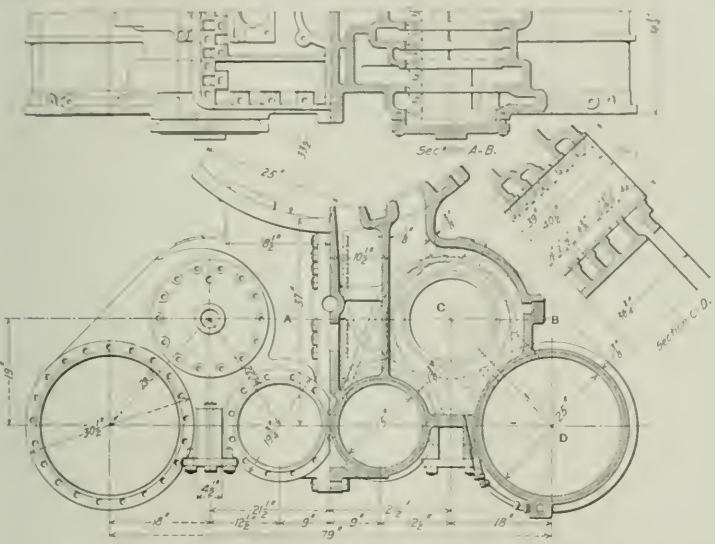
These are the first balanced compounds purchased by this road, although the line has had a large number of four-cylinder compounds and locomotives in service for some time. Opportunity should therefore be given for securing interesting comparative data relative to the performance of the new engines.

The following are some of the principal dimensions of these engines:

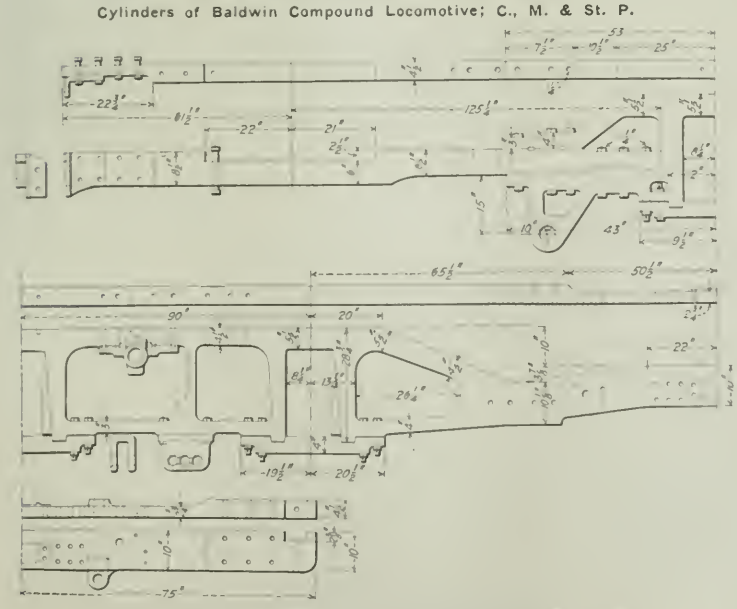
Cylinders, diameter, h. p.	15 in.
Cylinders, diameter, l. p.	25 in.
Piston stroke	28 "
Valves	Balanced piston
Boiler, diameter, shell	66 in.
Boiler, thickness sheets	⅝, ¹¹/₁₆ and ¾ in.
Steam pressure	220 lbs.
Firebox, length	108 in.
" width	69⅛ "
" depth, front	70 "
" depth, back	63⅛ "
" thickness, sides	⅝ in.
" thickness, back and crown	⅝ "
" thickness, tube sheets	½ "
" water space, front	4½ in.
" water space, sides and back	4 "
Tubes, number	268
" diameter	2¼ in.
" length	19 ft.
Heating surface, firebox	155 sq. ft.
" " tubes	3,015 "
" " arch tubes	28 "
" " total	3,198 "
Grate area	45.8 "
Wheels, diameter, driving	85 in.
" " front truck	36 "
" " back truck	49 "
" " tender	38 "
Journals, main, driving	10 in. x 11 in.
" trailing, driving	9 " x 12 "
" front truck	6 " x 10 "
" back truck	8½ " x 14 "
" tender	5 in. x 9 "
Wheel base, driving	7 ft. 6 in.
" engine	32 " 2 "
" engine and tender	63 " 1½ "
Weight on drivers	107,550 lbs.
" " front truck	52,000 "
" " back truck	45,800 "
" total engine	205,350 "
" total engine and tender	310,000 "
Tank capacity, water	7,000 gals.
Tank capacity, coal	14 tons
Tractive effort	22,200 lbs.

Weight on drivers / Tractive effort	4.84
Total weight / Tractive effort	9.25.0
Tractive effort x diameter of drivers / Heating surface	590.0
Heating surface / Grate area	69.82
Firebox heating surface / Total heating surface	5.72*
Total heating surface / Total weight	33.63
Total heating surface / Total heating surface	64.22
Volume of 2 h. p. cylinders, cu. ft. / Total heating surface	5.72
Total heating surface / Volume 2 h. p. cylinders	560.0
Grate area / Volume 2 h. p. cylinders	8.00
Volume of 2 l. p. cylinders / Volume l. p. cylinders	15.99
Volume l. p. cylinders / Volume of h.p. cylinders	2.77
Tube heating surface equated to firebox heating surface (Vaughan formula), sq. ft.	691.51
Total equated firebox htg surf., sq. ft / Total heating surface	874.51 / 3.66
Equated firebox heating surface	

*Per cent.



Cylinders of Baldwin Compound Locomotive; C., M. & St. P.



Frame of Atlantic Locomotive; Chicago, Milwaukee, & St. Paul.

Americanizing Brazilian Railroads.*

As a result of concessions secured and purchases made within the past year American interests, including Canadian interests and supported largely by French capital, have secured more or less perfect control of a system of rail and water transportation forming a "belt line" about the whole of the better portion of Brazil and which, with Government railroad lines and Government subsidized steamships, reaches almost every portion of the immense republic. This great system is composed of parts which may be conveniently grouped under three heads, as the Sao Paulo-Rio Grande railroad lines; the Amazon-Bolivian system, and the Paraguayan-Bolivian connections.

The first of these subsidiary divisions will cover to a greater or less extent the southeastern portion of Brazil, reaching the coffee and live stock country and connecting them with the seaboard. The third will connect this coast system with the Paraguayan railroad, reaching eventually up into Bolivia, and by means of its own and Government lines, penetrating the great grazing country in the interior table-lands and valley country of south-central Brazil. The second system represents the connection of Bolivia with the Atlantic ocean by means of the Bolivian railroads and rivers, and the Madeira river, the Madeira-Mamore Railway, and the Amazon river.

The tangible outline of the first division is represented by the Sao Paulo-Rio Grande Railroad, the Sorocabana Railroad, and the port works at Rio Grande do Sul. The tangible outline of the second is represented by the concession for the Paraguayan railroad connections in relation to the line of the Brazilian Government into Matto Grosso and Goyaz, while that of the third division is represented by the port works at Para, the Madeira-Mamore Railroad, and the connections of the Bolivian railroads under contract held by what is known as the Speyer syndicate of New York.

About a year ago a concession was granted certain American-Canadian capitalists for the construction of docks and port works, and the removal of the sand bar which has concerned the port of Rio Grande do Sul and Port Allegre, on the Laguna dos Lagos. Within a very short time thereafter this same syndicate purchased the Sao Paulo & Rio Grande Railroad and proceeded to open up that portion of Brazil. A well-known American railroad builder and manager was brought down for the completion of the road, the enterprise was put upon the way to immediate completion, and the development of that portion of Brazil with American capital seemed about to commence. Within the past month this same syndicate leased the Sorocabana Railroad.

The work on the Sao Paulo railroad now represents the construction of the remaining parts of a railroad system which will reach from Rio de Janeiro to Sao Paulo over the Central Railroad of Brazil (Government owned and managed), and thence by the new lines to the extreme southern portion of Brazil. It will force the English monopoly between Sao Paulo and Santos to afford reasonable rates for Sao Paulo's products, to be collected largely by the new American system, or will afford an outlet to the seaboard for such products either over its own lines to the south or by a new line to be constructed direct to the seaboard.

The great country to the south of Sao Paulo—live stock, farming, timbering and mineral—will be opened up by affording it a route to the sea. That portion of Brazil which is susceptible to the most immediate and satisfactory development is reached by this American-Canadian railroad property.

The feeling shown by English residents and English investors in Brazil over the turn of events is not so much due to disappointment over the loss of any single particular investment as it is to the fact that the American-Canadian syndicate has undertaken development in Brazil upon so extensive a scale that its ultimate effects will be felt in every line of foreign business in Brazil. The actual work to be done by the syndicate in Sao Paulo and through the interior to Rio Grande do Sul, and thence in fact to Montevideo, is to be strictly up to date, representing the best there is in American railroading. It represents American materials and methods, American locomotives and American rolling stock. The port works at Rio Grande do Sul are indicative of the whole. There will be a double stone jetty extending over the bar, and within the port there will be a quay wall like that at Antwerp and the one at Hamburg. The railroads will come to the quay. There will be electric cranes, fireproof warehouses and the most modern equipment. The equipment of the railroads will be in keeping with the ports they are to serve.

Part of the work of this syndicate in connection with the Sao Paulo-Rio Grande Railroad is the construction of a line 600 miles into the interior of the country to Iguassu Falls, starting from the port of San Francisco. This line will open up Paraguay to the Atlantic by rail and will, by means of the Paraguayan railroads now existing and under concession, form connection with the new Bolivian railroads, for Bolivia is to be thoroughly developed in a railroad way and will have connections with the Atlantic ocean, both to the north by way of the Amazon and to the south through Paraguay. There are interests in the United States now organizing for the further development of the Paraguayan and Bolivian connections. Independent of them, however, there are to be notable changes in Bolivia under the direction of the Speyer syndicate.

About three years ago there was signed in Petropolis, Brazil, a treaty between the Government of Brazil and that of Bolivia for the settlement of the boundary between the two countries—a boundary which had been the subject of dispute since the two Governments were founded. The chief dispute was over the large territory known as the "Acre," chiefly important for the amount of rubber it produces. In this treaty Bolivia quitclaimed its rights in the Acre for $9,733,000. This money it has contracted with Speyer Brothers, of New York, to spend for over 300 miles of railroad to cost $26,766,000, the balance of cost of the roads to be covered by bonds upon the railroads themselves. The connections with the southeast, which it is expected will be effected through the railroads mentioned as forming the second part of the system outlined, will probably be secondary to the principal system in Bolivia formed to connect with the great Amazon system, forming the third heading above indicated. This connection is to be effected by means of the Mamore river, the Madeira-Mamore Railroad and the Madeira and Amazon rivers.

In some respects the development of this great line of transportation is the most important of all those undertaken by the American-Canadian syndicate. The beginning of this line came in the granting of a concession about a year ago to the American syndicate to construct port works at Para (Belem), at the mouth of the Amazon river. Soon after the signing of the treaty of Petropolis the Brazilian Government, in line with the provisions of the treaty, granted a concession for the construction of a railroad from San Antonio, on the Madeira river, to a point on the Mamore river above the falls, which have made navigation by that river impossible.

The concession was granted to a Brazilian as against an American syndicate, which bid for it, and it was understood that French capital was secured to work it as a Brazilian concern. The announcement was made a short time since, however, that the American-Canadian syndicate constructing the Para port works and operating in other portions of Brazil had bought the concession and had men on the way to begin work under it. A party of 30 men, under the charge of H. C. Miller, at one time chief assistant in a Nicaraguan canal survey, are now engaged in the preliminary work, and men and materials for the construction of the road are now on the way, the plans calling for the construction of warehouses, workmen's cottages and even a cold-storage plant.

Commencing with the railroad development of Bolivia and with fully 3,000 miles of navigable rivers to feed the new railroad between the Madeira and Mamore rivers, the line of traffic from La Paz, the capital of Bolivia, to the Atlantic, with the exception of the rivers and the river traffic, which will always be more or less under the control of the Brazilian Government, will be American in control and methods. The principal product of that country at the present time is rubber, but what the limits are of the country's production in other lines no one can tell. The Bolivian country opened up by the new railroad system and connected with the sea, as well as the Brazilian territory reached in the lines west from the southern ports of Brazil, is one of the finest in the world for live-stock raising and for general agriculture. In a climate both temperate and healthful, free from malarial and similar diseases, with a soil more fertile and less subject to deterioration than that of almost any other portion of Brazil, there is apparently no limit to possible development.

EFFECT ON BOLIVIA.

It is important as well as interesting to note the possible effect of this development upon Bolivia. A correspondent of the *Financial News*, who is evidently acquainted with conditions in Bolivia, says of the matter:

> It is, however, interesting to consider the effect on a country hitherto so isolated as Bolivia of the expenditure of so large a sum of money as £5,500,000 on development in any form. Among other things, increased means of transportation and locomotion will induce a great deal of traveling in the country. There will be an enormous inrush of foreigners to Bolivia. These people will secure the major portion of the better-paying industries, and most of the Bolivians will accept minor posts, for out of a population of 1,750,000 there are 1,500,000 Indians, speaking only native dialects. There will be a great expansion in most branches of trade and industry. Banking will increase and there will be a great accession of wealth, most of which will be secured by the new arrivals. Stronger characters will bear down the passive and inexperienced Bolivians. The mining industry, already encouraged by high prices in Bolivia's special products, is likely to progress in an astonishing degree, and all existing commercial mechanism will be strained to keep pace with expanding trade. How much attention from neighboring nations this will attract can be understood, and, in one way and another, Bolivia's awakening will be watched with interest by many persons.

The amount of money invested and to be invested immediately in the several enterprises, including the Bolivian development, will probably exceed $150,000,000. The movement of American railroad and other material in this direction for such works represents the most active and the most considerable element in the export trade of the United States to Brazil and Bolivia.

*Consular report.

GENERAL NEWS SECTION

NOTES.

The Grand Trunk expects to begin operating a car ferry between Grand Haven and Milwaukee next week. The terminal in Milwaukee is practically completed.

Beginning December 8, the Southern Pacific will run two passenger trains daily each way between Houston, Tex., and the Pacific coast, instead of one a day, as at present.

The Huntingdon & Broad Top, after a strike lasting two weeks, has granted the demand of its trainmen that they be paid at the rates prevailing on the Pennsylvania Railroad.

At St. Louis the Wabash Railroad has been fined $200 for failing to promptly report train accidents, as required by the Interstate Commerce Commission, under the Act of 1901.

The Baltimore & Ohio, which is using coke on some of its locomotives in the residential part of Pittsburgh, intends to fit a considerable additional number of engines for burning that fuel.

The Official (Freight) Classification Committee has announced that henceforth no changes will be made in the classification of commodities in freight tariffs until after the proposed changes have been published 30 days.

J. N. Seale, Manager of the Northern and Eastern districts of the Southern, had a stroke of paralysis last Saturday while at Salisbury, N. C. He was taken to Washington, where his condition is said to have improved.

The Atlanta & West Point reports an increase of 18 per cent. in passenger receipts for the month of September over the corresponding month of last year. On this road the state rate, now in force, is 2 cents a mile.

In Macon, Ga., Wilmington, N. C., and other cities business men have combined to request the governors to be less severe in their demands on the railroads, declaring that their radical action has disturbed business seriously and that at the present time it is highly important to allay unfavorable criticism on the railroads.

The Pennsylvania has issued an order to its agents that freight must be kept moving on Sundays to avoid a congestion of loaded cars at the terminals, and to meet the largely increased demands of freight traffic at this time. For several years the movement of much of the low-class freight has been practically suspended on Sunday.

The people of Middletown, N. Y., are complaining because the Erie Railroad has covered "nearly every available space" on the outside of its handsome station in that city, with billboards. It is reported that the Erie intends to do a general advertising business. Billboards have been put up at Erie stations all the way from Jersey City to Middletown.

The State Railroad Commission of Georgia, acting on a report of an inspector and on personal inspections by two of the commissioners, has ordered the Georgia Railroad, within 30 days, to replace defective ties and within 10 days to replace defective spikes, bolts and angle plates at certain specified places. According to the newspapers the defects found were numerous.

In the Federal Court at Little Rock, Ark., November 9, the Arkansas Railroad Commission was temporarily enjoined from carrying into effect its recent order instructing the Prosecuting Attorney to institute suit against the Iron Mountain to collect penalties aggregating $990,000 for alleged discrimination in furnishing coal operators with cars in the Spadra and Denning coal fields.

The Supreme Court of the United States has affirmed the validity of the South Carolina law providing for a fine of $50 upon a railroad for failing within 40 days to settle claims for damage to freight carried between points within the state. The court held that the act applied only to intrastate traffic, and as the State Supreme Court held it was valid there was no Federal question involved.

The Chicago, Rock Island & Pacific is now among the roads which publishes "merits" credited to employees for doing more than their duty. Some of the credits appear to have been made with a liberal hand, as for example, one to a man who was very prompt in responding to a call for the wrecking car. A passenger brakeman in Oklahoma received 10 merits because, while his train was delayed a long time by a washout, he borrowed a broom and swept and dusted the coaches.

The Wabash has notified its competitors that it may decide to give store-door freight service, or its equivalent, in St. Louis because of the disadvantage which it suffers by the absorption of cartage charges to and from East St. Louis by the other roads. It appears that these charges are such that from parts of St. Louis it is cheaper for shippers to send freight across the river than to send it to the Wabash freight house.

The Southern Kansas Railway, a line of 120 miles in the western part of Texas, operated by the Atchison, Topeka & Santa Fe, owns no cars or engines of any kind, and Mr. Colquitt, member of the State Railroad Commission, has formally moved that the Commission order the company to at once buy five passenger and 12 freight engines, 12 passenger cars, four express and mail cars, 500 cattle cars and 200 box cars, all for use in Texas.

The Boston & Albany, already burdened with the autumn rush of freight, has issued appeals through the advertising columns of the newspapers of the principal cities, calling on consignees to promptly unload bulk freight. At Worcester on a given day last week the number of bulk cars waiting to be unloaded was 352, while the number waiting on side tracks to be brought into the city was 912. Springfield and Pittsfield were in a similar condition.

At the shops of the American Locomotive Company at Dunkirk, N. Y., the working day has been reduced from 10 hours to nine, and the shops will be closed Saturday afternoons. The New York Central has canceled a part of its last large order for locomotives. The New York Air Brake Co., Watertown, N. Y., has reduced the pay of officers and employees 10 per cent. The Illinois Central has reduced the working time of its shops at Burnside, Ill., from 10 to nine hours a day.

On the Boston & Maine, passenger tickets which are sold at reduced rates to compete with electric lines are made good only for continuous passage and no baggage is checked on them. This no-baggage arrangement has been in force over three years and appears to be entirely satisfactory. Between Springfield and Greenfield, Mass., where the regular rate is 73 cents, the conditional ticket is sold at 50 cents. Similar tickets, with a less marked difference in rates, are sold between Portland, Me., and Kennebunk.

The Southern Pacific reports that from $3,528,199 in 1902, the cost of locomotive repairs increased to $5,717,667 in 1907. The average of $2,666 per locomotive in 1902 rose to $3,381 in 1907. From 1902 to 1907 the average cost of repairs per passenger car increased from $741 to $801 for this year. Repairs of freight cars increased in cost from $2,380,410 in 1902 to $3,875,956 in 1907. The value of freight cars withdrawn from service, largely because too small and weak to be run in trains with large cars, averaged $732,128 for each of the six years covered by the figures.

The Southern Pacific, which for the past six years, has been occupying the Illinois Central passenger station at New Orleans, bringing its passenger trains across from the other side of the Mississippi on ferry boats, has abandoned that station, at least temporarily, and all passengers will leave and take the cars at Algiers, being carried across the river on ferry boats to and from the Southern Pacific station at the foot of Esplanade street, New Orleans. This change has been made necessary by the caving in of a bank. The new place of landing in New Orleans is close to the station of the Louisville & Nashville.

At a hearing in Albany on a complaint of a brotherhood representative that insufficient men were employed on trains, it was testified that the Erie Railroad now has its colored porters on passenger trains qualified for flagging duty. The brotherhood representative said that he could not get trainmen to appear and testify because they feared dismissal, whereupon Vice-President Place, of the New York Central, announced that no employee of that company would be discharged for testifying. The commission will send an inspector over the Pennsylvania division of the New York Central to examine the ground for the complaint concerning that line.

Judge Calhoun, of Texas, has sustained the validity of the full crew law of that state, prescribing the number of men to be assigned to trains, and assessed a fine of $2,000 and costs against the Missouri, Kansas & Texas for violating it. The case will be appealed. The Pennsylvania and other companies are named as defendants in a suit to test the constitutionality of the "full crew law" passed by the last Legislature of Indiana. The railroads and the railroad commission have submitted an agreed statement of facts. A press despatch says that most of the roads are obeying the law on trains carrying intrastate freight exclusively, but on interstate trains are employing the same number of men as before the law was passed.

It appears that the Merchants' Despatch Transportation Co. has not been dissolved, nor has it abandoned all of its business. As before reported, the fast freight line business will now be done by the railroads, but the Merchants' Despatch will continue to exist as

a car-owner, and it retains its car shops at Despatch, N. Y. The ice houses at East Buffalo and Karner have been sold to the New York Central; the ice house at West Seneca, N. Y., has been sold to the Lake Shore & Michigan Southern, and that at Detroit to the Michigan Central. The several thousand M. D. T. box cars have been sold to the New York Central and the Lake Shore, as have the carriage cars owned by the company; but the 5,284 refrigerator cars are retained. Thus, the box cars will hereafter be paid for by borrowing roads at the per diem rate, while the refrigerators will continue to be paid for by the mile.

Chicago railroads now report that miscellaneous freight business has slacked sufficiently to enable them to accept all shipments offered. At Pittsburgh, however, reports continue to indicate a shortage of cars, and many industrial establishments are said to be suffering loss by delays. A despatch from that city, November 10, says that orders for 500,000 tons of coal for points in the Northwest have been refused because it was impossible to secure coal cars before the close of navigation. An officer of the Burlington road says that that company now has 1,400 box, coal and cattle cars standing idle. The state railroad commissioners of Montana have approved an order of the Northern Pacific suspending the operation of six passenger trains for 90 days in order to enable the road to relieve the congestion of freight; this notwithstanding loud complaints from citizens of the towns on the branches where the trains are to be taken off.

Twenty-two railroads, most of them prominent companies, have invited all the other roads to attend a meeting in Chicago next week, Wednesday, to see if they can agree to adopt a penalty of $5 for wrongful diversion of cars in switching territory. The proposed rules are similar to those which were proposed in connection with the rule for a general diversion penalty (which failed of adoption) except that they apply only to movements in switching territory. The 22 roads have agreed with each other, already, to abide by the proposed rules for six months, on the understanding that they shall not be changed in next Wednesday's meeting, except in accordance with the rules of procedure, which are followed at the meetings of the American Railway Association. The 22 roads are: Chicago, Burlington & Quincy; Chicago, Rock Island & Pacific; Illinois Central; Pennsylvania Lines West; Chicago & North-Western; Atchison, Topeka & Santa Fe; Baltimore & Ohio; St. Louis & San Francisco; Belt Line Railroad of Chicago; Quincy, Omaha & Kansas City; Chesapeake & Ohio; Buffalo & Susquehanna; New York, Chicago & St. Louis; Detroit, Toledo & Ironton; Ann Arbor Railroad; Norfolk & Western; Erie Railroad; Louisville & Nashville; Hocking Valley; Lehigh Valley; Mobile & Ohio, and Louisville, Henderson & St. Louis.

The state railroad commissioners of Massachusetts, reporting on the records sent in by the railroads showing delays for passenger train say that:

"The record of train delays upon the Boston & Albany Railroad for the three weeks ended October 19 is so bad that there is no occasion to analyze it. The service as a whole has been growing worse rather than better during the last eight months, as must have been the case with locomotives overtaxed and tracks overloaded.

"It has become evident that the expenditures authorized were on too frugal a scale, and that the work of improvement was tardily begun and ineffectively prosecuted; in brief, that there has been a failure to meet the emergency which the situation presented.

"Discouraging as this conclusion is and destructive as it must be of faith in assurances, the vital question is whether the outlook to-day is any better than it was six weeks ago. That question, in our opinion, ought to be answered in the affirmative. No impartial critic in possession of all the facts can fail to note the signs of a thorough understanding, at least of the troubles which have caused disaster, and of a new administrative purpose to drop superficial treatment of symptoms and to get at the real disease.

"* * * A part of the criticism which has been so lavishly expended upon the Boston & Albany might well be diverted to the record of trains upon other railroads, where, in varying degrees, there have also been delays. * * *"

Reciprocal Demurrage in Texas.

At a conference between the principal railroads and a large number of representatives of shippers, an agreement has been reached for the establishment on the railroads of Texas of "reciprocal demurrage," and it is expected that the Railroad Commission will adopt and promulgate the rules which have been formulated. The conference recommends that a railroad shall have five days in which to fill orders for not over five cars and an additional day for each car. Demurrage is to be $1 a day as now; and the penalty for failure to furnish cars 50 cents a day. The same penalty applies for failure to move cars at least 25 miles a day. The railroads agree that the shippers shall be represented on the Texas Car Service (Demurrage) Association.

The "Aero" Vacuum System for Cleaning Cars.

The Chicago, Milwaukee & St. Paul has installed in its Western avenue yards, Chicago, the "Aero" vacuum system for cleaning cars. This system, which has been in use for some time for house cleaning and similar purposes, has lately been adapted to car cleaning, the installation on the C., M. & St. P. being the first. The plant is portable and the mechanism simple. There are no vacuum pumps and elaborate piping system. Instead there is a dust separator tank on wheels, the mechanism for producing the vacuum, which is affixed to the side of the tank, and the necessary hose and nozzles.

A jet of compressed air blowing through a special designed aspirator produces a vacuum of about 10 in. The compressed air is taken from the yard pipes, and if an air cock is not convenient to the car to be cleaned the aspirator can be connected to the air line of a string of cars standing on the cleaning tracks and the air cock reached in that way.

The dust-laden air is drawn from the car into the separator tank, where the dust is removed from the air partly by centrifugal force and partly by a special strainer. The exhaust air is discharged at the bottom of the tank. The dust is removed from the tank through a door at the bottom.

The novel feature of the system is the dust separator, which it

Cleaning Parlor Car by "Aero" Vacuum Machine.

is claimed is quite efficient, separating all entrained dust from the air. Each outfit has several nozzles of different shapes for the different kinds of work. A tool with an opening 10 in. wide is used for carpets, curtains and bedding. For the seats a 4-in. upholstery nozzle is used, and for the arm-rests and other surfaces there is a special curved nozzle.

The C., M. & St. P. adopted the system after a series of tests lasting for months. These tests brought out several interesting facts. Cars cleaned by the system have the dust so completely removed that a thorough cleaning is necessary only every third or fourth trip. On intermediate trips a simple brushing is sufficient. This keeps a cushion in better shape than when cleaned every trip by the beating or blowing method. The vacuum system saves so much time and labor that three men have been dispensed with at a saving of $150 a month. Other tests to compare the vacuum with the blowing method showed that after sleeping cars had been thoroughly blown by compressed air and were ready for the station, the vacuum apparatus would remove 1 to 2½ lbs. of dust from the seats and carpets.

There are two machines in use in the Western avenue yard of the St. Paul, and at present they take care of 12 to 15 sleeping cars a day and an equal number of coaches. A cleaning outfit complete costs $350. The American Air Cleaning Co., Milwaukee, Wis., is the maker.

Atchison Fined $330,000.

In the United States District Court at Los Angeles, Nov. 7, Judge Olin Wellborn fined the Atchison, Topeka & Santa Fe $330,000 for paying rebates illegally. The company was convicted on October 11 last by a jury in the Federal court of granting rebates to the Grand Canyon Lime & Cement Company of Arizona. It was found guilty on all the 66 counts. The rebates were given on shipments of lime and cement from Nelson, Ariz., to Los Angeles. The company claimed that these amounts were allowances for damages to goods which were allowed after such claims had been regularly presented and proved in each instance. Judge Wellborn says: "I am inclined to think that the defendant's underlying purpose in the transaction complained of was to foster on its own lines any industry which would permanently contribute to its traffic against competitors in other localities. But the evidence shows that the concessions were intentionally and systematically made, and it is hard to believe that the defendant did not know that they were unlawful departures from its established tariff. At all events, ignorance of the law under the circumstances in this case would imply a degree of negligence well nigh equivalent to guilty knowledge. The judgment of the court is that the defendant be sentenced to pay a fine of $5,000 on each count of the indictments."

Judge Wellborn allowed a stay of 30 days, with the privilege of an extension. Judge Wellborn is 64 years old, a native of Georgia and a Confederate veteran. He went to California in 1887, and was appointed to the Federal bench by President Cleveland in 1895. He served in Congress from the Dallas (Tex.) district in the 46th, 47th, 48th and 49th Congresses.

An officer of the Atchison, Topeka & Santa Fe in New York said: "This entire case is an outrage and the matter will certainly be appealed. A man in a remote section of Arizona asked us to name a rate on lime shipments to Los Angeles. We stipulated that the minimum carload should consist of 40,000 lbs. The place was so small that there were no track scales there. The shipper at times did not send the minimum load, and many of his carloads on arrival at Los Angeles showed only 35,000 lbs. The man said he could not help having sent an insufficient amount, owing to the absence of track scales, and asked that in such instances he be charged only for the amount sent.

"The adjustment of his claim did not even reach the officials of the company. It came under the eye of a clerk, to whom the claim seemed so just that he granted it without even presenting the matter to his superiors, who were unaware of it." * * *

Rochester-Coburg Car Ferry.

The Buffalo, Rochester & Pittsburgh and the Grand Trunk have established a car ferry across Lake Ontario between Rochester, N. Y., and Coburg, Ont. A steamer with capacity for 26 cars has been put in service and it is expected to be powerful enough to cut its way through the heaviest ice. Its ordinary speed is 15 knots an hour. The B., R. & P. has built a dock on the Genesee river, which is reached by its Charlotte branch. It is expected that the ferry will secure a good traffic in coal from the Pittsburgh district to points in Canada. The boat was built by the Canadian Shipbuilding Company. It is the largest ever used on Lake Ontario, being 316 ft. long, 57 ft. 7 in. beam and 17 ft. draft. While especially designed for carrying freight, accommodations in keeping with the best modern sea going vessels have been provided on the upper decks for passengers, comprising 32 staterooms, dining saloons and lounging rooms. The distance between Rochester and Coburg is 60 miles, and it is expected that the boat will make two round trips each 24 hours.

Alabama Legislature.

The special session of the Alabama legislature opened November 7. Gov. Comer in his message declared that the control and regulation of the railroads by the state is a question more important than the making of rates or any other matter, in that it involves the question of the right of the state to control its internal affairs. He says that President Smith, of the Louisville & Nashville, has held out against the Alabama laws, while others have put them into effect; has defied the state and its people by conducting a lobby at the Capitol, openly admitting that his company influenced legislation in the past; has called the Governors of Alabama and Georgia Populistic; has raised rates overnight in defiance of state laws, and has generally refused to recognize the right of the state to make laws applying to transportation companies. That the Alabama rate laws are not confiscatory is evidenced, the Governor says, by the fact that they prevail in other nearby states, and provide profit. Financial troubles, he says, are due to the rascality of the high financiers, and the producer of the cotton of the South is now coming to save the country from panic. The Louisville & Nashville is charged with manipulation to prevent use of waterways, to make rules for handling coal and as to demurrage and freight rates, which are arbitrary.

President Smith has issued a pamphlet replying to Governor Comer's charges.

Eight bills have been introduced in the legislature to carry out the Governor's proposals, and some of the bills under consideration in the house were passed by that body on Tuesday of this week. The maximum rate bill, which was enjoined by the railroads, was repealed, the authority given the railroad commissioners to bring suit was revoked with a view to preventing the railroads from enjoining the state. The bill providing for penalties for failing to put in effect the state laws was passed. The passage of these bills and of the eight bills known as "the 110 commodity rate bills" is expected to put the low rates into effect without going to court. Each of the bills provides a heavy penalty. There is another bill, providing that a passenger who tenders the amount required by state law for passage and is ejected from a train may bring suit within ten years. The bills are carefully drawn by the most prominent constitutional lawyers in the state.

New York State Commission Orders.

The Public Service Commission of New York, Second district, has ordered the railroads of the state to report all important improvements to roadway, buildings, bridges and terminals and all additions to rolling stock, made during the year ended June 30 last, and also improvements of this kind now unfinished. The Commission calls on the roads for full and prompt responses, believing that by furnishing the desired information, to be laid by the Commission before the Legislature, the roads will be promoting their own interests and disarming prejudice.

The Commission has also ordered the railroads of the state to have their local agents report, direct to the Commission, all cases in which it is impossible to provide cars for shippers within four days of the time the cars are required.

The Commission has also ordered all railroads to promptly report to the Commission, with full particulars, any embargo which may be laid on intrastate traffic; also to send notice when any embargo is revoked or modified.

Cement Show in Chicago.

The first annual cement show will be held in Chicago at the Coliseum, December 17 to 21 inclusive. It will be under the auspices of the Cement Products Exhibition Co., which was formed to hold annual expositions of cement products. The enterprise is being promoted by Portland cement manufacturing interests of the Middle West. Its scope may be judged from the classifications of exhibits, which include: Cement, concrete mixers, block machines, brick machines, cement pipe machines, cement tile machines, cement post machines, cement coloring mixtures, reinforcing metal, cement publications, testing machinery, sheet piling, aggregates, sand and technical institutions. L. L. Fest, who has been manager of several large trade exhibitions of this kind, is in charge. It is hoped that the attendance will be increased by the fact that the date set will allow visitors to do their Christmas shopping in Chicago. It is desired that everybody directly or indirectly interested in the cement industry will do something to contribute to the success of this demonstration, which is intended to exploit cement as the leading building material of the future.

A State Rule for Distributing Coal Cars.

The State Railroad Commission of Indiana has given to the Southern Indiana Railroad an order directing in detail how that railroad shall distribute cars to the coal mines dependent upon it for transportation, leaving no discretion to the management of the road. The order is the result of an investigation of charges by the Calora Coal Company that the Southern Indiana was grossly discriminating against it and in favor of the mines owned wholly or in part by John R. Walsh, who controls the road. The commission directs that the distribution of cars shall be based on the average daily capacity, or on the daily requirements, of each mine. If the daily requirement of a mine is 100 cars and there are only 500 cars to be distributed, the mine will receive one-fifth of the cars available. The mine, however, has the right to increase its daily requirements up to its average daily capacity, but not beyond this point.

Each mine must furnish by telephone daily, between 5 and 6 p.m., all information necessary to enable the company to make a distribution of cars in accordance with the rules of the commission. The road must include in the "total equipment" on its line "available for the operation of all mines" all "system" coal cars that day apportioned to the mining district; all foreign cars available for use in the district; all foreign cars specially assigned to or requested by particular mines for loading with commercial coal;

all foreign cars specially consigned for loading with fuel coal for foreign lines, and all private cars owned by mines on the line of the Southern Indiana.

On any day when the allotment of cars due the mines which furnish the Southern Indiana with fuel coal [for its locomotives] does not equal the requirements of the railroad, such mines shall be served first despite the lack of cars in the general distribution.

The commission requires the road to arbitrarily assign from its equipment before distribution a reasonable number of cars for the development of new mines. This shall be continued until the capacity of the new mine is equal to the lowest capacity of any mine operating on the road.

TRADE CATALOGUES.

Welded Pipe.—The National Tube Company, Pittsburgh, Pa., has published an exceptionally well illustrated pamphlet entitled "The Manufacture of Modern Welded Pipe." It describes the older process of making wrought-iron pipes, taking up each step beginning with the ore, and then goes on to tell the history of pipe steel and the stages in the making of steel pipe nowadays at the company's works. The last part of the pamphlet is taken up with a comparison of the relative value of steel and iron pipe.

Friction Draft Gear.—The Republic Railway Appliance Co., St. Louis, Mo., has a new catalogue of its "Republic" friction draft gear. It is a 6-in. x 9-in. pamphlet presenting in concise form essential information concerning the device. The construction of the gear, the parts in detail and their relation are shown by half-tone engravings and the different applications by line engravings. The action of the gear and its advantages are briefly given in the text.

MANUFACTURING AND BUSINESS.

The Schoen Steel Wheel Co., Pittsburgh, Pa., has opened an office at 1407 Fisher building, Chicago, with J. T. Milner as Western Sales Agent.

The jury of awards for the Jamestown Exposition has awarded the Baldwin Locomotive Works, Philadelphia, Pa., a diploma of a gold medal for installation of exhibit.

During October of this year, the American Car & Foundry Company, New York, built 10,780 cars and repaired 626 cars. Its output of cars during the quarter ended October 31, 1907, was greater than in any previous quarter.

S. T. Callaway has been elected Secretary of the American Locomotive Company, New York, succeeding Leigh Best, who has been Secretary of the company since its organization. Mr. Best remains Vice-President. Other officers were re-elected, as follows: President, W. H. Marshall; Vice-President, R. J. Gross; Vice-President, H. F. Ball; Vice-President, David Van Alstyne; Treasurer, C. B. Denny; Comptroller, C. E. Patterson.

Contracts for erecting buildings and for other structural work at the $1,000,000 open hearth steel plant and finishing mills at McKees Rocks, Pa., of the Schoen Steel Wheel Co., Pittsburgh, Pa., have been let to the Riter-Conley Manufacturing Co., Pittsburgh, Pa. The Shaw Electric Crane Co., Muskegon, Mich., has the contract for a number of heavy cranes, and the Porter-Miller Co. will install a large gas producer. It is expected that the plant will be in operation next spring.

The Westinghouse air-brake equipment specified for the six switching locomotives, which, as mentioned in another column, are to be built by the Davenport Locomotive Works, Davenport, Iowa, for John Marsch, Cleveland, Ohio, consists of Westinghouse automatic and straight air-brakes with two 9½-in. pumps and triple train lines for operating brakes and pneumatic dump cars. These are equipped with two-way cocks so that all pneumatic operations are handled from the cab.

Richard D. Hurley, Manager of the Pittsburgh office of the Independent Pneumatic Tool Company, Chicago, died at Chicago on November 5 of heart trouble, which did not develop until about a month ago. Mr. Hurley was 39 years old and had been in the pneumatic tool business for 10 years. He was a brother of John D. Hurley, Vice-President and General Manager of the Independent Pneumatic Tool Company, and of Edward N. Hurley, formerly President of the Standard Pneumatic Tool Company.

The United States Steel Corporation is exchanging its 5 per cent. sinking fund bonds for Tennessee Coal, Iron & Railroad stock at the rate of $120 face value in bonds for each share of stock. At the end of last week, $21,500,000 of the about $33,000,000 outstanding T. C. I. & R. R. stock had been exchanged and it was expected that nearly all the rest would be turned in on the same basis. G. C. Crawford, of the National Tube Co., Pittsburgh, Pa., has been elected President of the T. C. I. & R. R., succeeding J. A. Topping.

A cash dividend of 3 per cent. and a scrip dividend of 20 per cent. on the $17,240,000 outstanding 6 per cent. cumulative preferred stock of the American Steel Foundries, New York, has been recommended by the Board of Directors. The cash dividend will be a semi-annual dividend and the scrip, which is to bear interest at 4 per cent., represents back dividends, nothing having been paid since the 2½ per cent. in 1904. A stockholders' meeting is to be held soon. The above dividends are to be paid only on condition that preferred stockholders exchange their stock for an issue of new preferred stock which will not be cumulative.

The General Electric Company, Schenectady, N. Y., has been awarded two gold medals and a bronze medal for its exhibit at the Jamestown Exposition. The company's exhibits are grouped in three departments: machinery, manufactures and liberal arts, and mining. In the first classification, a gold medal was awarded for a collection of motors applied to various machine tools and other devices. In the second department, a gold medal was given for an exhibit of arc and incandescent lamps and electric cooking applications. The bronze medal was awarded for a special motor designed particularly for use with an Ingersoll-Temple pneumatic rock drill. The company was also awarded a silver medal for installation of exhibit.

The Buffalo Brake Beam Co., New York City, is now occupying its new plant at West Seneca, Buffalo, N. Y. The plant covers five acres. The buildings consist of the main shop, 60 ft. x 200 ft., with an adjoining open shed extension 100 ft. x 24 ft.; they are equipped with modern machinery and have twice the capacity of the old plant, which was recently destroyed by fire. The fire occurring, as it did, when the new plant was nearly ready for occupancy, the company was hampered very slightly in making deliveries. A siding from the South Buffalo Railway runs into the yard of the new plant, with a track on each side of the main building on a 1 per cent. grade, so that when empty or loaded cars are switched on to these tracks they return to the main line by gravity, thus saving time and expense in switching.

Iron and Steel.

The Bessemer & Lake Erie has ordered 183,000 steel ties.

The Harriman Lines are in the market for 30,000 tons of rails.

OBITUARY NOTICES.

Frank H. Earle, President of the Raritan River Railroad, died of heart disease on November 7 at his home in Newark, N. J. Mr. Earle was 65 years old.

Charles E. Perkins, formerly and for many years President of the Chicago, Burlington & Quincy, died on November 8 at his home at Westwood, Mass.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad conventions and engineering societies, etc., see advertising page 24.)

New England Railroad Club.

At the meeting of this club in Boston, November 12, a paper on the "Trials of a Master Mechanic," by R. H. Rogers, was discussed.

Canadian Society of Civil Engineers.

At a meeting of the Mechanical Section, Thursday, November 14, a paper on "Hydraulic Turbines," by W. Kennedy, Jr., was read by the author.

Western Railway Club.

At the November meeting, which will be held Tuesday, the 19th inst., at 8 p.m., in the Auditorium Hotel, Chicago, a paper entitled "The Influence of Heat Value and Distribution on Railway Fuel Cost" will be presented by J. G. Crawford, Fuel Engineer of the C., B. & Q. Ry.

Car Accountants.

The winter meeting of the Association of Transportation and Car Accounting Officers will be held at the Auditorium Hotel, Chicago, December 10 and 11. There will be reports from the Committees on Car Service and Per Diem, on Office Methods and Accounting, on Railroad Business Mail, on Conducting Freight Transportation, and on Conducting Passenger Transportation.

New York Railroad Club.

At the meeting of this club November 15, a paper on the Brass Foundry, Modern Method of Melting and Handling Metal," by W. S. Quigley, will be presented for discussion.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Astoria & Columbia River.—The office of M. P. Martin, Secretary and Treasurer, has been moved from Tacoma, Wash., to Portland, Ore.

Central of Georgia.—William Nelson Cromwell and J. W. Castles have been elected Directors, succeeding Oakleigh Thorne and Marshall J. Perry, resigned.

The title of W. D. Beymer has been changed from Auditor to Comptroller. His office is at Savannah, Ga.

Chicago & Alton.—The accounting departments of this company and of the Toledo, St. Louis & Western are to be combined, effective December 1. W. D. Tucker, General Auditor of the Toledo, St. Louis & Western, has been appointed General Auditor of both companies, with office at Chicago.

Chicago & Eastern Illinois.—H. J. Cronin, Auditor of Disbursements of the St. Louis & San Francisco, has been appointed Assistant Auditor of the Chicago & Eastern Illinois, with office at Chicago, succeeding John J. Duck.

Chicago, Ziegler & Gulf.—W. B. Clark, Traffic Manager, has been appointed also Auditor, succeeding I. F. Neltz.

Lehigh Valley.—E. A. Albright, Assistant to the President, has been appointed Assistant Secretary, succeeding L. D. Smith, who has succeeded Mr. Albright in his former position.

Louisville & Atlantic.—A. E. Richards, Vice-President and General Counsel, has been elected President, with office at Louisville, Ky. E. M. Wallace, Secretary, has been appointed also General Counsel.

St. Louis & San Francisco.—See Chicago & Eastern Illinois.

Tehuantepec National.—H. O'Connor, Auditor, has resigned.

Toledo, St. Louis & Western.—See Chicago & Alton.

Wabash.—James L. Minnis, General Attorney, has been appointed General Solicitor, with office at St. Louis, Mo., succeeding C. N. Travous, deceased.

Operating Officers.

Alabama Great Southern.—R. E. Boswell, Superintendent, has resigned to go to the Seaboard Air Line.

Beaumont, Sour Lake & Western.—H. Hall, trainmaster of the St. Louis & San Francisco at Chaffee, Mo., has been appointed Superintendent, with office at Beaumont, Tex.

Central Vermont.—W. E. Costello, formerly Superintendent of the Union Pacific at Salt Lake City, Utah, has been appointed Superintendent of the Southern division of the Central Vermont, with office at New London, Conn., succeeding E. D. Nash, resigned to go to another company.

Chicago, Rock Island & Gulf.—H. E. Allen has been appointed Superintendent at Amarillo, Tex.

Chicago, Rock Island & Pacific.—Ariel B. Copley, who was recently appointed Superintendent of the Indian Territory division, is 43 years old, and all his railroad work has been done on the Rock Island. He began in 1881 as a messenger boy. From 1886 to 1893 he was a trainman on the Iowa division, and was then made assistant yardmaster at Des Moines, Iowa. In 1901 he was made general yardmaster of the Des Moines and Valley Junction yards, and two years later was made Trainmaster of the Dakota division. In 1904 he was transferred to the East Iowa division and the next year to the Illinois division. At the end of 1906 he was made Trainmaster of the Colorado division and last spring was appointed Superintendent of the Kansas City terminal division, where he remained until his recent promotion.

Detroit, Toledo & Ironton.—J. M. Jones, chief despatcher at Springfield, Ohio, has been appointed Trainmaster at Napoleon, Ohio, succeeding D. J. Hardy, resigned.

Gila Valley, Globe & Northern.—L. H. Landis has been appointed General Agent at Globe, Ariz.

Gulf Line Railway.—D. L. Turner, Jr., is Superintendent, with office at Sylvester, Ga.

Kansas City Southern.—Frederick B. De Garmo, who was recently appointed Superintendent at Pittsburgh, Kan., was born in Kentucky in 1867. He went to the State Normal School at Warrensburg, Mo., and began railroad work in 1889 as a telegraph operator on the Missouri Pacific. He remained on this road and the St. Louis, Iron Mountain & Southern until 1901, serving as despatcher, chief despatcher, Trainmaster and Superintendent. He then went to the Denver & Rio Grande as Assistant Superintendent and in 1905 was made Trainmaster of the Cincinnati, Hamilton & Dayton. During the present year he went to the Kansas City Southern as Trainmaster at Pittsburgh, Kan., where he remained until promoted to be Superintendent at that place.

Kansas City, Mexico & Orient.—Edward Harrison has been appointed Superintendent of the Montana division, with office at Creel, Chihuahua, Mex.

Louisiana Railway & Navigation.—C. L. Vaughn has been appointed Superintendent of Transportation, with office at Shreveport, La.

Midland Valley.—R. Ward has been appointed Trainmaster, with office at Muskogee, Ind. T., succeeding W. J. Weir.

Missouri, Kansas & Texas of Texas.—C. M. Bryant has been appointed Acting Trainmaster of the Fort Worth and Henrietta divisions and of the Sherman and Cleburne branches, succeeding to the duties of J. E. Farrell, assigned temporarily to other duties. J. R. Shaughnessy has been appointed Acting Trainmaster of the Dallas and Denton divisions and of the Bonham branch, succeeding to the duties of George Stoner, assigned temporarily to other duties.

Missouri Pacific.—R. E. Cahill, Superintendent at McGehee, Ark., has been appointed Assistant Superintendent at Kansas City, Mo., succeeding G. W. Inge, resigned to go to another company. T. M. Wallace succeeds Mr. Cahill. W. S. Coffin, chief despatcher at Wynne, Ark., has been appointed Trainmaster at that place, succeeding T. R. Nash, who takes Mr. Coffin's position.

Northern Pacific.—George Theron Slade, who was recently appointed General Manager of the Lines East of Trout Creek, with office at St. Paul, Minn., was born in New York City in 1871. He graduated from Yale College in 1893 and the same year began railroad work as a clerk on the Great Northern. The next year he spent in the track department and in 1895 was appointed chief clerk to a Superintendent. He was made Assistant Superintendent in 1896 and Superintendent in 1897. Two years later he went to the Erie & Wyoming Valley, now part of the Erie, as General Manager, and in 1901 was made General Superintendent of the Erie division of the Erie. In 1903 he returned to the Great Northern as General Superintendent, where he remained until his recent promotion.

Southern Pacific.—The authority of B. A. Campbell, Trainmaster at Sparks, Nev., has been extended to include the territory heretofore in charge of W. J. Stinson, Trainmaster at Winnemucca, Nev., who has been assigned to other duties. Mr. Campbell's territory now extends from Carlin, Nev., to Sparks, and his headquarters are at Winnemucca.

Union Pacific.—W. A. Worthington, whose appointment as Assistant to the Director of Maintenance and Operation of the Union Pacific and the Southern Pacific was announced last week, has been connected throughout his entire railroad career with the latter company. Starting as stenographer and clerk in the office of the Superintendent at Sacramento, Cal., he shortly afterward was made Secretary to the Engineer of Maintenance of Way at San Francisco and three years later became chief clerk. In 1893 he went to the General Manager's office as statistician, and at the end of two years was promoted to chief clerk. He remained in this position until 1901, when he was made executive secretary to the Assistant to the President. In 1894 he was transferred to Chicago as executive secretary and chief clerk to the Director of Maintenance and Operation of the Union Pacific and the Southern Pacific, from which he was advanced to his present position.

Traffic Officers.

Central Vermont.—J. W. Hanley has been appointed General Passenger Agent, with office at St. Albans, Vt., succeeding J. E. Bentley, assigned to other duties.

New York Central Lines.—Carl Howe, Traffic Manager of the Merchants' Despatch Transportation Company, has been appointed Manager of all New York Central fast freight lines except on the New York, Chicago & St. Louis and the Canada Southern.

Engineering and Rolling Stock Officers.

Ann Arbor.—See Detroit, Toledo & Ironton.

Atlanta, Birmingham & Atlantic.—J. E. Cameron, Superintendent of Motive Power, has resigned and the office has been abolished. R. L. Doolittle, Assistant Master Mechanic of the Cen-

tral of Georgia at Macon, Ga., has been appointed Master Mechanic of the Atlanta, Birmingham & Atlantic, with office at Fitzgerald, Ga.

Baltimore & Ohio.—W. I. Rowland, general foreman locomotive department at Grafton, W. Va., has been appointed Master Mechanic at that place, succeeding O. J. Kelly, resigned.

Central of Georgia.—See Atlanta, Birmingham & Atlantic.

Chicago & North-Western.—W. H. Hufman, Master Mechanic at Baraboo, Wis., has retired after 50 years of service on the road.

Detroit River Tunnel.—W. J. Wilgus, formerly Vice-President of the New York Central & Hudson River, has been appointed Consulting Engineer of the Detroit River Tunnel. The peculiar and entirely novel method of construction of this tunnel was designed by Mr. Wilgus and its contract cost is only one-half the amount bid by Sir Weetman Pearson's firm, who are contractors for the Pennsylvania tunnel under the East river, New York City. It is probable that Mr. Wilgus will also act for the New York Central in the construction of the Buffalo union terminal.

Detroit, Toledo & Ironton.—R. Tawse is Superintendent of Motive Power of this road and of the Ann Arbor, with office at Jackson, Ohio.

Georgia Southern & Florida.—W. C. Shaw, Jr., has been appointed Chief Engineer, with office at Macon, Ga., succeeding G. B. Herrington, resigned.

Grand Trunk.—M. Stansfeld Blaiklock, who was recently appointed Engineer of Maintenance of Way, with office at Montreal, Que., was born in Quebec in 1859. He was educated by private tuition under engineers and architects and began railroad work in 1880 as Assistant Engineer on the St. Clair tunnel construction and two years later was made Inspector of Transportation. In 1897 he was appointed Resident Engineer of the Eastern division. Five years later he was appointed Superintendent of that division, where he remained until his recent promotion.

M. S. Blaiklock.

Midland Valley.—James Carr has been appointed Master Mechanic, with office at Muskogee, Ind. T., succeeding C. H. Welch.

New Orleans Great Northern.—J. F. Coleman, Chief Engineer, has resigned, effective January 1, to become a Consulting Engineer.

New York Central Lines.—See Detroit River Tunnel.

Wisconsin & Michigan.—B. W. Hicks has been appointed Chief Engineer, with office at Peshtigo, Mich.

Purchasing Agents.

Lehigh & New England.—J. B. Whitehead has been appointed Purchasing Agent, with office at Philadelphia, Pa.

LOCOMOTIVE BUILDING.

The Pittsburgh, Shawmut & Northern is said to have ordered 10 freight locomotives and two passenger locomotives.

The Maine Central did not recently order 10 locomotives from the Baldwin Locomotive Works, as reported in the *Railroad Gazette* of November 8.

The Southern denies that it has ordered recently 25 locomotives from the Baldwin Locomotive Works, as reported in the *Railroad Gazette* of November 8.

The Topeka-Southwestern will soon ask for bids on locomotives. Contracts have been let for building the road. W. L. Taylor, Topeka, Kan., is President.

The Pennsylvania has ordered 25 simple, class H6B, consolidation locomotives from the Baldwin Locomotive Works for December, 1907, delivery. These locomotives will be equipped with Walschaert valve gear. The specifications are as follows:

General Dimensions.

Type of locomotive	Consolidation
Weight, total, in working order	204,470 lbs.
Weight on drivers	181,170 "
Diameter of drivers	56 in.
Cylinders	22 in. x 28 in.
Boiler, type	Belpaire, wide firebox
" working steam pressure	205 lbs.
" number of tubes	373
" diameter of tubes	2 in.
" length of tubes	164¼ "
Firebox, length	107 "
" width	66 "
" grate area	49.11 sq. ft.
Heating surface, total	2,842.4 "
Tank capacity	7,000 gals.
Coal capacity	27,000 lbs.

John Marsch, Cleveland, Ohio, has ordered six (0-4-0) switching locomotives from the Davenport Locomotive Works for January, 1908, delivery.

General Dimensions.

Type of locomotive	Switching, four-wheel
Weight, total	60,000 lbs.
Cylinders	15 in. x 20 in.
Diameter of drivers	44 in.
Boiler, diameter	42¾ "
" material	Worth steel
" number of tubes	160
" material of tubes	Detroit seamless
" diameter of tubes	2 in.
" length of tubes	10 ft.
Firebox, length	60 in.
" width	34 "
" material	Worth steel
Tender	Sloping type
Tank capacity	2,800 gals.
Coal capacity	3½ tons

Special Equipment.

Air brakes	Westinghouse
Holsters	Bettendorf
Couplers	Washburn
Injectors	Ohio
Lubricators	Chicago
Metallic packing	Jerome
Springs	Pittsburg Spring & Steel Co.
Tender trucks	Bettendorf
Tires	Midvale

CAR BUILDING.

The Grand Trunk is said to be building four dining cars at its own shops.

The Virginian Railway is preparing specifications on 100 or more coal cars.

The Metropolitan Street Railway, Kansas City, Mo., has ordered 25 city cars from the St. Louis Car Co.

The Chicago & North-Western has asked bids on 1,000 steel ore cars of 100,000 lbs. capacity, the purchase of which has been postponed.

The Atlantic & Western denies that it has ordered 60 box cars from the Lenoir Car Company, as reported in the *Railroad Gazette* of November 8.

The Topeka-Southwestern will soon ask for bids on cars. Contracts have been let for building the road. W. L. Taylor, Topeka, Kan., is President.

The Missouri, Kansas & Texas is said to have canceled contracts for 500 of the 2,000 box cars ordered from the American Car & Foundry Co. last spring.

RAILROAD STRUCTURES.

Cleveland, Ohio.—The Cleveland Electric Railway is said to have agreed to construct subways at the public square and to build a high level bridge over the Cuyahoga flats.

Denver, Colo.—A final conference is soon to be held between the city authorities and the representatives of the railroads regarding plans for the Nineteenth street viaduct, which has been under construction for a number of years. The cost is to be divided among a number of railroads.

East Stroudsburg, Pa.—The Delaware, Lackawanna & Western, it is said, will put up a passenger station here 175 ft. long with a 150-ft. platform extension to replace the present structure. The cost will be about $60,000.

Hagerstown, Md.—The Western Maryland shops at this place have been opened for operation. The locomotive and machine shop building is of brick 150 ft. x 300 ft.

Norfolk, Va.—The Virginian Railway is building a coal pier at Sewells Point. It is to be 1,000 ft. long and 65 ft. wide. It will be 69 ft. high at the outer end and 75 ft. high at the inner end. The sub-structure is to be concrete, on piling. The steel superstructure will be 1,045 ft. long between the bulkhead and pierhead. There will be three tracks on the pier and 31 chutes with pockets of 60 tons capacity.

ROCHESTER, N. Y.—Contract is reported let to J. W. Dwyer, of Buffalo, at $100,000, for constructing a subway under the New York Central tracks at Culver road.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

ALABAMA & NORTHWESTERN.—Rights-of-way, it is said, are now being secured by this company for its proposed line from Gadsden, Ala., northwest to Tuscumbia, 120 miles. S. E. Gardner, President, Landersville; J. B. Sherrill, Chief Engineer, Falkville.

AMERICAN RAILROAD OF PORTO RICO.—This company, which early this year finished its line from the western end of the line on the north coast at Camuy west and thence south to Aguadilla, 27 miles to a connection with the line south along the west coast, is now running trains through from San Juan to Ponce. (April 12, p. 531.)

CANADIAN PACIFIC.—On the Central division a new route has been opened from Molson, Man., west via Hazel Ridge to Whittier Junction, 36.7 miles. Trains between Fort William, Kenora and Winnipeg are now run over the new line.

An extension has been opened on the Pheasant Hills branch from Strassburg, Assn., west to Nokomis, 31.2 miles.

CATAWBA VALLEY.—See Seaboard Air Line.

CENTRALIA EASTERN.—Bids, it is said, are being asked for by a company under this name to grade its proposed line in the state of Washington from the coal mines of the Mendota Coal & Coke Company to the Northern Pacific, near Centralia, about 10 miles.

CENTRAL OF OREGON.—This company is building from Union, Ore., northwest to La Grande, 45 miles. It has opened the road for business from Union Junction to Valley Junction, 1.5 miles, and from Valley Junction to Cove, 10.5 miles. (March 29, p. 467.)

CENTRAL ONTARIO RAILWAY.—Bids are wanted by this company December 2, at Trenton, Ont., for clearing, grading, track laying, ballasting and other work on its extension between Lake St. Peter and Whitney, about 18 miles. The road is now in operation from Picton, Ont., north to Bancroft, 116 miles, from which point an extension is being built north to Whitney, 43 miles. Contracts for some of this work have been let to William G. Gibson, of Port Hope, Ont. Grading work has been finished on 14½ miles and track laid on four miles. (March 15, p. 395.)

CHICAGO, BURLINGTON & QUINCY.—An ordinance, it is said, will be passed by the Hannibal (Mo.) city authorities, granting permission to this company to lay a double-track line along the river front. The company is to reconstruct and extend its yards at this place, and a union passenger station may also be put up.

CHICAGO, ROCK ISLAND & PACIFIC.—This company, it is said, has work under way at El Reno, Okla., involving the handling of 500,000 cubic yards of earth raising the grades from 3 ft. to 7 ft. on a plot of ground 600 ft. x 7,000 ft. as a site for freight yards. There are to be 24 freight tracks each 7,000 ft. long.

CHICAGO, ST. PAUL, MINNEAPOLIS & OMAHA.—The extension of the Nebraska division from Newcastle, Neb., to Wynot, 18.3 miles, was opened for traffic on October 28. (Sept. 27, p. 370.)

COPPER RIVER & NORTHWESTERN.—Contracts are reported let by this company to M. J. Heney for some of the work on its proposed line from Cordova, Alaska, north to the Copper river, thence along that river. It is said the company will spend $25,000,000 in building the line and adding a large smelter at tidewater. (April 26, p. 599.)

DALLAS INTERURBAN (ELECTRIC).—This company, it is said, will soon start work on its proposed electric line from Dallas, Tex., east via Mesquite and Forney to Terrell, 30 miles. The company also proposes to build a line from Dallas south to Waxahachie, 30 miles. D. E. Waggoner is President. (Oct. 25, p. 509.)

GREAT NORTHERN.—It is announced that the Spokane Falls & Northern, building in the United States under the name of the Washington & Great Northern, has been opened for freight traffic to a point north of Chopaka, Wash., and across the international boundary into Canada, where the line is being built under the name of the Vancouver, Victoria & Eastern to Keremeos, B. C., 15 miles north of its junction with the Washington & Great Northern, and 122 miles west of Grand Forks, B. C. The line is eventually to be extended west to Vancouver and east to Winnipeg. Contracts let from Keremeos northwest to Princeton, 45 miles.

GREENVILLE & KNOXVILLE.—This road has been extended from Travelers Rest, S. C., north to Marietta, six miles. (Sept. 6, p. 277.)

JEFFERSON CITY, ALBUQUERQUE & SAN DIEGO VALLEY.—Incorporated in Oklahoma with $7,000,000 capital and office at Carthage, Mo. The company proposes to build a line from Jefferson City, Mo., southwest through Missouri, Kansas, Oklahoma, New Mexico and Arizona to San Diego, Cal., 1,600 miles. The incorporators include: J. H. Langston, J. H. Harris and O. S. J. Guymon, of Carthage; C. R. Wright, Liberal, Kan., and W. F. Burt, Wichita, Kan.

LIMA & TOLEDO TRACTION.—This company building an extension from Lima, Ohio, north to Toledo, 40 miles, has grading about finished and track laid on 32 miles. It is said that work is to be suspended with the exception of finishing the reinforced concrete bridge over the Maumee river at Waterville, until next spring, when the line is to be finished to Toledo. (March 15, p. 361.)

MEXICAN CENTRAL.—This company, it is said, has adopted plans for extensive terminals at the new port of Arina, nine miles north of Tampico.

MEXICO, SANTA FE & PERRY TRACTION.—Work is reported under way and contract let to J. M. Wolf, of Collinsville, Ill., for building this proposed electric line from Mexico, Mo., northeast via Molino and Santa Fe to Perry, 27 miles. S. L. Robinson, President, Mexico, and C. O. Thon, Chief Engineer, Belleville. (May 24, p. 727.)

MISSOURI ROADS (ELECTRIC).—The Chippewa Valley Construction Co., of Ashland, Wis., will, it is said, build next spring an interurban electric line from Ashland north to Washburn, ten miles. About one-third of the right-of-way has been secured.

MORGAN'S LOUISIANA & TEXAS.—See Southern Pacific.

NORFOLK & SOUTHERN.—The Raleigh division of this road has been extended from Zebulan, N. C., east to Farmville, 48 miles. This entire division is now finished and open for traffic from Raleigh, N. C., east to Washington, 105.3 miles. (July 19, p. 83.)

NORFOLK & WESTERN.—On the Radford division, the Speedwell branch has been extended from Cripple Creek, Va., west to Speedwell, seven miles.

The Dry Fork branch on the Pocahontas division has been extended from Berwind, W. Va., southeast to Canebreak, 2.3 miles. (Sept. 20, p. 339.)

NORTHERN PACIFIC.—President H. Elliott, of this company, is quoted as saying that in Washington and Montana construction work is to be continued; but in Wisconsin and Minnesota the forces will be reduced.

OREGON & WASHINGTON.—See Oregon Railroad & Navigation Company.

OREGON RAILROAD & NAVIGATION COMPANY.—Bids are reported asked for this week for work on the Oregon & Washington between Portland, Ore., and Seattle. The work includes many trestles and bridges and a long tunnel. (July 19, p. 83.)

OREGON TRUNK LINE.—Preliminary surveys, it is said, are being made by this company for its proposed line from The Dalles, Ore., south through the canyon of the Deschutes river, about 125 miles. Work on the line is to be begun early next year. W. S. Nelson, President, and F. S. Gordon, Chief Engineer, Seattle, Wash. (Aug. 9, p. 164.)

PITTSBURGH RAILWAYS COMPANY (ELECTRIC).—Work has been resumed on the Canonsburg branch of this road. It was stopped some months ago because of difficulties in securing the right-of-way. It is from Finleyville, Pa., on the Charleroi division, west to Canonsburg, about 12 miles, to a connection with the company's line running south from that place to Washington. Almost all of the line will be over a private right-of-way, and the company plans to run express trains from Pittsburgh to Washington, whence connection may be made with an electric line now partly built to Wheeling, W. Va. The company is also considering the double-tracking of the entire Charleroi division. The line has double-track bridges and all of the cuts and fills are wide enough for second track. During the year the company has lengthened many of the sidings on this division.

PLANT CITY, ARCADIA & GULF.—See Seaboard Air Line.

QUEBEC & LAKE ST. JOHN.—The branch from La Tuque Junction, Que., west to La Tuque, 38.6 miles, has been opened for business. (Oct. 11, p. 435.)

A new line called the Gosford branch has been opened for business from Valcartire Junction, Que., (formerly Valcartire) northwest to Clarks, 5.5 miles.

RED RIVER (ELECTRIC).—Incorporated in Oklahoma with $5,000,000 capital, and offices at Oklahoma City and at Durant, the company proposes to build an electric line from a point in Oklahoma at the Texas-Oklahoma state line north of Bonham, Texas, northwest to Oklahoma City, about 200 miles. The incorporators include: E. M. Abernathy, S. C. Hawk and F. J. Hawk, of Lexington; D. F. Robertson, of Atoka; F. P. Kibbey, of Byers; J. W. Hocker, of Purcell; A. Rennie, of Pauls Valley, and T. H. Bayless, of Durant.

ROBERT LEE & FORT CHADBOURNE.—Grading work is reported under way by E. Hunter, of Robert Lee, who has the contract for 30 miles of this proposed line from Robert Lee, in Coke county, Tex.,

northeast towards Fort Chadbourne. The line is projected east to Winter, about 50 miles. J. H. Spencer, President, and S. J. Bross, Chief Engineer, Robert Lee. (Sept. 27, p. 371.)

Seaboard Air Line.—A new line, the Catawba Valley, has been opened for business from Spence, S. C., south to Great Falls, 21 miles.

The Plant City, Arcadia & Gulf has been opened for business from Plant City, Fla., south to Nichols, 16 miles.

Southern Pacific.—Tracklaying has begun on the extension of Morgan's Louisiana & Texas from Lafayette, La., which is 145 miles west of New Orleans, east to the west bank of the Mississippi river opposite Baton Rouge, 53 miles. By cutting out the long detour southward to New Orleans this line saves 180 miles on through shipments. The most difficult part of the work was over the Atchafalaya swamp, where it was necessary to construct 12 miles of trestles. This will be filled in as soon as rails are laid to the eastern boundary of the swamp. The Atchafalaya river is crossed by a 450-ft. truss bridge. From Lafayette the extension passes through the Anse La Butte oil country and the Grand Point Prairie, a fertile cotton section. Between the swamp section and the Mississippi the line traverses about eight miles of valuable hard timber land. At the river there will be a passenger and freight ferry to Baton Rouge. (Jan. 7, p. 819.)

Spokane Falls & Great Northern.—See Great Northern.

Texas Roads.—It is said that preliminary plans are being made by residents of Denton, Tex., and Krum to build a line to connect these two places, which are five miles apart. C. B. Duffy, of Boston, Tex., is said to be the principal promoter.

Texas Roads (Electric).—Residents of Greenville, Wolfe City and Bonham are organizing to build an electric line to connect these places. The length would be about 35 miles. J. C. Russell, of Bonham; J. H. Blocker, of Wolfe City; J. T. Jones, G. H. Collins and Y. O. McAdams, of Greenville, are interested.

Tonopah & Tidewater.—This road is now in operation from Ludlow, Cal., north to Leeland, Nev., 144 miles; also from Death Valley Junction, Cal., west to Lila C. It is reported that regular freight service is to be extended north to Beatty, Nev., and to Rhyolite November 25, and passenger service is to be started about December 1. (Sept. 6, p. 278.)

Tulsa-Sapulpa Interurban.—Residents of Tulsa, Okla., have applied for authority to build this line from Sapulpa northeast to Tulsa, 20 miles, with a connection to the Glenn oil fields. They propose to begin work at once and expect ultimately to extend the line east through Broken Arrow to Muskogee.

Union Pacific.—At the offices of this company in Omaha, Neb., the report that construction work on this system has been abandoned is denied. Vice-President A. L. Mohler is quoted as saying that there is much unnecessary sensation over the reduction in track forces which always takes place at this season of the year on account of the shorter hours and cold weather. "We have been making a large amount of improvements and have put our property in the best physical condition it has ever known, and the opportunity for reducing forces earlier than usual has been acted upon. We are continuing all improvement work which can be done to advantage and which we can utilize. Work which cannot be carried on at normal expense will be discontinued."

Vancouver, Victoria & Eastern.—See Great Northern.

Washington & Great Northern.—See Great Northern.

West Texas & Northern.—This company, which has projected a line from Stanton, Tex., north to Hereford, 225 miles, is said to have given contracts for building the first 75 miles from Stanton north to Tahoka. S. G. Bon Durant, of New York, is said to be promoting this project.

Woodstock, Marengo, Genoa & Sycamore (Electric).—Incorporated in Illinois with $25,000 capital and office at Chicago, the company proposes to build an electric line from Woodstock, Ill., southwest through McHenry and De Kalb counties to Sycamore, 30 miles. The incorporators include: C. A. Spenney, M. W. Powell, E. B. Horang and H. S. Hedberg.

RAILROAD CORPORATION NEWS.

Chicago Junction.—See Indiana Harbor Belt.

Connecticut Railway & Lighting Company.—See New York, New Haven & Hartford.

Consolidated Railway.—See New York, New Haven & Hartford.

Denver & Intermountain.—See Intermountain Railway.

Hocking Valley.—See Kanawha & Michigan.

Illinois Central.—Arguments are to be heard on November 25 on the question of the voting of 5,500 shares of Illinois Central stock held by the Mutual Life Insurance Company, New York. These shares are among those whose voting rights were enjoined just before the annual meeting last month.

President Harahan has sent to stockholders a circular letter, in which he answers criticisms which have been made of the management. In reference to Stuyvesant Fish's statement that exclusive traffic alliances with east and west connecting roads are undesirable, President Harahan says that the Union Pacific and the Southern Pacific have, during the past six years, delivered to the Illinois Central 46 per cent. more tonnage than they received from it; that these two roads are the only lines of those connecting with the Illinois Central which do not own eastern outlets, and that the Illinois Central has to compete with other eastern roads for this Union Pacific and Southern Pacific traffic.

Indiana Harbor Belt.—This company has made a mortgage to the Guarantee Trust Company, New York, as trustee, securing an issne of $25,000,000 50-year 5 per cent. general mortgage bonds. It is understood that plans are under way for making the Indiana Harbor Belt the owner of all New York Central terminals in and near Chicago. It is said to have bought the Chicago Junction Railway's belt line around Chicago from Whiting, Ind., to Franklin Park, Ill., 27 miles. This does not include the branch from Chappell, Ill., to the union stock yards. An option of the property was taken by New York Central interests last Jnne. (June 28, p. 949.)

Intermountain Railway.—This company has been incorporated, with $1,000,000 capital stock to take over the Denver & Intermountain and electrify it from Barnum, Colo., to Golden, seven miles. The five miles of road from Denver to Barnum are already operated hy electricity.

Kanawha & Michigan.—It is said that arrangements have been made for issuing $2,000,000 of the $2,500,000 second mortgage, 20-year 5 per cent. bonds authorized last Jnne. Part of the proceeds are to be used to pay off $1,800,000 floating debt, of which $1,600,000 is due the Hocking Valley and $200,000 due to the Toledo & Ohio Central.

New England Investment & Security Co.—See New York, New Haven & Hartford.

New York, New Haven & Hartford.—The Directors have decided to issue about $40,000,000 6 per cent. convertible 50-year debenture bonds instead of new capital stock. The debentures will be convertible into stock after January 15, 1923, at the rate of one share of stock for each $100 face value in debentures. The debentures are to be offered to stockholders of record December 2, 1907, for snbscription at par up to January 15, 1908, at the rate of $100 in debentures for every three shares of stock already held. The subscriptions are payable in four instalments, falling due January 15, 1908, and at six months intervals thereafter. The proceeds of the debentures, it is understood, will pay for improvements amounting to $17,000,000 and $21,000,000 worth of new equipment. (Nov. 8, p. 574.)

The regular quarterly dividends of 1 per cent. on the $8,142,900 4 per cent. cumulative preferred stock, 1 per cent. on the assenting common stock and 0.15 per cent. on the non-assenting common stock of the Connecticut Railway & Lighting Co. have been declared. The company was leased in August, 1906, to the Consolidated Railway, which has since been merged with the New York, New Haven & Hartford. The majority of the common stockholders agreed to pay the Colonial Trust Company, as Trustee, $10 a share on their stock, which amount, with the rental received under the lease, provides a fund for dividend payments on both common and preferred stock.

President Mellen has retired from the Presidency of the Springfield (Mass.) Street Railway, and it is said that he will also resign from offices in other electric railway companies in Massachusetts which are controlled by the New England Investment & Security Co., a subsidiary of the New York, New Haven & Hartford.

North American Company.—The directors have announced that payment of the usual quarterly dividend of 1 per cent. on the $29,791,300 capital stock will be postponed. The company controls street railways and other electric properties in and near St. Louis, Mo.; Milwaukee, Wis.; Cincinnati, Ohio; Detroit, Mich., and other cities. It has made loans amounting to over $3,600,000 to subsidiary companies for improvements and extensions, and these companies cannot repay these loans without selling at large sacrifice their own mortgage bonds; therefore, the North American Company is for the present short of ready money.

Southern.—This company has asked the New York Stock Exchange to list $1,964,000 additional first consolidated 5 per cent. bonds and $300,000 additional Memphis division first mortgage 5 per cent. bonds, making the total amounts listed $50,101,000 consolidated and $6,883,000 Memphis division bonds.

Toledo & Ohio Central.—See Kanawha & Michigan.

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS.

THE BRITISH AND EASTERN CONTINENTS edition of the Railroad Gazette is published each Friday at Queen Anne's Chambers, Westminster, London. It contains selected reading pages from the Railroad Gazette, together with additional British and foreign matter, and is issued under the name Railway Gazette.

CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.

ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

OFFICERS.—In accordance with the law of the state of New York, the following announcement is made of the office of publication, at 83 Fulton St., New York, N. Y., and the names of the officers and editors of The Railroad Gazette:

OFFICERS.

W. H. BOARDMAN, *Prest. and Editor*
E. A. S[illegible], *Vice-President*
RAY M[illegible], *Secretary*
R. S. CHI[illegible], *Treas.*
I. B. RI[illegible], *Cashier*
L. B. SHERMAN, *Western Manager*

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RAY MORRIS, *Man'g Editor*
BRAMAN B. ADAMS
CHARLES H. FRY
RODNEY HITT
G[illegible] L. FOWLER
FRANK W. K[illegible]
HUGH RANKIN
[illegible] BOARDMAN

CONTENTS

VOL. XLIII., NO. 21. FRIDAY, NOVEMBER 22, 1907.

At a conference held in Chicago Wednesday representing 37 roads and over 1,000,000 cars a resolution was adopted approving rules providing that when a car is received from its owner in switching service, it is not to be moved out of the switching district, and must be returned to its owner. The penalty for violation was fixed at five dollars, but it was further provided that the agreement should be obligatory only at points where all roads agree and that it could be put in effect at any point where a number of roads centered. The roads opposed were those objecting to the old diversion agreement, chiefly the New York Central lines and the Southern, making practically a Chicago road agreement.

Further discussion of one highly important but still unsettled rail specification appears elsewhere in the correspondence column. The writer is a railroad officer to whom high credit is due, not only for assembling and presenting the dangerous and costly results of using bad rails, but also for recognizing that railroads separately negotiating with the makers can only in individual cases get a better product. He is a sturdy advocate of requiring a fixed percentage of discard from the top of the ingot, pending a possible improvement in the homogeneity of the ingot and has a common-sense notion that discard, based on present practice, will hasten rather than hinder the improvement of the ingot, and that the arbitrary percentage may be relaxed as progress is made.

The annual reports for the year ended June 30, 1907, of the three Hill railroads—the Great Northern, the Northern Pacific, and the Chicago, Burlington & Quincy, which last year together operated an average mileage of 20,548 miles—are reviewed in this issue of the *Railroad Gazette*. The map published with these reports is drawn from the latest official one, and is a striking picture of the territorial extent of the Hill system. In earnings, the three railroads together have now for the first time passed 200 millions. Their gross earnings last year were $208,000,000. This year the tremendous growth of the Northwest affected the Great Northern and the Northern Pacific in a new way. The 1906 year was a high record one not only in gross but in net earnings and profits after all charges. In the 1907 year the increases in gross earnings continued but the business was handled at a rapidly decreasing margin of profit, so that net earnings of the Northern Pacific were little larger than in 1906 and on the Great Northern were smaller by nearly $3,000,000 than in the previous year. Both roads have reached the point where large expenditures must be made on double tracking, cutting down grades and reducing curves in order to maintain the same proportion of profit from operation which has been received in the past. Fortunately for their stockholders, they are both supplied with funds with which to carry out these vitally necessary improvements, through the new stock issues of $60,000,000 for the Great Northern and of $93,000,000 for the Northern Pacific, subscribed for by the stockholders early in the year. If any more traffic is to be poured over these lines—and the Northwest is slow to admit that it will long suffer from industrial depression—these sums in full will be needed to fit the roads for the task which lies before them. The case of the Burlington is different. During the past six years it has been built up out of earnings to a remarkable degree, while there has been an equally remarkable development of operating efficiency. A granger road with a vast branch-line mileage, it spent nearly $1,600 a mile last year on maintenance of way, while the Chicago & North-Western and the Chicago, Milwaukee & St. Paul, which are comparable, spent from $400 to $750 less. Meanwhile its gross earnings have risen from $53,800,000 in 1907 to $82,500,000 last year. Few roads are in so strong a position as the Burlington to meet industrial depression, yet 20 or even 10 years ago few roads were so vulnerable. The showing of these three great railroads is in itself the best of proof of the past wisdom and present foresight of that great railroad manager, James J. Hill.

According to the old theory of the duties of a State Railroad Commission, the most useful function of such a body is that of an illuminator; not exactly a publicity bureau, for the matters with which it deals are in many cases accessible to the public already; but an instrumentality to make the public see things which people lack the discernment to pick out for themselves. It is encouraging to see evidence that this old theory is still alive and in the hands of competent men, who try to throw light into fields where it is needed rather than on things which mostly please the galleries. Mr. Clark, of the Interstate Commerce Commission, set a good example in this line when he told an Ohio road how to distribute coal cars to the mines. We do not know that the plan which he laid down was exactly right; possibly a year's trial may be necessary to justify any plan of that kind; but it is good to have that troublesome subject brought out into the light, so that everybody can have authoritative knowledge concerning it. In a matter which, like the distribution of cars when cars are scarce, the railroad manager cannot possibly handle to the satisfaction of everybody, managers ought to be glad to let the government step in. The Indiana commission

has adopted Mr. Clark's rule, in substance, for one road in that state. The commissioners may not have a pleasant task in justifying their rule, if shippers who are short of cars make complaint, but it ought to be much pleasanter for them than for the railroad manager, for they are looked upon as the avowed friends of all shippers. The demand for a uniform classification of freight is another matter which a commission can deal with much better than can railroad managers. If, as all experts have long believed, the scheme is unworkable, it is highly desirable that a government body declare the fact. If, on the other hand, the thing can be accomplished, it will be only by arbitrary raising or lowering of a great many rates; and only a governmental body, with its unparalleled inertia to resist disturbers, should take such arbitrary action. We do not say that the government ought to decree uniformity, but it is quite plain that the railroads ought not to. The only way to do it is by leveling down or leveling up; but the first would be unjust to the railroads and the second would be intolerable to the shippers.

The Albany Commission—New York State Public Service Commission, Second District, is an intolerably long name—has announced plans for desirable publicity in three important matters—freight movement (embargoes and car shortage), passenger movement (in one feature, engine failures), and permanent improvements. The public is entitled to accurate knowledge on these matters, but has to put up with what the newspapers can get. Usually the reader gets fragmentary material prepared by poorly qualified reporters. Embargoes have lately had to be declared against apples and vegetables at Pittsburgh and Cleveland, against grain at Buffalo and Galveston, and on various commodities at several other places. An embargo has great possibilities of injustice, and a statement of the facts in any given case from an impartial state authority ought to be a benefit to the railroads. The New York Board's call for records of engine failures is significant mainly because the Board has engaged an experienced locomotive superintendent to receive and digest the reports, instead of entrusting the matter to an amateur, as has been done with many subjects in many states. Indeed, this last is an essential feature in all these publicity movements. A competent editor is an important man in a state commission. It is the disposition, already shown at Albany, to fairly use and temperately set forth the facts gathered from the railroads, which gives to the Commission's action such a hopeful look. To digest the reports of permanent improvements which the railroads have made will perhaps be the most difficult task of all, and show the quality of the Commission in this respect. The large railroads have spent enormous sums of money and probably without exception have aimed to use their resources for the best interest of the public. If the Commission finds this to be the fact it will, of course, put its finding on record, while at the same time it is bound to report cases of money ill-spent and also those where the public really needs more than a railroad can or will furnish. In contrast with the sane acts of the New York Commission, the reader will be interested in an order recently issued by the Railroad Commission of Missouri, which had to be suspended before it went into effect. According to a St. Louis paper "the Board on November 12 decided to suspend the greatly reduced rates on coal, which had been ordered to go into effect November 15, because their enforcement would have resulted in closing many of the coal mines in Missouri, throwing thousands of miners out of employment and affecting some of the manufacturers who have cheap rates on coal for industrial purposes. The coal operators informed the Commission that operators in Iowa and Illinois could ship their coal to St. Louis and Hannibal and reconsign from those points and thus take advantage of the low rates in Missouri. Coal may be mined so cheaply in Illinois and Iowa, as compared with the cost of mining in Missouri, that such a reduction in rates would make the Illinois and Iowa operators dangerous competitors in the Missouri market."

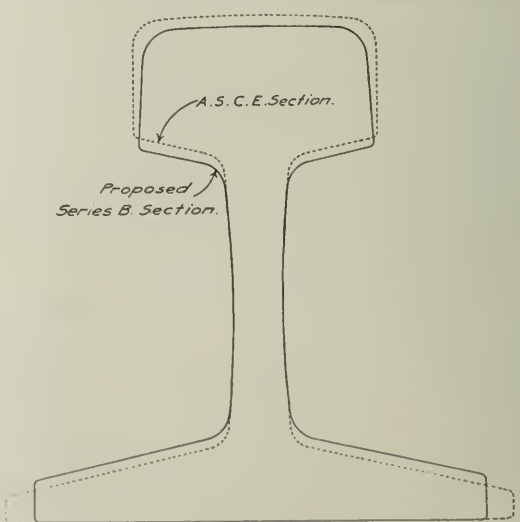
SETTLEMENT OF THREATENED BRITISH STRIKE.

On November 6, a King's messenger traveled by special train and motor to Sandringham to tell His Majesty that the railroad crisis was at an end. The happy result is due in the first place to the skill and efforts of the President of the Board of Trade, but that his efforts were so rapidly brought to a satisfactory conclusion is doubtless the result of the firm attitude maintained by the companies up to the very last, on the question of recognition. While willing to make every concession in the interests of industrial peace which their duty to their shareholders justified, they refused to the last to allow the interference in management which this would inevitably have entailed. The solution now reached does not include recognition of the unions, and, in consequence, does not meet with any warm welcome from the other trade unions in the country. For while in the agreement recently made with the Amalgamated Engineers' Society any employee had the option of going straight to his union, the railroad employee now can only take the matter to the Conciliation Board after it has been put before his employers.

But although the companies were unable to accede to the request of the unions for recognition, they have shown themselves quite ready to modify the present system for the removal of disputes, and to extend the means for bringing about the peaceful settlement of questions relating to hours and wages, to the consideration of which, it will be noted, the Conciliation Boards are limited by the agreement. Briefly, the arrangement arrived at is this. Boards are to be appointed for each railroad company to deal with questions of hours or wages referred to them by employers or employed, after such questions have failed to be settled by the means at present in vogue. The union officials, as such, have no *locus standi* in the earlier stages of the dispute. If, however, they are employees, they may of course be elected members of the conciliation boards, or they may appear before them to represent the men before the boards, for neither solicitors nor barristers will, wisely we think, be allowed to appear. The various grades and the various districts will be separately dealt with, the boards will have two chairmen elected by the two sides, and the two sides will vote separately and subsequently agree. Nominations for the boards are to be submitted to and approved by the Board of Trade. The term of each board will be three years, but the present agreement is to last seven years. In the event of either masters or men failing to accept the decision of the board, the matter may, on the motion of either party, be referred to a Central Conciliation Board. Failing agreement again, the matter goes to arbitration. As the law now stands, there is nothing of course to compel the union to abide by the decision of the arbitrator. But in Great Britain public opinion would be a weighty factor in the matter, and in any case legislation making the arbitrator's award compulsory, could and probably would, if necessary, be resorted to.

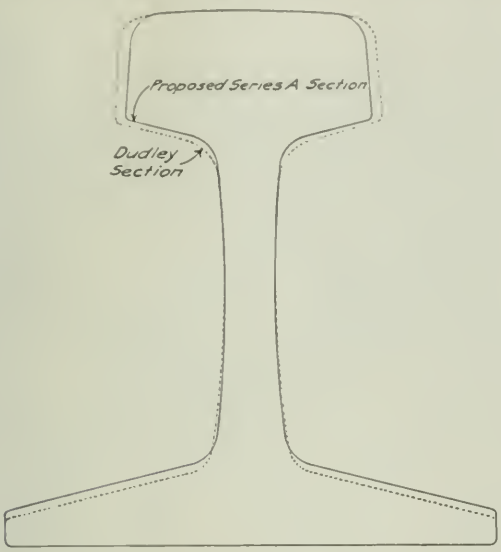
TWO TYPES OF RAIL SECTIONS.

The two types of rail sections proposed by the Rail Committee of the American Railway Association represent two different ideas in rail design, while at the same time both approximate the requirement that the metal be equally distributed in the head and base. The origin of the two sections is not hard to trace. Series A is a modification of the Dudley section used on the New York Central,



and Series B is a redesigned A. S. C. E. standard section. In the accompanying engravings the original and modified sections have been superimposed on each other to show geographically the changes proposed. In the Series A section metal has been taken from the sides and bottom of the head of the Dudley section and added to the

top of the base. The web has been thickened $\frac{1}{16}$ in., but otherwise no change has been made. P. H. Dudley has long been an advocate of a rail section designed as a stiff girder, and approximately the same vertical strength has been retained in the Series A section with some sacrifice in the amount of metal which can be worn off of the head. The Series B section has a slightly better distribution of metal than the Series A section. It meets the requirements where the wear of metal in the rail head is a matter of more serious consideration than additional strength as a beam. No sacrifice in the depth of the head has been made over the A. S. C. E. section, and only a small decrease has been made in the width of the head. Such metal as has been taken from the head has been added to the thickness of the base, which is also increased by reducing the width of the base from 5⅜ in. to 5¼ in. in the 100-lb. section. The stiffness has been reduced also from a moment of inertia of 44.4 to a moment of 41.3, or 7 per cent. The relative distribution of metal and moment of inertia of 100-lb. rails of the four sections is given in the following table:



	Distribution of metal in per cent.			Moment of inertia of 100-lb. section.
	Head.	Web.	Base.	
Am. Railway Assoc., Series A.....	36.9	23.4	39.7	48.94
P. H. Dudley—N. Y. Central lines...	40.8	23.5	35.7	48.5
Am. Railway Assoc., Series B.....	40.2	19.2	40.6	41.3
Am. Society of Civil Engineers	42.0	21.0	37.0	44.4

The superimposed outlines of 100-lb. sections are shown here simply to indicate the changes graphically. In other pages are shown the proposed sections and data for rails of different weights.

SMOKE ABATEMENT ON RAILROADS

Nowadays it is generally admitted that the smoke from soft coal in thickly settled districts is a decided nuisance, and an unnecessary nuisance at that. Attention has been directed to the large stacks of power plants and factories and the unpleasant effects of the volumes of smoke and soot which pour from them and over the surrounding country.

In many localities the smoke from locomotive engines is more annoying than that from stationary plants. The constant passing to and fro of the locomotives distributes the smoke over a large area and the low level of the stacks causes most of the smoke to linger near the ground. In the neighborhood of union stations and of railroad yards in our large cities this is especially noticeable. The southern part of Chicago, the lake front in Cleveland and the neighborhood of the university in Philadelphia are striking examples.

The conditions on a locomotive are particularly trying, and there are many difficulties which are absent in the stationary plant. The engineer in the latter usually grumbles if the load varies 25 or 50 per cent. and complains that he cannot keep his fires in good condition. If the grade of coal is changed two or three times in a season, he considers himself a much-abused man. The locomotive engineer, on the other hand, finds his load increased in a few minutes from nothing to 25 per cent. overload, and is fortunate if he can have the same grade of coal on two successive days. In yard service the conditions are oftentimes particularly trying, and the fireman has enough to do to keep his engine moving without giving much thought to careful firing. Starting a heavy passenger train from the station with a new fire, taking a through freight over bad grades and curves inside the city limits, or starting any train when the rails are slippery, gives the engine crew enough to think of beside smoke abatement. However, "nothing is so bad that it may not be better," and there is a trace of silver even in the smoke cloud.

Perhaps the first thing which should receive attention is the quality of fuel supplied to the engine. Different coals require different treatment and different methods of firing. No fireman can expect to get good results when he has to change without notice from one grade to another. The coal should not only be of good quality and uniform in its characteristics, but should be so prepared before reaching the tender as to be of the right size for firing. It is a waste of a good fireman's time to ask him to break coal at the engine. Locomotives will probably be stoked by hand for the present, as so far no mechanical device has met with general adoption or approval. The adoption by several roads of rules for firing on the "single scoop" plan has resulted in a marked reduction of the amount of smoke. These rules vary somewhat on the different lines, but may be summarized as follows:

One shovelful to be fired at a time and the door left slightly ajar for a few seconds, but no longer than is necessary to burn the gases. The fire to be kept as light as possible. In starting, the blower to be put on, and after a sufficient supply of coal has been shoveled for a good fire the door to be left open an inch or so until all smoke disappears, when the door is to be closed.

Water to be supplied to the engine continuously when possible and the engineer and fireman to work together for uniform conditions.

Blower to be used when approaching a station and on down grades.

Doors not to be left open except as herein noted.

Attention to such rules has reduced the amount of smoke emitted more than 50 per cent. in several cases which have come to our notice. The brick arch is an efficient smoke abater, as it helps to burn the gases and to prevent their being chilled by striking too soon on the tube sheets. A deflector plate above the fire door, which shall direct downward the currents of cool air entering the door, is another useful adjunct. If the plate burns away the expense of renewal is not great, while it is possible to protect it with firebrick if necessary. If steam jets are used, they should be located just above the door on either side. Two-inch steel tubes can be inserted through both plates and expanded in the usual way. The steam jets can be directed through the openings thus provided and pointed in the way which shall be most effective. It would seem that some automatic apparatus of the door-check type might be used to advantage in operating both fire door and steam jets. A dash pot could be so arranged as to rise by the action of opening the fire door and to turn on the steam jets. It could then be set so as to close the door and shut off the steam after a proper time had elapsed.

But no mechanical apparatus or devices for abating smoke can take the place of care and intelligent co-operation on the part of both engineer and fireman. There must be a thorough understanding between the two, so that the fireman may not have unexpected demands for steam, but may know for a reasonable time beforehand what is to be expected of him. The engineer should use all the means in his power to make the conditions of firing as uniform as possible and to prepare in season for any unusual fluctuations of service. Engineers and firemen are human, like the rest of us, and the exigencies of train service are such as to turn their thoughts entirely away from any such æsthetic subject as smoke abatement. The experience of those who have dealt with this problem in the neighborhood of our large cities has shown it to be necessary to institute a careful system of inspection of all locomotives inside the city limits, and especially of those used in yard service. Every supervising engineer or chief smoke inspector should have in his employ a sufficient number of subordinates for this work, who are themselves trained railroad men, capable of appreciating the trials of the engineer and firemen and of making allowance for necessary infractions of the rules. Careful and systematic observation of each locomotive as long as it is in sight of the inspector, with a grading of the smoke density on a ruled chart prepared for the purpose, will enable the inspector to speak with knowledge which will command respect. These smoke charts can easily be made in duplicate by the use of carbon paper and one copy sent to the railroad office, the other being retained for reference. Comments written on the charts will express the opinion of the inspector as to whether the smoke observed was necessary or unnecessary. In most cases the officials of the railroads have been glad to co-operate with the inspectors in this work and to call upon the carpet employees who are manifestly careless or inefficient in this regard. It is perhaps needless to say that

the improvement in smoke conditions obtained in this way will also mean an improvement in the efficiency of the locomotive and in the condition of the firebox and flues. In fact, some roads have found it advisable to enforce some such rules as these throughout their lines merely as a matter of economical firing. Until such time as some suitable mechanical apparatus shall have been devised for this purpose, reliance will have to be placed on the means just outlined.

The question of the use of smokeless fuels is to a large extent a local one. The use of either Pocahontas coal or coke involves certain changes in the firebox and grates which make it decidedly inconvenient to change from the use of these fuels inside the city limits to the use of soft coal on the lines. In many cases, however, fuels of this kind can be used for switching service with good results, and it may be possible to change engines at the yard limits and employ smokeless fuel within the confines of the city. Without doubt, the electric locomotive will take every year a more prominent place for interurban service and for most of the work in the neighborhood of large cities. The ordinary soft coal-burning engine is, however, destined to be with us for a considerable period, and the importance to the community at large and the railroads themselves of reducing the consequent smoke cannot be stated too strongly.

The Hill Railroads—Western Section.

Great Northern.

The Great Northern is the railroad which J. J. Hill created and which he himself has managed. Therefore it reflects both the high standard of railroad construction originally carried out and the operating methods continuously applied over many years which made this railroad builder again famous long after his road was put through to the Pacific coast.

To the Great Northern, the past year has brought many changes. The annual report for 1906 was reviewed in the *Railroad Gazette* of November 16, 1906. On that day Great Northern stock sold at 330. In December, 1906, each shareholder was given as many certificates of beneficial interest in the company's ore properties as he held shares of stock. These ore certificates sold for about 85 at the time of their issue and are selling at about 40 to-day. On December 11, 1906, an increase of $60,000,000 in the capital stock was authorized and offered to stockholders at par, with payments in instalments running up to May 1, 1908. The rights to this new issue were quoted at about 35 when it was announced. The high price at which Great Northern stock was selling last fall was due in large degree to the expectation of these valuable distributions to stockholders. Furthermore, the road had just had the largest earnings and most prosperous year in its history. Now Great Northern stock sells around 110.

This tremendous decline in price is due to a number of different

influenced. In the first place there is no expectation now of valuable rights in the near future; in the second place, there has been a tremendous drop in the prices of all securities. In the third place, though gross earnings have again increased, the Great Northern has been very hard hit by increases in operating expenses. With gross earnings about $4,000,000 larger than in 1906, net earnings last year were nearly $3,000,000 less.

Like all other roads the Great Northern suffered from increases in wages and in the cost of material and supplies. There were two other special influences which reduced its net earnings, from which it suffered more than most other roads. These were a large number of rate reductions, voluntary and forced, and a very severe winter during which the depth of snow in northern Minnesota and North

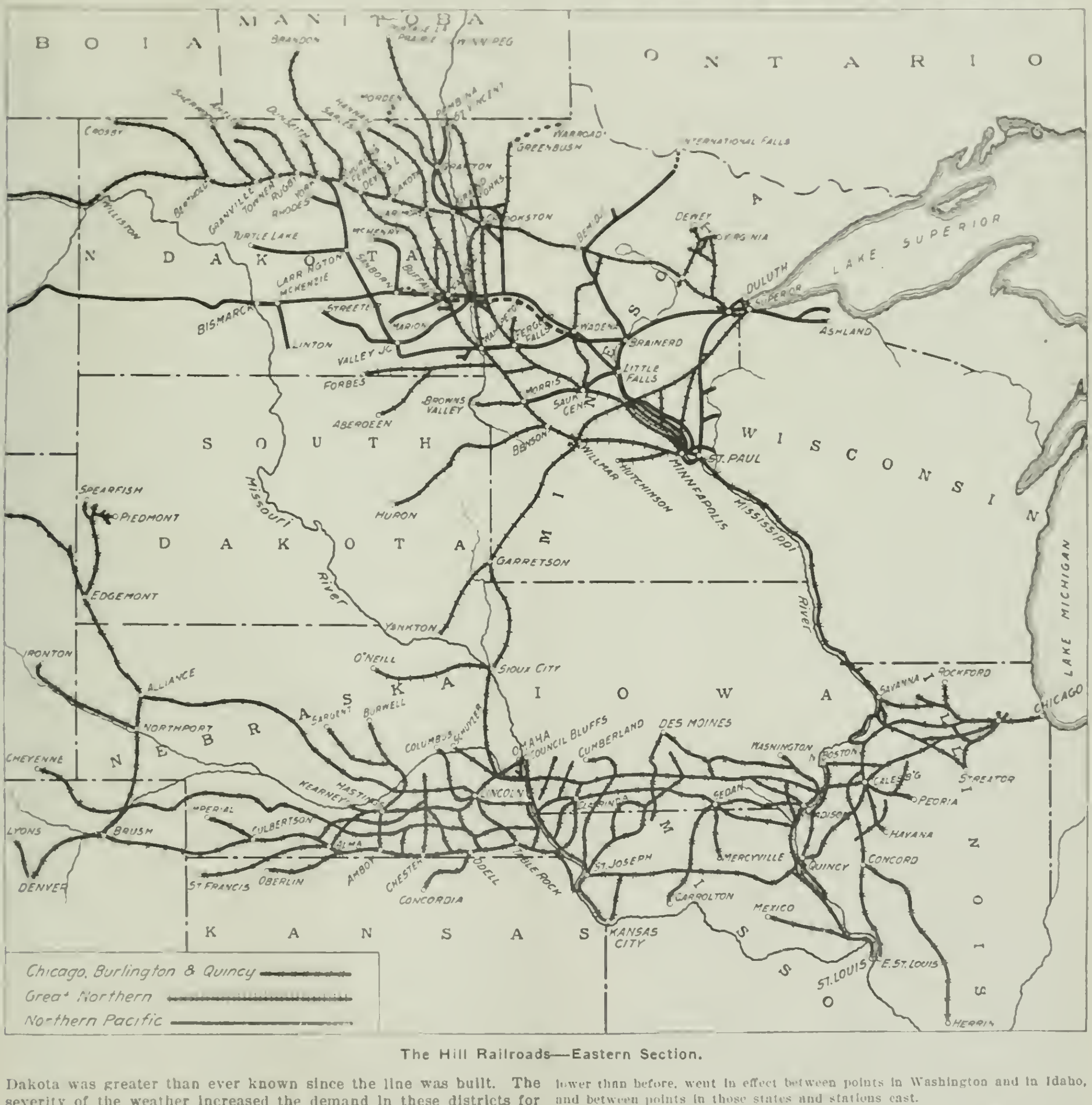
South Dakota, Iowa and Nebraska were reduced, causing a loss of revenue for the ten months of $[illegible].

On Sept. 1[illegible], 190[illegible], a reduction of about 1[illegible] per cent. in class rates was made from far Western points to Montana points.

On Oct. 2[illegible], 190[illegible], rates on coal from Duluth, St. Paul and Minneapolis, Minn., and Superior, Wis., to stations in Minnesota, North and South Dakota, Iowa and Nebraska were reduced, causing a loss up to June 30, 1907, of $[illegible].

On Nov. 1[illegible], 190[illegible], reductions were ordered by the Minnesota Railroad and Warehouse Commission on [illegible] between [illegible] points in Minnesota. As a result, reductions had to be made in interstate rates so as to grade into the Minnesota rates in the bordering states. During the 7½ months in which these rates were in effect the Great Northern's revenue was reduced $[illegible], or at the rate of over $500,000 a year.

On Dec. 12, 1906, a new distance tariff with rates about 10 per cent.



The Hill Railroads—Eastern Section.

Dakota was greater than ever known since the line was built. The severity of the weather increased the demand in these districts for fuel at the same time that it made it almost impossible to keep the railroad lines open. Some towns ran out of fuel altogether and for a week or two were in desperate straits. Fuel and supplies had to be moved to save lives whether other traffic moved or not. This caused a direct and unusual expenditure of over $950,000, which does not include the loss of earnings due to delays and suspension of the movement of traffic.

The various rate reductions caused an actual loss in earnings of about $1,000,000. They are important enough to be listed in detail, as follows:

On Sept. 1, 1906, grain rates from stations in Minnesota, North and lower than before, went in effect between points in Washington and in Idaho, and between points in those states and stations east.

On March 11, 1907, on the opening of the line north to Portage la Prairie, Man. (the line to Brandon, Man., was opened April 4, 1907), the rates from Port Arthur to Manitoba points were applied to shipments from Duluth and eastern terminals to points in Manitoba reached over either of these new lines. This, however, was a rate reduction made necessary in order to compete with the Canadian Pacific and the Canadian Northern, which both use the Port Arthur gateway.

On March 18, 1907, new rates ordered by the South Dakota Railroad Commission went in effect. These reduced by about 10 per cent. the rates on live stock and traffic shipped on class rates.

On June 3, 1907, new rates ordered by the Minnesota Railroad and Warehouse Commission on various staples in carloads from Eastern terminals to 11

different jobbing centers became effective. The average reduction under this order amounted to about 14 per cent.

On June 1, 1907, maximum freight rates on grain, coal, lumber, live stock, and other commodities, were to have taken effect. The Great Northern prepared new tariffs in accordance with these rates, but on May 31, 1901, on the prayer of certain stockholders, the United States Circuit Court in Minnesota granted an injunction to remain in force until suit was decided, forbidding the company to adopt the rates on the ground that they were unreasonably low and confiscatory. This suit has not yet been decided.

These reductions, it will be observed, are all of freight rates. Freight earnings are a railroad's strong dependence, and thus far few railroads have had any serious reductions by law in their freight rates. The Great Northern has been peculiarly unfortunate in this respect.

Nor has it been free from passenger-rate reductions. By legislative act passenger rates were reduced from 3 to 2 cents a mile in Nebraska, effective March 6, 1907; in Minnesota, effective March 6, 1907; in Iowa, effective July 4, 1907, and in Wisconsin, effective August 15, 1907. Passenger rates were reduced from 3 to 2½ cents a mile in North Dakota, effective July 1, 1907, and in South Dakota, effective August 15, 1907. President L. W. Hill (James J. Hill being now Chairman of the Board) states that the minimum reduction in the Great Northern's revenue by reason of these passenger-rate reductions, based on the passenger business handled this year, will amount to $1,180,000 a year. It is therefore evident that the Great Northern has been and will probably be in the year now passing a heavy sufferer from enforced rate reductions.

The increase in operating expenses was $6,700,000, or 26 per cent. Maintenance of way increased 24 per cent., maintenance of equipment 17 per cent. and conducting transportation $4,160,000, or 33 per cent. Of this last increase $799,000 came from "station service," due to more stations, increase in station forces and higher rates of pay. In the past the Great Northern has been accused of maintaining stations only where it wished to do so, and the large increase in this item, especially as it was stated in the 1906 report that part of the increased expenses of that year came from the opening of additional stations, looks as though the road had been compelled to follow a more liberal policy in this respect. There was an increase of $373,000 in "train service," due to additional train mileage and increased wages. "Engine service" increased $1,745,000, due to 12 per cent. more engine mileage, an increase of $550,000 in wages of enginemen, an increase of $75,000 in cost of "other supplies," and an increase amounting to $1,020,000 in the cost of coal, of which there were about 300,000 more tons used than in 1906.

These are the only detailed figures given in regard to any of the three great operating expense accounts. As a consequence, no unit maintenance of equipment figures can be worked out. Maintenance of way, however, cost $1,342 a mile, against $1,093 in 1906 and $973 in 1905. The 1907 increase in this figure is an important one and raises the standard of the road in maintenance of way per mile to a figure which, if the road has been so well maintained on so much less during previous years, ought to be more than adequate for keeping up the condition of the property.

There was more traffic throughout the year than could be conveniently handled, an underlying factor which counted for a great deal in increasing the operating cost. The trainload was increased, but at the expense of the helping mileage. The Great Northern, with its nearly 6,000 miles of line and its many branches and feeders, carries an average revenue trainload of 549 tons. This is an increase of 3½ per cent. over 1906, when the revenue trainload was 530 tons. Including company freight the trainload was 625 tons, against 590 tons in 1906. As remarked in the review of the 1906 report, Mr. Hill's average trainload on his pet property has long been, and still continues to be, the marvel and the despair of other railroad managers. The increase in total trainload was 6 per cent.; the increase in freight and mixed train mileage 5 per cent. Against these the mileage of locomotives employed in helping freight and mixed trains increased 30 per cent., following an increase of 32 per cent. in 1906. Furthermore, the mileage of locomotives helping passenger trains increased 45½ per cent., following an increase of 113 per cent. in 1906.

These figures in themselves are enough to justify the new stock issue of December 11, 1906. Traffic has grown so great that the existing line, strikingly efficient as it always has been, is outgrown. Grades must be reduced, curves straightened and double track laid or each new increase of traffic will return a smaller proportion of net earnings than the one before. It is true that one result of the new stock issue has been to depress the market value of Great Northern stock, but the road now has funds assured for carrying out these necessary improvements. Such expenditures are not doubtful investments, but outlays necessary to maintain operating profits.

Construction advances during the year to various companies amounted to $23,314,945. For new equipment $6,000,000 was paid. Out of earnings $3,000,000 was credited to "fund for replacement of equipment" on account of depreciation of equipment caused by its use during the year. At the same time there was $2,000,000 appropriated out of income to "fund for permanent improvements and renewals" to provide for future contingencies and the cost of such additions and improvements as cannot properly be included in operating expenses, but which on the other hand should not be capitalized. There was charged against this fund during the year $4,000,000. These several expenditures suggest the large increase in equipment during the year (there were 943 locomotives on June 30, 1907, against 786 a year earlier, an increase of 20 per cent.), the various improvements to the property, and the construction of new lines to develop new territory and facilitate operation. Of the lines built for the last purpose there are two most important: The connecting line from a point near Great Falls, Mont., southeast to Laurel, on the Northern Pacific, which is to be a short connection between the Burlington through line to Huntley, Mont., and the Great Northern; and the Portland & Seattle, which is described in the Northern Pacific review, below. The most important construction work done during the year is listed in this week's Railroad Construction column.

The following figures of mileage, earnings and operating expenses cover the Great Northern system, not including the Spokane Falls & Northern lines, 390 miles, which are operated separately. The figures for net income, improvement appropriations and final surplus are those of the Great Northern Railway proper:

	1907.	1906.
Mileage worked	5,982	5,906
Passenger earnings	$10,605,598	$9,460,659
Freight earnings	41,270,192	39,044,732
Gross earnings	55,144,402	51,276,280
Maint. way and structures.	8,924,889	6,453,240
Maint. of equipment	5,622,513	4,820,650
Conducting transportation	16,833,854	12,676,737
Operating expenses	32,562,776	25,852,923
Net earnings	22,581,626	25,423,357
Net income	17,897,824	19,464,000
Improvement appropriations	4,034,976	5,130,910
Year's surplus	2,155,703	5,184,569

Northern Pacific.

The Northern Pacific came formally into the Hill system as a result of the famous Northern Pacific corner. When the Northern Securities Company was broken up by the government, control of the Northern Pacific was handed over to the Hill party, while the Union Pacific in return for almost a majority of Northern Pacific stock which it turned over to the Northern Securities Company, was given merely its pro rata share of the Northern Pacific stock held by the Northern Securities Company, which amounted to much less than a majority. The difference in value was made up by receiving its pro rata share of the Great Northern stock held by the Northern Securities Company.

In 1896 the Northern Pacific was in the hands of a receiver. Its career since the formation of the new company, with J. P. Morgan as the leading spirit, has been a brilliant one. It has profited from the tremendous prosperity of the Northwest in a remarkable degree. At the same time it has been improved not only on capital account, but out of income. Up to June 30, 1906, there had been spent out of income for additions and betterments $18,162,598. A new policy was last year adopted in regard to these improvement expenditures. This sum was transferred to capital account and at the same time added to the profit and loss credit balance. This is improving on the Chicago & North-Western's example of stopping appropriations for additions and betterments out of current income. The Northern Pacific has not only stopped making these appropriations out of earnings but has capitalized all such expenditures which have been made in the past. Probably the reason for this is that the company, believing that the value of its property is at least as great as the total amount charged to capital account and spent out of income, wishes to put itself in a better light for a possible valuation by the states or the national government. This change is really one of accounting rather than of general policy. The present management has made improvement appropriations out of income in every previous year in which it has been in control of the road. It is certain that the improvements will go on, though charged in a different way.

The Northern Pacific had the same difficulties to contend with last year as the Great Northern, but judging by results did not suffer so severely. It shows a small increase in net earnings instead of a large decrease. More detailed facts are given in regard to the severity of the winter. From November 18, 1906, to March 18, 1907, four months, the movement of all business both on the main line and branches in Minnesota, North Dakota and Montana was seriously affected by snow and cold weather. Train movement was greatly interfered with for about 100 days during this period; for over 60 days in North Dakota there was scarcely any freight moved, except fuel and supplies sent through behind snow plows. In Washington during part of the same period, that is between November 13, 1906, and February 23, 1907, the Northern Pacific suffered from serious washouts which stopped through train service between Spokane and Puget Sound and Portland for a total of 25 days. Besides this, during much of the winter the snow and bad track on this part of the railroad made the movement of trains very difficult.

The capacity of the road was overtaxed by the volume of busi-

ness at various points. The Northern Pacific had literally more traffic than it could carry, and much more than it could carry economically and expeditiously. It shows this in the same way as the Great Northern. The revenue trainload increased slightly, from 490 to 497 tons, the total trainload more, from 468 to 492 tons, and the empty freight-car mileage decreased by over 26 per cent. With an increase of 5 per cent. in revenue ton mileage, the mileage of revenue freight and mixed trains increased 3 per cent. But there are other results which spell congestion of traffic rather than economy in operation. The mileage of locomotives employed in helping mixed and freight trains increased 35½ per cent., following an increase of 33 per cent. in 1906. With an increase of 11 per cent. in mileage of revenue passenger trains the passenger locomotive helping mileage increased 31 per cent., following an increase of 59 per cent. in 1906. Within two years the passenger helping mileage has increased from 3 per cent. to 5 per cent. of the total revenue passenger train mileage, and the freight helping mileage from 13 per cent. to 21 per cent. of the total revenue freight train mileage. Here is convincing proof that the road's traffic has outgrown its economical capacity. Here also is good reason for the new stock issue authorized January 7, 1907.

Of the authorized issue of $95,000,000, $93,000,000 was subscribed for by stockholders at par, payments to be made in instalments up to January, 1909. A year ago to-day Northern Pacific was selling at 225. This month it has been down almost to par. Of course, the new stock issue is responsible for much of this decline but, nevertheless, the stockholders of the Northern Pacific are fortunate that their company for the next few years will have funds at its command to make the improvements which are vitally necessary to maintaining the maximum rate of profit on its fast growing business.

Already during the past year there have been large expenditures for improving the property. There appear to have been more improvements to the line than on the Great Northern, but this is no proof that the Great Northern is falling behind its southern neighbor and ally in the condition of its railroad. The Northern Pacific was built as most other railroads were built, by speculative methods. It has been said, perhaps unfairly, "The Great Northern was built to carry freight; the Northern Pacific, to carry bonds." At any rate, the Northern Pacific needs grade revisions and line changes where the Great Northern does not and never has needed them. There are listed in the Northern Pacific report 20 distinct pieces of double tracking, grade revisions and line changes; two in Wisconsin, four each in Minnesota and North Dakota, eight in Montana and two in Washington. The most important of these are in Montana, where work is now under way on a total of 157 miles. Besides this, one grade revision in that state, 1.75 miles long, has lately been finished. The most important of these improvements were listed in the *Railroad Gazette* of November 1, 1907, in the Railroad Construction column. How much work they really represent can be judged from the fact that on the important pieces of work under construction during the 1907 year there were 10,900,000 cu. yds. of material moved, of which 8,000,000 cu. yds. were earth, 1,200,000 hard pan and 1,700,000 rock.

The same figures are given for the work done on the Portland & Seattle, the low-grade line along the north bank of the Columbia river from Pasco, Wash., to Portland, Ore. In contrast they are mute testimony of the difficulty of the work on the new low-grade connection. During the year there were 12,500,000 cu. yds. of material moved on the Portland & Seattle, of which 3,200,000 were earth, 4,000,000 hard pan and 5,300,000 rock. On the Northern Pacific construction work there were over twice as many cubic yards of earth moved as of the two harder materials. On the Portland & Seattle there was nearly twice as much rock alone moved as earth, and rock and hard pan together made up more than three times as many yards as the earth moved.

Naturally the amounts spent during the year on the Portland & Seattle have been large. On June 30, 1906, the Northern Pacific had advanced $5,600,000 to that road for construction. During last year it made additional advances amounting to $11,400,000. Up to June 30, 1907, the Great Northern had made advances on account of the Portland & Seattle amounting to $9,200,000, making a total expenditure by both roads up to June 30, 1907, of $26,200,000. The Portland & Seattle line between Kennewick, Wash., and Vancouver, 221 miles, is rapidly approaching completion, and track should be laid by 1908. The large bridges over the Columbia and the Willamette rivers between Vancouver and Portland are well under way and to be finished by June, 1908. Then the through low-grade connection for the Northern Pacific from Pasco, Wash., to Portland, Ore., will be finished. The Portland & Seattle is also building a line from Pasco northeast to Spokane, 145 miles, which will connect it with the Great Northern. This is to be finished next summer. It is also building a branch from a connection with this Spokane line east to Texas Ferry, 41 miles, which also is to be finished in the summer of 1908. The Portland & Seattle lines are shown on the accompanying map.

This is to connect the joint lines which are being built by the Northern Pacific and the Union Pacific together between Texas Ferry and Lewiston, Idaho, 72 miles, and between Cullulac, Idaho, and Grangeville, 55 miles. The Lewiston line is being built by the Union Pacific and is mostly finished, but the bridge over the Snake river at Lewiston will not be finished until next month or later. The line to Grangeville, which is an extension of an existing Northern Pacific branch, is being built by the Northern Pacific. On June 30, 1907, when 80 per cent. of the construction work was finished, the Northern Pacific had advanced for construction of this road $2,274,279. It is expected that this extension will be finished by January 1, 1908.

The new projects and revisions of line already mentioned do not include all the improvement activities of the Northern Pacific during the past year. There were 480 miles of track laid or relaid with new 85-lb. rail against 168 miles in 1906. On the main line 1,162,754 ties were renewed, against 946,087 in 1906. There were five miles of timber bridges replaced by permanent structures and embankments, against two miles in 1906, and 340 timber culverts replaced by stone, iron or tile, against 177 in 1906. On June 30, 1907, the company owned 250 more locomotives than a year earlier, 85 more passenger train cars and 6,223 more freight cars. In addition there were to be received between June 30 and December 31, 1907, 52 new locomotives, 28 new passenger-train cars and 1,537 new freight cars. The increase during the last fiscal year in locomotives amounts to 25 per cent. in number and 31 per cent. in total weight on drivers, and in freight cars to 17 per cent. in number and 26 per cent. in capacity.

Gross earnings were $68,500,000, an increase of $7,500,000, or 12 per cent. over 1906. Operating expenses were $6,600,000, or 21 per cent. larger, leaving net earnings of $30,900,000, against $30,100,000 in 1906, an increase of $740,000, or 2 per cent.. The operating ratio was 55 per cent., against 50.8 per cent. in 1906. From the net income $5,926,753 was appropriated for depreciation of equipment and written off from the capital account "equipment." This charge, which compares with an appropriation of $2,000,000 in 1906, was arrived at by computing the depreciation to June 30, 1907, of all equipment owned on September 1, 1896, and purchased and built since then. The equipment account of the company is stated to represent the fair value of all equipment owned on June 30, 1907, after making full allowance for depreciation according to the principles laid down by the Interstate Commerce Commission. As already mentioned, no appropriation was made out of income for additions and betterments. The extra amount shown in the table at the end of this review, as appropriated in 1906, was $1,081,980 for the insurance fund. The surplus of the year was $6,700,000, against $8,600,000 in 1906.

Freight earnings increased 10 per cent., while the revenue ton miles increased only 5 per cent. The gain in earnings was due to a larger rate per ton-mile which resulted from a greater proportion of high-class tonnage and a shorter average haul, and not to an increase in rates. The same thing was true in the passenger department, where the rate per passenger-mile increased 8 per cent. The lower rate for 1906 was due to the large amount of low-rate traffic to the Portland Exposition; there has been no actual increase in passenger rates. It is a striking indication of the prosperity of the Northwest that, compared with 1906, the year of the Portland Exposition travel, passenger earnings of the Northern Pacific increased 18 per cent.

The great increase in operating expenses was in conducting transportation, which rose 33⅓ per cent. Maintenance of way increased 18 per cent., while maintenance of equipment decreased 7 per cent. As in the case of the Great Northern, no detailed figures of operating expenses are given, so that the increases in the conducting transportation accounts cannot be located nor the unit maintenance of equipment charges discovered. Per mile of road, maintenance of way cost $1,680, against $1,387 in 1906, and $1,382 in 1905, a distinctly higher standard of maintenance expenditure and one which represents more than necessary requirements.

The income account for the last two years is shown below:

	1907.	1906.
Mileage worked	5,444	5,401
Passenger earnings	$16,924,188	$14,568,221
Freight earnings	48,395,878	44,011,467
Gross earnings	65,534,832	61,223,476
Maint. way and structures	9,145,547	7,493,729
Maint. of equipment	5,542,209	5,944,119
Conducting transportation	20,887,730	15,673,348
Operating expenses	37,664,317	31,095,432
Net earnings	30,870,516	30,128,043
Net income	23,473,929	22,487,700
Improvement appropriations	5,926,753	3,081,980*
Year's surplus	6,697,176	8,555,760

*There was an additional improvement appropriation of $3,000,000 in 1906 for additions to and betterments of existing lines, but this has since been transferred to capital account and therefore is shown, not in this figure, but in the year's surplus.

Chicago, Burlington & Quincy.

Last and greatest of the Hill roads is the Chicago, Burlington & Quincy. It was in 1900 that Mr. Hill set out to buy a Chicago connection for the Great Northern, which he owned, and the Northern Pacific, in which he was interested. He tried in the open market to buy control of the Chicago, Milwaukee & St. Paul and failed. Nothing daunted, he took the Burlington, which connected with the Great Northern only at St. Paul and with the Northern Pacific

only at St. Paul and at one point in Montana, with most of its nearly 8,000 miles of line hundreds of miles away from either of the northern trans-continental roads. During 1900 Burlington stock fluctuated between 120 and 144. Mr. Hill paid $200 a share for it. He was severely criticised for this purchase, both on account of the high price paid and because it was buying thousands of miles of railroad for the sake of a 500-mile connection. He said little, but began to send men trained in the Great Northern service to manage the Burlington. More and more Great Northern men came to the road as time went on and with them came Great Northern operating methods. The results which have been accomplished during the six years of Hill management are remarkable.

When the Burlington was taken over by the Great Northern and the Northern Pacific it was, like the Chicago, Milwaukee & St. Paul, essentially a local railroad, with the operating methods of a local railroad—small trainloads, light equipment and slow service. In the year ended June 30, 1902, the first year under Hill management (the Burlington was taken over April 1, 1901), the revenue trainload was 218 tons and the total trainload 251 tons. Last year the revenue trainload was 389 tons and the total trainload 444 tons. In 1902 there were 4,000,000,000 tons carried one mile with a freight train mileage of 18,300,000; last year, with a freight train mileage of 18,400,000, there were considerably over 7,000,000,000 tons carried one mile. Meanwhile the railroad lines have been greatly improved; old equipment of small capacity has been scrapped with what might seem like wasteful rapidity and replaced with new equipment, fast freight service has been established between Iowa, Nebraska and the Black Hills and Chicago, passenger service both through and local has been brought to a high standard of excellence and the road stands to-day strong, efficient and well equipped.

Since 1902 there has been an increase of 53 per cent. in gross earnings. Last year gross earnings were $82,500,000, against $74,100,000 in 1906 and $66,000,000 in 1905. Net earnings have not increased so fast but this is because the Burlington includes large improvement expenditures in its regular operating expense accounts instead of making special appropriations out of earnings.

It is particularly unfortunate that where this is the case no detailed figures of operating expenses are given, for this makes it impossible to analyze the expenditures in detail and form an opinion as to the amount spent on betterments. The only unit maintenance figure which can be obtained is that for maintenance of way per mile of road which on all roads operated and controlled, including some narrow gage mileage, was $1,584 last year, against $1,272 in 1906. It is necessary to look at the map to realize how generous is this figure. The Burlington is essentially a granger road with most of its mileage in the level prairie country between Chicago and the eastern line of Colorado and with a great clustering network of branch and feeder lines. If the records of the other two leading granger roads count for anything, this type of railroad is the cheapest kind there is to maintain. The Chicago & North-Western and the Chicago, Milwaukee & St. Paul each have a large mileage of branches and feeders in the prairie country. Last year the North-Western spent $1,185 for maintenance of way per mile, and the St. Paul $827 per mile. There is no obvious reason why the Burlington should have to spend any more than these roads. Therefore it is clear that an expenditure of nearly $1,600 a mile by the Burlington means that large improvements are being made directly out of earnings.

The same process of analysis cannot be applied to the maintenance of equipment accounts. But from indirect evidences it is likely that betterments are being charged to operating expenses almost as heavily in equipment. There were added to the equipment during the year 136 locomotives, 712 stock cars and 1,000 coal cars. This, however, probably does not by any means represent the value added to the equipment during the year. It appears that when an old worn out Burlington car of 30,000 or 40,000 lbs. capacity is broken up, it is replaced with a new and modern car of 60,000 or 80,000 lbs. capacity, and the whole cost of the new car charged to maintenance of equipment. This process is said to have been going on with especial rapidity of late.

With such limited figures at command, the most concise and accurate way to estimate the results of the money spent in operating expenses is to observe the proportion of gross earnings which was used on each of the separate accounts. Last year maintenance of equipment expenses amounted to 17.9 per cent. of gross earnings, against 18.4 in 1906 and 14.8 in 1905. Maintenance of way amounted to 17.5 per cent., against 15.2 per cent. in 1906 and 13.8 per cent. in 1905. These figures are clear proofs of the large and increasing amounts spent on improvements through the maintenance accounts.

Similarly the conducting transportation ratio shows the operating efficiency of the year as nothing else can. In 1906 of the gross earnings 30.2 per cent. went for conducting transportation. Last year, with all the wage increases, higher prices of supplies and other influences tending to raise the costs of getting and moving the business, and with 869,000,000 more tons moved one mile and 98,000,000 more passengers carried per mile, only 30.6 per cent. of gross earnings was required for conducting transportation. This small increase is a triumph of good management. General expenses, the other non-productive operating cost, was only 5.4 per cent. of gross, against 5.6 per cent. in 1906.

The few traffic statistics given show this operating efficiency. With an increase of 23,800,000 miles run by loaded freight cars, there was a decrease of 8,400,000 in the empty freight car mileage. The revenue trainload increased from 365 tons to 389 tons, and the total trainload from 420 tons to 444 tons. With a decrease in earnings per ton-mile, earnings per freight-train mile increased. An increase of 12 per cent. in passengers carried one mile was handled with an increase of 7 per cent. in mileage of passenger trains.

Neither the Great Northern, the Northern Pacific nor the Burlington give figures of tonnage carried by commodities. This would be particularly interesting in the case of the Burlington, because its mileage is so much more compact than that of either of the other roads. It is certain that one economy which has been gained during recent years—partly by the natural growth of the territory, partly by special efforts—is the development of a westbound back-haul. This would be indicated by the reduction in empty car mileage. The Burlington is a corn road rather than a wheat road, and is therefore likely to fare well during the next six months, for the corn crop is not only large, but the price is high. It also carries a great deal of live stock eastbound and merchandise westbound which it distributes to the various jobbing centers in Iowa, Missouri, Nebraska and Colorado. A description of its traffic by commodities would, in fact, be a summary of the products and business of the strip of territory between Chicago and Denver, which it so completely occupies.

In July, 1906, the line from Frannie, Wyo., south to Worland, 91 miles, was opened for traffic. An extension of this line from Worland south to Kirby, 20 miles, is now being finished. Since the close of the fiscal year the annual dividend rate on Chicago, Burlington & Quincy stock has been increased from 7 to 8 per cent., with an extra dividend of 6 per cent. This extra disbursement exactly refunds to the Great Northern and the Northern Pacific the amounts which they have paid during the last six years as the difference between the 7 per cent. received on the Burlington stock which they own and the 4 per cent. which they have paid on the joint Burlington bonds, which were issued at the rate of $200 for each $100 of Burlington stock.

The fifty-third annual report of the Burlington covers 36 printed pages. In proportion to its length it probably gives less real information than any other railroad report issued. The Great Northern and Northern Pacific reports are lacking enough, omitting as they do detailed figures of operating expenses, classification of tonnage by commodities and other important information, but the Burlington goes a step further. It is a pity that so great a railroad makes so incomplete an annual showing.

The following table shows the income results of all roads operated and controlled by the Chicago, Burlington & Quincy:

	1907.	1906.
Mileage worked	9,122	8,896
Passenger earnings	$18,666,973	$16,409,104
Freight earnings	56,516,689	51,168,339
Express earnings	2,000,149	1,456,990
Gross earnings	82,473,251	74,146,671
Maint. way and structures.	14,445,867	11,312,712
Maint. of equipment	14,725,632	13,639,942
Conducting transportation.	25,224,272	22,354,707
Operating expenses	58,904,988	51,463,642
Net earnings	23,568,263	22,683,029
Net income	13,155,207	12,742,430
Year's surplus	4,320,333	3,907,572

Detroit, Toledo & Ironton-Ann Arbor.

This is a combination of two small weak railroads. The combined lines run from the Ohio river to the northern part of Lake Michigan, from which there is connection by car ferry with a number of different ports on the western shore of the lake. The northern end of the line, from Frankfort, Mich., to Toledo, Ohio, is the Ann Arbor Railroad. The southern line, from Detroit, Mich., south to Ironton, Ohio, is the old Detroit Southern, now reorganized as the Detroit, Toledo & Ironton. The two roads were united in the hope of developing a larger aggregate of traffic by the alliance. This was successfully accomplished in 1906, the first year of combined operation, in which the combined net earnings were $1,300,000, against $739,000 in 1905 and the combined operating ratio 67 per cent., against 78 per cent. in the earlier year. The second annual report of the two roads shows that in 1907 there was only a slight increase in gross earnings, a decrease in net earnings and, owing to the application for the full year of the interest charges on new Detroit, Toledo & Ironton bonds, a large decrease in net income. The consolidated results for the last two years are shown in the table at the end of this review. In general the report takes up each of the two roads separately.

The Detroit, Toledo & Ironton, which showed great progress in 1906, went backward last year. Freight earnings decreased 4 per cent. and passenger earnings 3 per cent., while operating expenses increased 12 per cent. The reason gross earnings were larger than

In 1906 is that earnings from car per diem, car mileage and hire of equipment, which are included in gross earnings, were over twice as large as in the previous year. Receipts from these sources amounted to $434,334, against $205,584 in 1906, an increase of 111 per cent. The 1907 figure is over twice as large as the total receipts from passenger, mail and express earnings. It is probable that there is no other railroad with as much mileage (438 miles) which makes this showing. These earnings, instead of being an advantage to the road, are small recompense for being deprived of a large part of its equipment for several weeks or months of the year. It has a large tonnage of coal for domestic consumption which moves mostly in the fall and early winter and is destined to a great many different points off the line. Once these cars leave the road they are generally not returned till spring. Meanwhile the company is unable to satisfy the legitimate demands of its own shippers. Last year these shippers, unable to obtain cars, complained to the Railroad Commission of Ohio. In reply the Ohio authorities threatened to revoke the charter of the company if cars were not furnished more promptly to shippers. The company's

Detroit, Toledo & Ironton-Ann Arbor.

position is that if it had ten times as many cars they would, under present conditions, be loaded out during October and November and not returned, and shippers would be little better off than they were last year during the winter months. The Detroit, Toledo & Ironton, therefore, is a road on which the present conditions of car interchange have fallen with particular severity. The raising of the per diem rate from 25 cents to 50 cents a day last summer will increase its car service earnings, but it is obvious that even this increase will nowhere nearly make up for the hardship of being deprived of large numbers of cars for which loading is available. This state of affairs is probably largely responsible for the decrease in freight earnings.

One reason for the increase in operating expenses was that more was spent on the maintenance accounts. There was only a small increase in the non-productive accounts. Maintenance of way cost $723 per mile, against $628 in 1906; and repairs and renewals of equipment $1,701 per locomotive, against $1,055 in 1906; $474 per passenger car, against $322 in 1906, and $28 per freight car, against $22 in 1906. These are low figures, particularly in the freight car item. An average of $25 a year will not maintain modern freight equipment. The showing is made worse by the fact that no new equipment of any kind was bought during the year.

Net earnings were $[illegible] while fixed charges amounted to $927,000, leaving a deficit for the year of $[illegible]. There was a previous profit and loss surplus of $[illegible], so that the Detroit, Toledo & Ironton on June 30, 1907, showed a total profit and loss deficit of $677,000.

The Ann Arbor had a trifling increase in gross earnings and a decrease in net earnings. Freight earnings increased 1 per cent and passenger earnings 5 per cent. Net earnings and other income were $794,000 with which to meet fixed charges of $417,000. This left net income of $377,000 which carried to profit and loss, made a profit and loss credit balance of $1,[illegible]. It will be observed that the year's net income overbalances by $5,819 the deficit, Toledo & Ironton's net deficit.

The Ann Arbor spent less than in the previous year on maintenance. Its increase in operating expenses was in conducting transportation. Maintenance of way cost $864 per mile, against $1,029 in 1906. This is a large decrease, particularly for a year when costs were generally higher. Equipment repairs and renewals cost $1,337 per locomotive, against $1,462 in 1906; $678 per passenger car, against $519 in 1906, and $63 per freight car, against $69 in 1906. The locomotive figure is low, the others fairly adequate.

The prospects for the present year are said to be favorable for both roads. Whether the increased capacity and activity of the different industries mentioned will continue in face of the present depression is a question. A new traffic development is the beginning of special train service from Toledo to Detroit to handle coal for the Solvay Process Company and coal dealers in Detroit. This train has had an average of about 20 cars a day since it has been running. The Ann Arbor is increasing its summer tourist travel. To extend its possibilities in this direction it has canceled its contract with the American Palace Car Company and made a contract with the Pullman Company. As a result a Pullman sleeping car line was established on July 1, 1907, between Columbus, Ohio, and Frankfort, Mich., in connection with the Hocking Valley between Columbus and Toledo. This car was operated in each direction three times a week until September 1 and brought satisfactory returns.

The following table shows the results of the past two years, during which time the two roads have been operated together. The detailed figures of earnings and expenses of the Detroit, Toledo & Ironton and the Ann Arbor are added so as to show them for the combined properties.

	1907	1906
Mileage worked	734	728
Passenger earnings	$637,474	$618,715
Freight earnings	3,001,368	5,056,050
Per diem & equip. earn'gs	434,334	224,702
Gross earnings	4,298,925	4,118,809
Maint. way and structures	572,404	574,228
Maint. of equipment	699,140	602,626
Conducting transportation	1,624,783	1,510,564
Operating expenses	2,978,604	2,775,628
Net earnings	1,320,320	1,343,181
Net income	5,819	159,764
Year's surplus	5,819	159,764

Bangor & Aroostook.

This is a local railroad operating nearly 500 miles of line in northeastern Maine. Its southern terminus was at Oldtown up to the latter part of 1905. On November 4, 1905, the extension south to Searsport was opened for operation and since that time a branch has been built connecting this line with Bangor. Work was begun last spring on a cut-off from South Lagrange north to the main line between Schoodic and Seboois. This is to be put in operation shortly. It is a shorter route with lower grades than the old line. As shown by the map, an extension of this line, known as the Aliagash Line, is projected north through the wilderness about Mt. Katahdin, to a connection with the Temiscouata Railway at its eastern terminus on the St. John river.

The Bangor & Piscataquis Railroad and its leased line, the Bangor & Katahdin Iron Works Railway, were the beginning of the Bangor & Aroostook. Together in 1893 they had 95 miles of main line and gross earnings of $185,000. The Bangor & Aroostook in the next near operated 112 miles with gross earnings of $246,000. The year ended June 30, 1907, shows an average operated mileage of 482 miles and gross earnings of $3,200,000. Yet President Cram believes that the development of the natural resources of northern Maine is but fairly begun.

Certainly the record of the past year shows a gross traffic which last year increased too fast for the most profitable results. Even after an improvement appropriation smaller by $65,000, there was a deficit for the year of $28,000 compared with a surplus of $73,000 in 1906. This was the result of payments amounting to $152,000 on new car trusts. These were charged by the company to profit and loss instead of to income, so that the company's income account shows a surplus for the year instead of a deficit.

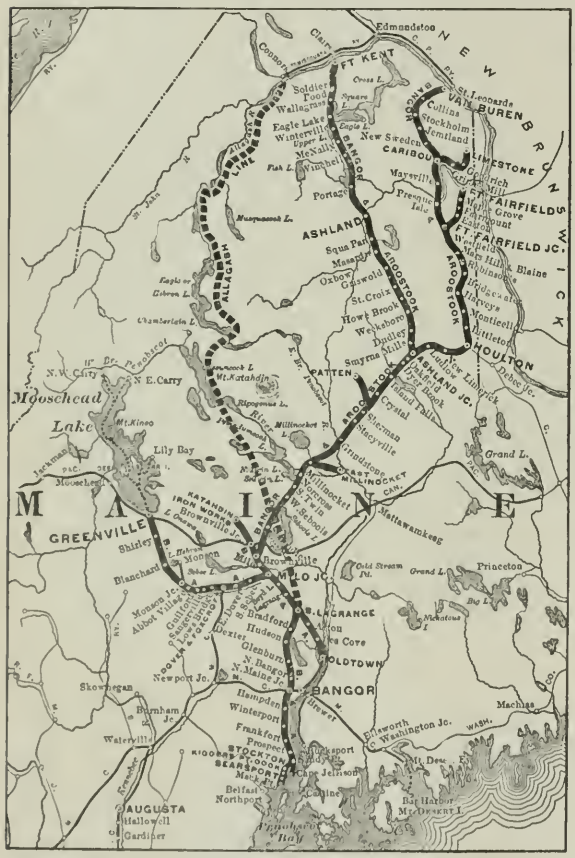
Gross earnings were $3,200,000, against $2,500,000 in 1906, an

increase of $700,000, or 29 per cent. Operating expenses increased $600,000, leaving net earnings of $1,088,000, against $952,000 in 1906. Fixed charges and taxes increased $281,000, as a result of additional bonds and car trusts issued during the year, so that the net income was only $143,000, against $300,000 in 1906.

Freight earnings increased from $1,700,000 to $2,300,000 or 35 per cent. Passenger earnings increased 11 per cent. There were large increases in each one of the four operating expense accounts.

Maintenance of way cost $1,141 per mile, against $859 in 1906, a distinct advance in the standard of roadway maintenance. Repairs and renewals of equipment cost $886 per locomotive, against $625 in 1906; $360 per passenger car, against $338 in 1906, and $40 per freight car, against $33 in 1906. The locomotive figure in both years is extremely low; most large railroads spend twice as much, or more.

Conducting transportation cost $1,100,000, against $830,000 in the previous year, an increase of 33 per cent. There were particularly large increases in wage payments. Wages have been advanced,



Bangor & Aroostock.

according to President Cram, beyond the company's reasonable ability to pay them. He hopes, however, that the company will be compensated by increased fidelity to duty.

The winter was the most severe in the history of the road, in its effect on both roadway and equipment. At the same time the offerings of traffic were unprecedentedly large. These difficulties were aggravated by delay in the delivery of new freight cars, which were to have been received in September. They did not arrive until several months later, after the potato crop, one of the most important items of the Bangor & Aroostook's traffic, had been harvested. It is estimated that the direct and indirect cost of operation was increased from $10,000 to $50,000 above the usual cost during the winter and that there was a decrease of from $50,000 to $75,000 in earnings, through the severity of the weather and the lack of expected equipment.

Freight traffic by commodities for the last seven years is reported. This shows that the potato traffic has increased from 98,000 tons in 1901 to 382,000 tons last year. Forest products, which were 381,000 tons in 1901, amounted to 540,000 tons in 1907. Paper tonnage has risen from 36,000 tons in 1901 to 97,000 tons last year. There has been a specially large increase within a year in the tonnage of cement, brick and lime, which rose from 19,000 tons in 1906 to 54,000 tons last year. The average distance which each ton of freight was hauled increased from 106 tons in 1906 to 121 tons last year. The train load increased from 192 tons to 221 tons, and the loaded carload from 16 tons to 17 tons.

The following table, rearranged according to our usual method, shows the operations of the last two years:

	1907.	1906.
Mileage worked	482	456
Passenger earnings	$615,908	$544,870
Freight earnings	2,340,390	1,743,267
Per diem & equip earnings	152,916	129,925
Gross earnings	3,221,696	2,496,547
Maint. way and structures.	552,010	391,565
Maint. of equipment	344,000	210,803
Conducting transportation.	1,093,465	829,733
Operating expenses	2,133,295	1,544,670
Net earnings	1,008,401	951,877
Net income	143,439	299,773
Dividends	71,840	62,000
Improvement appropriations.	99,626	164,842
Year's surplus	28,027*	72,931

*Deficit.

CONTRIBUTIONS

Rail Specifications—The Discard from the Ingot.

To the Editor of the Railroad Gazette:

Beyond question the railroads of the country rightfully bear the full responsibility for laying safe rails in their tracks. On neither moral nor legal grounds can they claim exemption because they have bowed to the arbitrary power of the steel rail pool that has fixed both price and quality. It is true that a condition that thus places responsibility without voice in the determination of quality is unfair. But what have the injured parties, the railroads, done to assert their rights?

Over five years ago the rail manufacturers unitedly deprived the railroads of the inalienable right of the purchaser to specify the quality of the material for which his money is expended; and the railroads meekly submitted, against the protests of their technical advisers. It is only within the past year that the alarming increase of rail breakages, even with larger sections and weights, have awakened the railroads and the public to the necessity of action compelling the manufacturers to improve their output.

That the manufacturers should be most interested in profits is but natural. That is what their stockholders demand. On the other hand it is equally the duty of the railroads, in the interests of their stockholders and the public, to insist on getting that for which they are paying—a safe, sound rail.

The technical officers of the railroads, through the more prominent technical societies of the country, have endeavored to bring about the desired result by drafting rail specifications; but the manufacturers have been successful in preventing their adoption, by indifference and antagonism. For traffic and other reasons no one railroad could singly compel the needed reforms.

Realizing the necessity of united action, the executive officers of all railroads, through the American Railway Association, took up the question about a year ago. Its Standard Rail and Wheel Section Committee has had many meetings, attended by representatives of the manufacturers, technical societies and prominent metallurgists, and unanimous agreements have been reached on various details, including amended rail sections and chemical composition. The question of discard, however, is still unsettled.

Regarding rail sections, all interests have agreed that to secure proper working of material, with uniformity of texture and absence of internal strains, the metal must be more evenly distributed between head and base than is done in the sections now in use. This conclusion has resulted in the selection of two types of rail sections, one with a high moment of inertia and wide shallow heads, for use by railroads preferring stiffness and smooth-riding qualities; and the other with less height and with deep, narrow heads for withstanding heavy traffic on tortuous alinement.

As to chemical composition, the railroads desire as low as possible percentage of phosphorus, so that the proportion of carbon may be correspondingly raised with safety, and thus produce a rail that will wear well. An attempt has been made to secure .085 phosphorus, but the ores available for the great majority of the rail tonnage of the country makes impracticable the securing by the Bessemer process of less than .10 per cent. It is true that foreign demands are often met with the better class of ores to the detriment of the domestic product, but the quantity is comparatively so small as to not affect the situation. Therefore until the open hearth process is more widely employed, the railroads are forced to the use of .10 phosphorus, with a correspondingly low percentage of carbon. This means a safe but soft rail.

The minimum discard continues to be a bone of contention,

and is really the most important of all. No matter how carefully the section is designed for obtaining suitable heat treatment, nor how the chemical composition is regulated, if the material in the rail is not homogeneous and contains hidden defects the result will be an unsafe rail. The manufacturers all agree that the upper part of the ingot contains cavities and segregated elements which cause pipes, flaws, brittleness and other undesirable faults in the rail rolled from that portion, and they agree that the nearer the bottom is approached the better the material. But with the discretion of one company the makers claim that an arbitrary discard is unfair, and that the inspectors of the railroad companies should require the removal of only such part of the ingot as in each instance demands for the security of sound metal. The Steel rail company, one of the best in the country, admits that for average conditions a discard of less than 20 per cent. is not to be recommended, and that company is now making a specialty of supplying rails with that amount of discard.

Such experts on rail manufacture as Dr. C. B. Dudley, of the Pennsylvania, and Capt. R. W. Hunt assert that the railroads cannot afford to do otherwise than unite on the requirement of a definite discard, and the latter believes that not less than 20 per cent. is essential for a safe rail under the usual methods of casting ingots. Both the American Society of Civil Engineers and the American Railway Engineering and Maintenance of Way Association have declared in favor of a 25 per cent. discard.

To leave this most important matter for the railroads' inspectors to decide appears to be very unwise, for how can they be expected to secure from the manufacturers that which their superior officers, the highest engineering officers of the railroads, have for five years been unable to get?

It is true that a definite discard will work some hardship to those progressive mills that cast a superior ingot, but for such exceptions special agreements can be made for a modified discard. The arbitrary standard is absolutely necessary for the protection of the railroads. It can of course, be modified by the united railroads from time to time as improved methods of casting the ingot show the safety of so doing.

To summarize: The agitation of the rail question seems to be leading the united railroads of the country to the ultimate adoption of the following policies.

(1) Two alternative types of rail sections, with a distribution of metal that will be favorable to proper rolling.

(2) Chemical composition in which the relation of carbon to .10 phosphorus in the Bessemer process of manufacture will insure safe but soft rail.

(3) Definite discard from the top of the ingot, probably not less than 20 per cent. and enough more in the inspector's opinion in each instance to secure sound metal.

(4) Gradual supplanting of the Bessemer by the open-hearth process of manufacture, so that with the lower phosphorus thus obtainable the carbon may be raised and thereby overcome the objectionable uneconomical softness of rail that seems inseparable from the Bessemer process.

When it is realized that the safety of travel on American railroads is even more dependent on the quality of rails than on the bridges that are the subject of so much solicitude and expense, is it too much to ask that no efforts be spared by all those burdened with the responsibility of safeguarding the traffic entrusted to their care, to get the best rail that money will buy?

RAILROAD OFFICER

The Prussian railroad loan bill of April 13, 1907, provides funds for the following purposes:

1. For building new railroads	$26,688,960
2. For double tracking and construction connected therewith	17,191,200
3. For various short connections and to cover deficits in construction previously authorized	5,889,200
4. For material for lines being built	2,100,000
5. Subsidies for building light railroads	1,250,000
Total	$53,319,360

Charles E. Perkins.

Charles E. Perkins.

Charles Elliot Perkins, who died recently at his home at West Newton, Mass., was President of the Chicago, Burlington & Quincy for 24 years up to 1901, when he resigned a directorship in the company until his death. The importance of this latter office, to Mr. Perkins' mind, may be judged from a piece of activity which has been made public only since his death. He had been made without his knowledge a director of a bank. The institution was not solvent and Mr. Perkins served as a director under protest. The bank failed and although he owned only $1,000 of its stock and accordingly was liable for but $20,000, he contributed $1,000,000 to reimburse depositors. This he did feeling that the use of his name on the list of directors had made him morally liable for losses sustained by those who may have been influenced by his presence on the board to deposit their money. Mr. Perkins was born in Cincinnati, Ohio, on November 24, 1840. All his railroad work was on the Chicago, Burlington & Quincy, where, although he held the highest operating offices, his work was primarily in the financial department. He began when he was 19 years old as a clerk in the office of the Assistant Treasurer of the Burlington & Missouri River (later merged with the Burlington). He was made cashier of the company and in 1862 was appointed Assistant Treasurer and Secretary. Three years later he was made General Superintendent. He served in this office for eight years and was then made Vice-President of the lines in Nebraska. In 1880 he was elected Vice-President and General Manager of the Chicago, Burlington & Quincy, at the time of the consolidation, and a year later was elected President. He retired from this office on February 20, 1901.

The Present Status of Mechanical Refrigeration in Railroad Work.

BY JOS. H. HART
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Mechanical refrigeration in the production of ice and cold storage is no longer a novelty in the industrial world to-day. Being a somewhat modern application, however, its development has steadily progressed with considerable change from time to time, so that there has been no opportunity for general standardization of plants as yet, and in some fields the development of this particular branch has scarcely commenced. This is particularly so in the railroad world. Mechanical refrigeration has proved its efficiency and ability in cold storage plants, department stores, hotels and in the large ocean steamers, both for freight and passenger service. However, in railroad work natural ice still holds its original position in the great majority of cases, in spite of the fact that in other departments it is hopelessly outclassed. The reason for this is not entirely clear. It is probably due to the fact that cold storage has been considered of minor importance in railroad transportation up to the present time, but this department of the business of a railroad is steadily becoming more and more important with enormous opportunities for profitable development in this field.

In order to understand the position of mechanical refrigeration in regard to natural ice, it must be remembered that both exist to-day on the market, in apparent competition. There exists, however, no real competition, in the strictest sense of the word. Artificial ice can be produced much cheaper than natural ice under almost any conditions. When the fact is considered that natural ice merely involves first cost on plant, cost of harvesting, storage and conveyance to the market, together with loss due to melting, this is no small achievement. Artificial ice can be produced in large plants readily at a cost of about 50 cents a ton, if the plant is of ordinary efficiency. In isolated cases this cost can be lowered as far as a minimum of 43 cents a ton, and this represents about the lowest limit. Thus, natural ice, except in a few isolated cases, where the cost of plant and equipment become practically negligible, is no competitor. The reason for the existence of natural ice in the market to-day, under any circumstances, is merely due to the fact that

sufficient artificial ice to satisfy the demand is never produced. Practically, artificial ice men have a ready market for their output at prices fixed to allow natural ice a reasonable profit. As an illustration of the remarkable progress of artificial ice to-day, and the inadequacy of the supply, it can be stated that over 4,000 new refrigerating plants were installed in the United States alone last year.

The situation in railroad work is essentially as follows: Natural ice is the chief source of cold storage here, and the competition with artificial ice in this department has not been as great as in other lines, owing to the fact that freight charges are generally negligible. Thus, ice is generally cut and stored at points along the railroad, wherever obtainable, and at the same time in locations suitable for utilization. When it is necessary to convey this ice to other points, the freight rate is not considered in the great majority of cases as a cost factor in its production. Thus, natural ice occupies a stronger position in the railroad world in regard to its competitor than in any other of its utilizations. That it is incorrect for the railroads to neglect freight rates on their own ice in a consideration of the cost of production is a foregone conclusion.

Another reason of considerable importance, tending to explain the backward position of the railroads in regard to mechanical refrigeration, is due to the fact that the applications of mechanical refrigeration for cooling purposes in railroad work are varied often almost as much as the different kinds of perishable freight. Further, mechanical refrigeration has been in a constantly changing development, and the manufacturers of refrigerating machines have readily found a wide open market without entering this field. The field is a difficult one to satisfy, since perishable freight requires different kinds of refrigeration for its transportation. Thus, most fruit cargoes require a temperature of about 60 deg. Fahr. maintained throughout transit for their best conveyance. Milk and dairy products suffer less when conveyed at a temperature of about 50 deg. Fahr. Meats and many additional provisions carry best below the freezing point, whereas eggs and other commodities utilize 35 to 40 deg., and are spoiled with much variation from this temperature. Again the nature of the business itself, namely, transportation, renders the application of mechanical refrigeration to cold storage when in transit a necessarily difficult matter. Thus, mechanical refrigeration loses a number of its advantages of direct application for a definite purpose, and generally wherever applied it has been as an intermediary in the process. The mechanical refrigeration has almost invariably been used to produce artificial ice, and this ice in turn used to produce the refrigeration, and hence it loses much of the economy due to its direct utilization. Hence, when all these conditions are considered, it is not surprising that mechanical refrigeration has found easier lines of development, and has not troubled the railroads to any great extent. To-day, however, mechanical refrigeration is applied in a number of developments of railway work. The United Fruit Company has a number of cooling plants in operation throughout the country for the refrigeration of its product in transit. A large number of railroads have cold storage houses operated by mechanical refrigeration in existence in the large cities for the storage of the perishable products immediately after transit. These houses, of course, in some places also utilize refrigeration in ice production, which sometimes finds its way into the cars in transit, but this is of comparatively minor significance in regard to the entire output. The Railway and Stationary Refrigerating Company utilizes mechanical refrigeration in car units for the conveyance of milk in the vicinity of New York, as has been said. This requires a temperature of about 50 deg. and has been fairly efficient in this application. The general development of single refrigerating car units has not progressed, however, to such an extent as at one time seemed inevitable. This is due almost entirely to mechanical difficulties. A refrigerating machine requires power and cold water for its operation, and considerable care in its maintenance. These three factors tend largely to eliminate the use of the unit car refrigerating plant. Ammonia is generally recognized as the best substance for the conveyance of heat in refrigeration and occupies a place analogous to water in the production of power in the steam boiler. However, the difficulties encountered in the use of ammonia, due to its high pressure and the large quantity of cold water required for its condensation, has resulted in the adaptation of other less efficient fluids for the operation of these machines in this field. Thus, in the example mentioned, methyl chloride is used as a refrigerating agent, with considerable saving in the design of the machine and the difficulty of maintenance, but with a remarkable diminution in efficiency in comparison to the ammonia type. The fact that this substance can be used in this application with any degree of success whatever speaks volumes for the availability of refrigeration in this field.

Among the other points which apply throughout the development in the application of mechanical refrigeration in this field is the fact that a large number of different types of refrigerating machines and systems are used. Thus, there are in existence to-day refrigerating machines using three different principles in their operation. The air machine, which uses air, either at atmospheric pressure or under pressure and cools the same by causing the compressed air to do work, thus changing the heat in the air into work, which is taken out, leaving the air cooled. Air as low as 140 deg. Fahr. below zero has been obtained readily by this method. This machine is often convenient on shipboard where the use of ammonia or other refrigerating substances may prove undesirable, but it is clumsy and inefficient in operation, and the first cost is from two to three times that of an ammonia machine. In addition, it never exists in large units, and all statements which have ever been made in regard to increased efficiency of large plants over small ones in any field whatsoever almost without exception apply equally in this field.

The liquifiable gas machine utilizes the latent heat of vaporization of water liquids for the production of cold. Thus, in order to make water boil, heat must be applied. If the water can be made to boil without this application, heat is taken from the water itself with a consequent cooling effect on the water. The boiling point of water is too high to use in this application, hence a class of substances known as volatile liquids are used. Ammonia, sulphurous acid, methyl chloride, benzine and a large number of other substances have been used. Even gasolene has been developed as a refrigerating agent in this field. The material produces the refrigeration automatically by boiling away, if its boiling point is below the temperature of surrounding bodies.

The sole end of the machinery in mechanical refrigeration as developed in this type is for the purpose of saving and reutilizing the refrigerating material. As has been said, ammonia is by long odds the most efficient agent for this purpose. It operates, however, at about a pressure of 180 lbs. for the regeneration device, and this has been a serious objection to its utilization and development in the unit car system. The regeneration of ammonia is accomplished in two ways, by means of a compressor, which compresses the exhaust gas until it attains a condensing temperature and pressure above that of the atmosphere, whereupon it is spontaneously condensed. The absorption machine, on the other hand, utilizes the absorption power of water for ammonia gas and the loss of this power with rise in temperature to produce the same effect. Regeneration is accomplished by the application of heat to the mixture with the evolution of the gas at a temperature and pressure sufficient to permit condensation.

Now these two types, the ammonia compression and absorption machines, are the only really efficient types on the market. The compression machine is much simpler in theory and operation, but has considerable less efficiency in the actual process of production than the absorption type. This latter has comparatively few moving parts, is almost automatic and is generally installed in large units.

In the application of mechanical refrigeration in railroad work, not only must all of these types be considered with their relative efficiencies and various advantages for different purposes, but a host of other conditions arise, since the mere installation of a refrigeration plant at certain localities along a railroad is not the accomplishment of transportation of perishable freight. As has been said, the cheapest and best method of applying this mechanical refrigeration has been through the production of ice as an intermediary. Further, the efficiency of the various types of refrigerating machines depends almost absolutely upon the duty they are to perform. Thus, the compression machine is superior for mild refrigeration, whereas the absorption is infinitely superior for sharp or extreme refrigeration. In the production of ice the absorption is superior, depending only upon the size of the plant. For large plants its relative efficiency increases almost in direct proportion to the size of the plant. The use of ice as an intermediary involves a selection from several different methods for its production. All these factors must be considered in the installation of mechanical refrigeration in railroad work. Further, its situation with respect to available coal and water is a matter of much importance, and many of the large refrigerating plants in large cities have their scale of profit dependent almost absolutely upon this supply and the temperature of the water. Large quantities of cold water are required in the operation of a refrigerating plant of any type, and it can be said in a general way, the more water and the colder it is the greater will be the efficiency and the profit resulting in mechanical refrigeration.

Individual unit refrigerating cars probably will never attain any great amount of success. A refrigerating machine is a complicated mechanical mechanism and requires care and attention, and practically all automatic machines at present on the market have proven failures at the present stage of development. With the large variations in mechanical refrigeration design and its various applications in transportation, the use of ice or possibly cold brine as an intermediary in the application of the refrigeration is extremely probable in this field. The chief development in railroad work of this department will be in the construction of larger and larger refrigerating units, with special care paid to the distribution of these units, not only in respect to freight transportation, but also cost of production of refrigeration, not only from a coal and water consumption viewpoint, but also from a cost of handling the refrigerating material and making it available in transportation. Many

improvements are possible in this line, and it is unfortunate that the great majority of railroads do not consider the mechanical end at all in the installation of such plants. They appear to be interested merely in the transportation end of the business and the two are so irrevocably connected in this particular field that it is not surprising that the results obtained in the present actual developments have not been as satisfactory as could be desired.

Ten-Wheel Locomotive with Superheater for the Canadian Pacific.

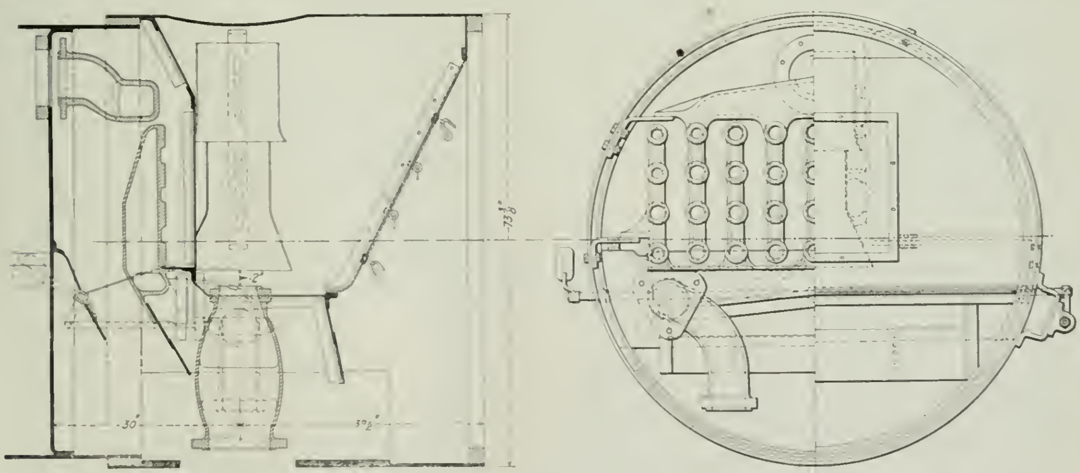
The Canadian Pacific has been the pioneer in the introduction of the superheater on American railroads. In April, 1906, H. H. Vaughan read a paper on the subject before the New York Railroad Club, an abstract of which was printed in the *Railroad Gazette* of April 27, 1906. At that time there were nearly 200 locomotives in service or on order with superheaters, the majority being fitted with the Horsey-Vaughan type which has been developed on the Canadian Pacific. It resembles the Schmidt firetube superheater in the general principle of a return tube for the steam located in the fire tube. In the newest ten-wheel engine, shown in the accompanying illustration, the arrangement of the front end is essentially the same as in the design of a year ago. A header taking steam from the dry pipe is placed just back of the petticoat. Steam enters the top of this header and passes out through solid drawn, weldless steel tubes having an inside diameter of $^{15}/_{16}$ in. These tubes are upset at one end and are forged and bent by a bolt header and bending machine to the shape shown. They are connected by bronze union nuts to special cast-steel fittings which screw into the header; a $^{1}/_{16}$-in. copper gasket being used in the union nut. These small tubes extend into large 5-in. superheater firetubes to within about 30 in. of the back tubesheet, where they connect with heavy cast-steel return bends. The steam returns from the return bends through $1\frac{1}{4}$-in. tubes which connect through union nuts and special cast-steel fittings similar to those mentioned above, with the fingers of the bottom header which is shown in detail. The steam pipes which connect this header with the cylinder casting are very short and there has been no difficulty in keeping the joints tight. Each large superheater firetube contains two of the small tubes from the top header and the corresponding tubes to the bottom header. The return bend has lugs cast on it which space it properly from the sides of the large tube and the other set of small tubes so that there is a uniform circulation space about them all.

The gases as they leave the superheater firetubes enter an enclosed space that is controlled by a damper. When this damper is closed there is no circulation of gas through the tubes and danger of burning is obviated by so closing it when steam is shut off.

As a result of the work that has been done with the superheater on the Canadian Pacific there has been a lowering of the steam pressure on these engines with a corresponding increase in the size of the cylinders. This is in accordance with the possible economies that have been outlined from time to time since the subject of high steam pressures and the use of superheated steam has been under discussion. It is also expected that this reduction will result in the lessening of boiler troubles.

Ten-Wheel Locomotive with Superheater; Canadian Pacific Railway.

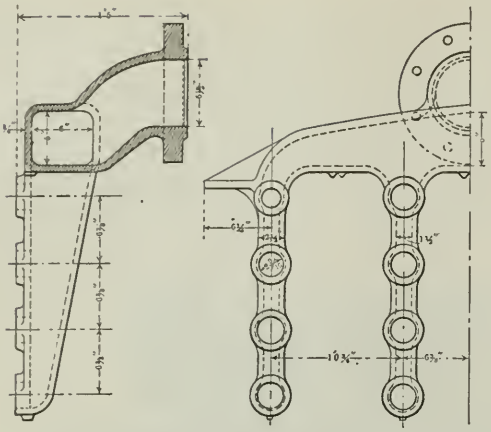
The engines illustrated, which were built by the Locomotive & Machine Co., of Montreal (American Locomotive Company), are practically identical in design with a previous order, also equipped with superheaters, built by the same company for that road, except for an increase of $1\frac{1}{2}$ in. in the diameter of the cylinders and a reduction of 20 lbs. in the boiler pressure. In working order they have a total weight of 192,500 lbs., of which 142,500 lbs. is carried on the driving wheels. The cylinders are $22\frac{1}{2}$ in. in diameter by 28 in. stroke, and with driving wheels 63 in. in diameter and a working pressure of 180 lbs., the engines have a theoretical tractive power of 34,410 lbs.



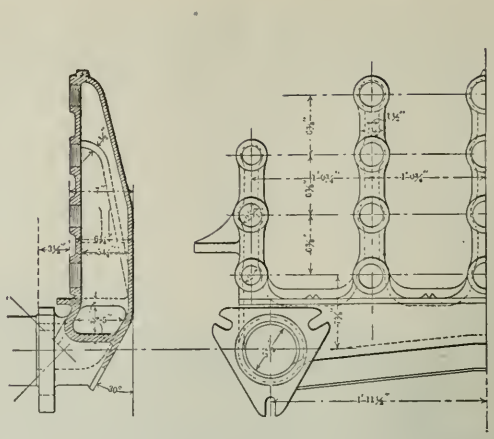
Smoke Box Arrangement with Superheater; Canadian Pacific Railway.

The boiler is of the wagon top type, the outside diameter of the first and smallest course being $70\frac{5}{8}$ in. It is fitted with 240 boiler tubes, 2 in. in diameter, and 24 superheater firetubes 5 in. outside diameter. The total heating surface is 2,403 sq. ft., of which the tubes contribute 2,237 sq. ft. and the firebox the remainder. The firebox is $102\frac{1}{8}$ in. long and $69\frac{7}{8}$ in. wide, and has a grate area of 50 sq. ft.

These dimensions and this data take on a new significance when the ratios that are given in the table to follow are compared with



Top or Saturated Steam Header for Vaughan Superheater; Canadian Pacific Railway.

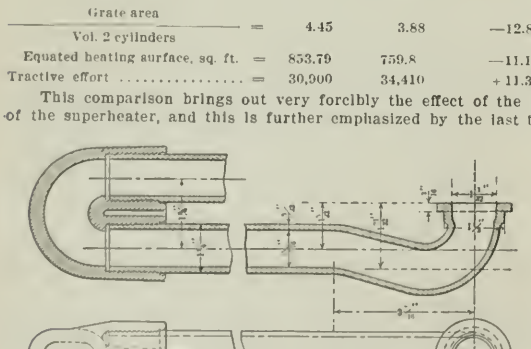


Bottom or Superheated Steam Header for Vaughan Superheater; Canadian Pacific Railway.

those of engines built along the usual lines. There are two influences that predominate in these changes of ratio: the diameter of the cylinders, and the reduction of the heating surface by the use of a fewer number of large tubes. To make a specific comparison, take the ten-wheel (4-6-0) locomotive for the Chicago & North-Western illustrated in the *Railroad Gazette* of July 5. That engine has approximately the same weight on drivers (134,000 lbs.), and is the same type of locomotive. The ratios are, however, quite different. For example:

		C. & N.-W., without superheater.	C. P. R., with superheater.	Difference in per cent. Chic. & N.-W. as base.
Weight on drivers / Tractive effort	=	4.37	4.14	— 5.27
Tractive effort x diam. drivers / Heating surface	=	666.0	901.4	+ 36.57
Heating surface / Grate area	=	64.0	48.1	—24.85
Weight on drivers / Heating surface	=	46.0	59.28	+ 28.52
Total weight / Heating surface	=	59.48	80.09	+ 51.39
Volume of 2 cylinders, cu. ft. / Firebox heating surface	=	5.09	7.00	+ 37.52
Heating surface / Vol. 2 cylinders	=	284.0	186.72	—34.25
Grate area / Vol. 2 cylinders	=	4.45	3.88	—12.81
Equated heating surface, sq. ft.	=	853.79	759.8	—11.11
Tractive effort	=	30,900	34,410	+ 11.36

This comparison brings out very forcibly the effect of the use of the superheater, and this is further emphasized by the last two



Superheater Tubes with Upset Ends and Return Bend Connection; Canadian Pacific Railway.

figures of the table where it appears that with 11.36 per cent. more tractive effort the engine with the superheater requires 11.11 per cent. less equated heating surface. All through the list the differences will be surprising to those who have not already made similar comparisons. And it must be remembered that these ratios and dimensions are not the result of theoretical calculations based upon assumptions, but are those that actual practice has found to be such that satisfactory and economical results will be obtained in the every-day working in regular service. And whether it is conceded or not that the superheater is an economical device to apply, when everything is taken into consideration, these figures are at least an interesting exhibition of what can be done.

The following are some of the principal dimensions of these engines:

Cylinders, diameter			22½ in.
Piston stroke			28 "
Wheel base, driving			14 ft. 10 "
" total engine			26 " 1 "
" engine and tender			54 " 6½ "
Weight in working order, drivers			142,560 lbs.
" " " "	engine		192,520 "
" " " "	engine and tender		318,830 "
Heating surface, tubes			2,237 sq. ft.
" "	firebox		166 "
" "	arch tubes		2 "
" "	total		2,405 "
Grate area			50 "
Journals, main driving			9½ in. x 12 in.
" trailing, driving			9 " x 12 "
" engine truck			6 " x 10 "
" tender			5½ " x 10 "
Steam pressure			180 lbs.
Firebox, length			102⅛ in.
" width			69⅞ "
" thickness crown and back sheets			8 in.
" " side sheets			5-16 in.
" " tube sheet			½ in.
" water space, front			5 in.
" water space, back and sides			4½ "
Tubes, number			240
" number, superheater			24
" length			14 ft. 4 in.
" diameter			2 "
" diameter superheater			5 "
" material superheater			Manseman steel
" thickness			No. 11, I. W. G.
Tank capacity, water			5,000 gals.
Tank capacity, fuel			10 tons
Valve, travel			6 in.
" lap			⅞ in.
" exhaust clearance			1/32 in.
" lead			0
Wheels, diameter, driving			63 in.
" " engine truck			31 "
" " tender			34 "
Tractive effort			34,410 lbs.

Weight on drivers / Total weight = 74.04*

Total weight / Tractive effort = 5.59

Tube heating surface equated to firebox heating surface (Vaughan formula.) ..... 591.8 sq. ft.

Ratio of equated to actual heating surface..... 1—3.16

*Per cent.

Cost of Ballasting Old Track and Renewing Ties.*

On a northern division of the Chicago & North-Western, to ballast a mile of track with unscreened and unwashed gravel, as it comes from the pit, for a 12-in. raise, with a standard gravel roadbed of 11 ft. 6 in. on the top, slope 1½ to 1 on the bottom, 16 ft. from bottom ballast line to ballast line, the cost is as follows:

Cost of gravel loaded on cars in pit, per cu. yd.	$0.07
Hauling and unloading, 50 mile haul	.10⅔
Ballasting	.12⅓
Total cost, per cu. yd.	$0.30

*A committee report to the Chicago convention of the Roadmasters' and Maintenance of Way Association.

At 3,400 cu. yds. per mile, it will cost $1,020 for one mile of finished work with this kind of ballast.

For tie renewals in this ballast, 425 ties per mile, evenly distributed over the entire mile, where track is in such condition that re-surfacing is not necessary and the old ties have to be dug out of the roadbed and new ties inserted, properly tamping with either tamping bars or picks, the roadbed properly dressed and old ties gathered up and neatly piled, it will cost 16½c. per tie.

On a division of the Lake Shore & Michigan Southern for the year 1906, the cost of ballasting with washed gravel and with broken stone was as follows:

Gravel washing and loading, per cu. yd.	$0.18
Hauling, per cu. yd.	.07
Digging out old ballast, per cu. yd.	.15
Unloading and placing in track, per cu. yd.	.15
Total, per cu. yd.	$0.55
Crushed limestone, ¾ to 1½ in. in size	
Cost of stone, per cu. yd.	$0.535
Digging out old ballast, per cu. yd.	.15
Hauling, unloading and placing in track	.40
Total, per cu. yd.	$1.085

Renewing ties cost $0.138 per tie in gravel ballast.

On a division of the Santa Fe the cost was:

Crushed stone, at crusher, loaded on cars, per cu. yd.	$0.61½
50-mile haul, per cu. yd.	.05½
Inserting (Mexican labor)	.333
Total cost, per cu. yd.	$1.00

For a 12-in. raise 3,400 cu. yds. are required per mile, making the total cost per mile, $3,400.

This road tried sloping the ballast, with a scant shoulder, for several years, but found it impossible to keep the track in line and surface. It therefore changed to the present standard, which requires the ballast dressed level with the top of the ties for the full length of the tie and extending 6 in. beyond the ends of the ties, making the top width of the ballast 9 ft. and giving it a slope of 1¾ to 1; this gives a roadbed 16 ft. wide from ballast line on one side to ballast line on the other side, with a 12 in. raise. Center-drop Rodger ballast cars, 80,000 lbs. capacity, drop the ballast in center of track and a center plow is used to plow the ballast off the track, leaving the track clear. The $3,400 per mile covers all costs for the ballast and inserting the ties, using not more than 425 ties per mile. It is very expensive work renewing ties in track that has been ballasted in this way. Renewing ties in the track where it is up to grade and cannot be given a raise, costs about 25c. per tie to renew the ties. It costs approximately 25c. to dig out an old tie, insert the new one, tamp it up properly, spike it and dress the track up in first-class shape. Where the track has to be re-surfaced the old tie can be removed and the new one inserted for about 8½c. per tie.

The report is signed by A. E. Hansen, Chairman; C. Buhrer, J. W. Guffey.

Automatic Block Signals on the Philadelphia & Western.

The General Railway Signal Company of Rochester, N. Y., which has put in automatic signals on the above named railroad, has issued a description of the apparatus, from which we take the following account. The installation is in many respects like that furnished by the same company for the Electric Zone of the New York Central.

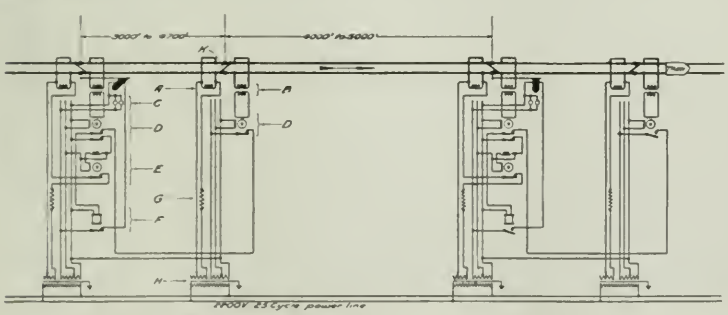


Fig. 1—Circuits.

This road is a double track, high-speed, direct-current electric line from 69th street, West Philadelphia, west to Strafford, Pa., 11½ miles. Both rails of each track are used for the return of the propulsion current and there is cross bonding between all rails of both tracks at the ends of all track circuits and from one rail of each track to one of the other track at some places intermediate between the ends of said sections. Ironless reactance bonds are used, permitting very long track circuits to be operated with a minimum expenditure of energy. Alternating currents are used for the track circuits and for the operation of all the devices connected with the system, thus doing away with all batteries.

There are on the line nine block sections on the eastbound track and nine on the westbound. The four long sections are made up each of two track circuits with relays in the middle.

Single arm, two position home signals are used, arranged normally clear, with an overlap between West Philadelphia and Beechwood Park, 2½ miles, the signals average about 3,300 ft. apart and a full block overlap is employed, permitting a two minute time interval. West of the park the signal spacing averages 1½ miles with a uniform overlap of about 3,700 ft., allowing trains to follow one another at five minute intervals.

Twenty-five cycle single phase alternating current is used for the operation of the entire signal system. It is obtained from the secondaries of the railroad company's power transformers at Beechwood Park. Two feeder circuits run in either direction from the power house. Power is delivered to the switch-board through a remote controlled automatic oil switch. Each feeder circuit is equipped with an ammeter and an electrically tripped, hand operated oil switch whereby the system may be relieved in case of a cross on either transmission line. The transmission line consists of two No. 6 B. & S., hard drawn bare copper wires strung on cross arms (used only for these) on the railroad company's high tension pole line. The line is protected at intervals by suitable lightning arresters.

"Line transformers" are installed at all signal and overlap locations. They step down directly from the transmission line voltage of 2,300 to the various voltages required for the signal system. These transformers are protected on the primary side by suitable cartridge fuses mounted in water-tight cast-iron boxes and so arranged that a fuse can be replaced without danger. The secondary windings are three in number, a 55-volt winding for the operation of the signal motors, lights and line relays, and provided with a tap for the local phases of all polyphase relays and two windings for supplying energy to the track circuits, taps being provided on these windings so that the voltage can be varied from 2½ to 15, as required for track circuits of different length. A copper shield is placed between the primary and secondary windings and connected to ground, affording protection in case of a breakdown in insulation. These transformers are made with great care. All coils are insulated with an oil and moisture resisting compound by the "vacuum treatment" process, in which the coils are heated in an air tight tank. After a vacuum has been secured and the moisture thereby extracted, insulating compound is forced into the coil under heavy pressure, which causes the liquid to penetrate to the heart of the coil, with the result that every individual wire is surrounded with a covering of high insulating power.

Both rails of each track are made available for the propulsion current by the use of ironless "reactance bonds" connected to the rails as shown at A and B on the circuit plan, Fig. 1. When so connected they form a path of low ohmic resistance and large current capacity for the traction current, while at the same time they offer an impedance to the passage of the alternating current from rail to rail. The reactance bond A at the transformer end of the track circuit has a single winding connected directly to the rails. The bond B at the other end of the circuit has two windings, one connected to the rails and the other directly to the relay. The winding connected to the relay acts as the secondary of a transformer, its object being to prevent an excessive flow of direct current through the relay which, owing to the low ohmic resistance of the relay, would otherwise result were the relay connected directly to the track rails. As these bonds are of the ironless type they are not subject to saturation due to an unbalanced condition of the traction current in the rails, and their reactance remains constant under all such conditions. Alternate rails in adjacent track circuits are connected by heavy "diagonal bonds" K so arranged that the breaking down of any insulated rail joint will short circuit either the relay or the transformer and prevent the giving of a false clear indication. Cross bonding between tracks may be effected by making connection, at any point desired, to the rails which are made continuous by the diagonal bonds K.

The reactance bonds are made up of flat copper strips of large cross section wound in the form of a spiral, the turns being suitably insulated from each other. The coils when wound are heavily taped and then "impregnated" as in the case of the transformer

coils. These coils are assembled in pairs in flat iron cases and mounted on extended ties. A connecting chamber is provided in the case between the coils in which all the coil ends terminate and where all connections to the rails, relays and transformers are made and then concealed by a suitable cover. The copper connections to the rails after leaving the bonds go directly downward and under ground to the rails where, after passing for a short distance above ground to insure flexibility, they are connected to the rails. This construction conceals the copper as much as possible and reduces theft to a minimum. Energy is supplied to the track circuits directly from the low voltage high current windings on the line transformer through adjustable cast-iron resistance grids which limit the current flow when a train is standing at the transformer. These grids are mounted in separate perforated cast-iron boxes.

The track relays are shown at D. The various moving contacts are mounted on a horizontal wooden bar to which motion is imparted by means of a small split phase induction motor having two stationary windings. One winding is connected directly to the reactance bond secondary, as shown in Fig. 1, and the other directly to a low voltage tap on the line transformer. When thus connected, a phase difference exists between the two coils and rotation of the armature is thereby produced.

Of the energy in the two relay windings, that supplied by the transformer direct is by far the greater. This requires but a small amount of energy from the track to give positive action of the relay and as a result very long blocks can be operated with a comparatively small amount of energy, as evidenced by the fact that track circuits 8,800 ft. long are operated with energy fed in at one end. Alternating current only can cause the relay to operate and hence it is absolutely immune to the effects of direct current. All contacts and other working parts are made visible by means of glass covered openings, and the case is made water tight by the use of rubber gaskets. These relays are thoroughly reliable, positive in action and give an exceptionally heavy rubbing pressure between the contacts in closing and an extra wide opening when de-energized. Contacts can be provided, as required, up to a maximum of four front and four back per relay. They are insulated to withstand a breakdown pressure of 3,000 volts alternating.

The function of the track circuit control relays, as shown at E, is to hold a given signal at stop until the train is out of the overlap for the next signal in advance. These relays have to carry continuously and break the entire current flowing to the track circuit at the rear of a signal, and of course must continue to do so without injury. They will actually carry an alternating current of from 50 to 75 amperes and break the same at 25 volts continuously without overheating and without perceptible arcing; but the current required to be carried in practice is much less than this. The construction and operation of these relays is similar to that of the track relays except that the contacts are made very much heavier and the necessary phase displacement to produce rotation is effected by a small reactance coil, placed in series with one of the relay windings.

Polyphase relays can be adapted to a variety of uses by the mere changing of the windings or contacts or by the addition of stock parts. When wound to a low resistance they may be used as track relays with contacts to the number of four front and four back, and when equipped with heavy contacts they can be used for the control of low voltage heavy currents, all as described above. When equipped with carbon to carbon contacts they will break small currents of high voltage (up to 600). When wound to a high resistance they may be used as line relays with any reasonable equipment of contacts desired. By adding an upward extension to carry a miniature semaphore arm they can be used as tower indicators and, when placed in a suitable case, as switch indicators.

The movements when placed in a suitable case and equipped with a shutter and suitable contacts can be used as light signals in tunnels. Furthermore, the feature which this relay possesses of operating in one direction with a given phase relation and in the opposite direction when said phase relation is reversed, and since a given reactance or resistance is necessary to produce rotation in a given direction, the possibility of false operation due to foreign currents or crosses is much more remote than in the case of direct current relays and other designs of a. c. relays. This feature also makes it possible in many cases to use but one line wire where two would otherwise be required.

The motor control relay shown at F is controlled by the three track circuits in advance of a given signal in such manner that it cannot close until the train is out of the overlap for the next signal in advance. This relay directly controls the clearing of the signal and is of the alternating current tractive type. It is so designed that a uniform magnetic pull is exerted on the armature notwithstanding the fact that the current in the magnetic coils alternates.

The signal mechanism is operated by a small single phase induction motor which is connected through suitable gearing to a "slot wheel." Projecting from the sides of the slot wheel are pins which as they come around engage the "slot dog" so as to clear the signal in case the slot is energized

The slot magnet is designed to operate on alternating current and to give a uniform pull without noise or vibration. It has a high "drop away" point.

The movement of the blade in clearing is limited by the "stop arm." The arm is brought precisely to, and held at, the clear position no matter what the speed of clearing. The circuit breaker contacts are enclosed in a dust proof case with a glass front, which is mounted at the top of the mechanism. The dash pot is of the "buffer type," allowing a free initial movement of the blade in returning to the stop position. All signals are lighted by two 4 c.p., 50-volt lamps in multiple. All relays are housed in wooden boxes which in turn are enclosed in cast-iron boxes.

Keeping Track in Line and Surface in the Winter.*

I knew track, laid upon a sub-grade of deep uniform red clay, which heaves high in the winter, but requires very few shims because the heaving is uniform. This material heaves excessively, as is proven by the fact that it rises at the ends of a spot where some special cause dries the clay and reduces the quantity of moisture which it contains. For instance: A large steam pipe was carried in a box under the track where the soil was of this kind. The heat from the pipe prevented heaving at that point, but on each side of it the track rose several inches above the level of the ties over the pipe, making an abrupt drop in surface over the latter spot. This spot was shimmed every winter, as the difference in height was sudden and severe enough to break an engine frame or cause other damage. When the frost came out of the ground in the spring the level of the track on each side of the pipe gradually subsided until it was the same as that over the pipe; when this occurred the shims were withdrawn. The thickness of the shims was gradually increased while the frost was entering the ground, and reduced while it was leaving.

In territories where the soil varies greatly in character—sandy, gravelly, various kinds of clay and loams, marshes, quick-sand, wet and dry cuts, springy soil, etc.—much shimming is required. In January, February and March frost enters the ground to a depth of from 3 to 6 ft. and maintenance of line and surface becomes difficult. In such territories it is a common thing for 5 or 6 ft. of track to rise, in a single day or night, 1 or 2 in. above the normal level. It is not uncommon to have a continued rise within a distance of 10 or 15 ft. that will, in a few days, reach a maximum of 5 or 6 in.

Of course, it is out of the question to run trains safely at schedule speed over such abrupt and excessive humps. Gradual run-offs must be introduced on either side of the high spots. But the ties being frozen solidly in place and the ballast frozen so solidly together that it can only be picked in irregular sized hard lumps unsuitable for surfacing, it is manifest that making a run-off as it would be done in summer is both impracticable and expensive. Again, when spring arrives this would make soft, mushy spots at the worst period of the year's work. The ties, if adzed to reduce the height of the rails at the point of heaving, would be ruined. So, in such cases it is customary to raise the run-off by drawing the spike on each side of the high spot, letting the rails spring up part way to surface, then introducing shims between the rails and the ties until a run-off of fairly uniform surface is provided. The rails then being raised, as it were, upon pedestals, are not so strongly held to gage as when resting upon the ties and are braced on the outside with special braces, usually devised by the foreman or roadmaster to fit the individual case.

Shims are sawed from hard wood, seasoned and clear. They are bored with holes for the spikes, which are staggered, there being sometimes two holes, sometimes four, to fit different widths of rail base. For shimming to a raise of ¼ in. the shims should be 4½ in. x 8 in.; for a raise of ½ in. up to 1¾ in. the shim should be 5 in. x 8 in. Above that height, up to 3 in., the shim should be 5 in. x 12 in. When necessary to shim 4 in. or higher a plank of about the same area as the surface of the tie, and extending almost or quite the length of the tie, should be used, fastened to the tie with boat spikes. The rails should be spiked through the shims to the ties with 8-in. spikes, which are longer than ordinary track spikes. For the planks referred to, they should be 8 in. long, or 2½ in. longer than ordinarily. To brace the rails on shims cut a light notch outside of the rail transversely across the tie, put a shim 2 or 3 in. thick with one end against the shoulder of the notch and the other a close fit at the fillet where the head and web of the rail meet, and drive 8-in. spikes into the tie at the lower end of this makeshift brace.

The foregoing has reference to ways and means to do things that it really ought not to be necessary to do. In other words, these are ways of meeting conditions that ought not to exist. The better way to maintain line and surface in winter is by proper drainage.

*A report presented to the Roadmasters' and Maintenance of Way Association by C. H. Cornell, Roadmaster of the Ashland Division of the Chicago & North-Western.

A Large Hydraulic Dredge.

The dredge illustrated herewith is a large and powerful machine built to the order of the Commissioners of Lincoln park, Chicago, to be used for filling in the new park extension to the north of the present park. The plan is to reclaim from Lake Michigan an area approximately 1,500 ft. wide by about a mile long by enclosing it with a stone revetment or breakwater and filling in behind it with

Hydraulic Dredge Francis T. Simmons, at Work.

material taken from the bed of the lake. For much of the distance the breakwater lies in 18 ft. of water and the total volume of fill is about 4,000,000 cu. yds. The breakwater is now partly completed and is made of stone from the spoil-banks of the Chicago drainage canal. A fleet of large scows and several powerful tugs bring the stone from the canal by way of the Chicago river out into the lake and to the site of the work.

The conditions surrounding the dredging and filling were difficult and peculiar. The work had to be done in deep water and exposed to the storms of Lake Michigan, which often rise with suddenness and severity, and the soil to be dredged consisted of the tough blue clay which underlies the Chicago area, compacted by the storms of the lake and mixed with more or less gravel and stones. The ordinary hydraulic dredge as used on the lakes was unsuitable because of unseaworthiness and because it could only deal effectively with soft material. The usual floating pipe-line connected by rubber sleeves and mounted on a number of small scows or floats would be disabled by every windstorm.

The economy of the hydraulic process of dredging and filling, if it could be successfully applied, led Francis T. Simmons, President, and R. H. Warder, Secretary, of the Park Commission, to pursue the subject further to see if these difficulties could be overcome, and they commissioned A. W. Robinson, M. Am. Soc. C. E., to examine and report on the conditions, and if possible to design a dredge that could cope with the difficulties presented. Mr. Robinson had previously designed and built several large hydraulic dredges, notably the "Tarte," which is employed in dredging clay from the bed of Lake St. Peter in the River St. Lawrence, and which is provided with a special pipe-line for withstanding heavy storms. This dredge is of great power and holds the world's record for output, having dredged 750,000 cu. yds. in a calendar month and delivered 2,000 ft. The original pipe-line of this dredge is still in use after five years.

It was, of course, realized that Lake Michigan during a storm would be too rough to attempt continuous dredging operations, and that the most that could be done would be to provide a plant of large capacity, so that the required output could be made after making allowances for weather interruptions, and also seaworthy enough to increase the working time to the largest possible amount. It should also be designed for safe and rapid picking up of anchorages and pipe-line in case of storm and to safely withstand any rough weather when not working. To meet these conditions Mr. Robinson designed the dredge now on the work, which was built by the Atlantic Equipment Company, 111 Broadway, New York, and put in service in June, 1907.

The hull is of steel, 148 ft. long, 38 ft. wide by 10 ft. 6 in. deep. The main pump has 30-in. suction and discharge, and the main engines are of the triple-expansion marine type of 1,200 I.h.p. There are two double-ended marine boilers 11 ft. 6 in. diameter by 18 ft. long, with eight corrugated furnaces. The installation of engine-room auxiliaries, such as condensing apparatus, pumps, electric light, is complete and well arranged, the engine-room space, in fact, resembling a small ocean liner. On the upper deck is a pilot-house with large plate-glass windows, where all the levers which control the operation of the dredge are arranged. Here are also pressure and vacuum gages for all purposes, indicating exactly the work that is being done.

The suction-pipe is carried by a very strong steel frame and is fitted with a powerful cutter for digging the clay. This cutter is an improved development of a number of earlier machines, and has demonstrated its efficiency by being able to handle the heaviest clay up to the full capacity of the pump. It is 9 ft. in diameter and weighs about nine tons, being formed of eight steel blades of peculiar curvature cast in one piece and having renewable hard steel cutting edges attached. The mechanism for driving and feeding this cutter is very powerful. The secret of success of this dredge is that the excavation of the stiff clay is done by an efficient cutting tool that will not clog and provided with a powerful feed, the main pump being only employed for transportation of the spoil. A capacity rate of 3,000 cu. yds. per hour has frequently been reached in clay, the entire under side of the discharge appearing as continuous slices of blue clay, some of the pieces being 4 or 5 ft. long.

One of the most difficult problems to be dealt with was the floating pipe-line. This is the most seaworthy pipe-line on the lakes, and is formed of semi-submerged steel pontoons about 100 ft. long, connected by ball-and-socket joints having spring connections of great strength. Long lengths of pontoon were necessary to give steadiness in waves, and a yielding connection was essential to relieve the joints of the great stresses due to surging. The springs are of locomotive drawbar size and are arranged in a manner similar to railroad car draft-rigging. There are also tension and compression springs to control the side deflection of the joint. In wave action this pipe-line is very satisfactory. A special flange connection is provided at the dredge, so that the pipe-line can be instantaneously disconnected from the dredge at any time by pulling out a toggle-lever. On several occasions when it became too rough for the

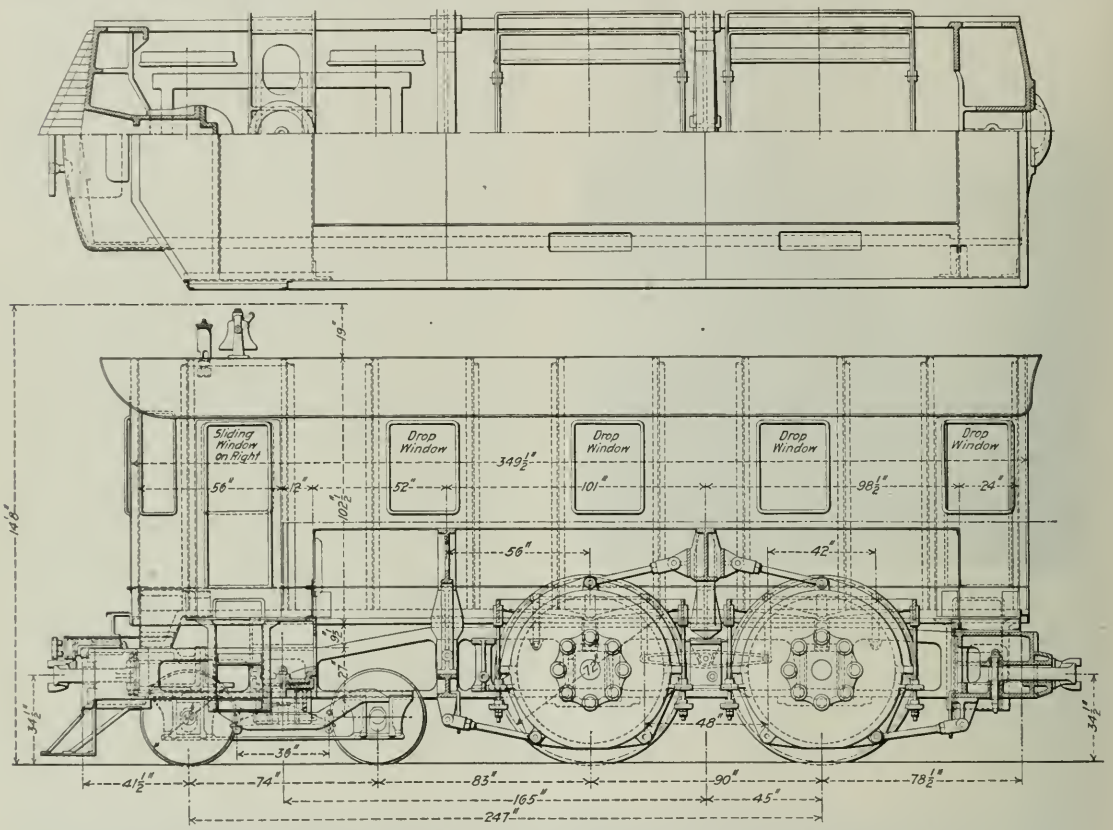
Hydraulic Dredge Francis T. Simmons, Built by Atlantic Equipment Company for Lincoln Park Commissioners, Chicago.

dredge to work, owing to the difficulty of discharging over the breakwater, the pipe-line was discontinued and towed to harbor by a tug through a rough sea which broke over both tug and pipes continuously, with no harm whatever to the pipe-line. These occasions, however, are relatively rare, and the operation of the dredge has proved not only that the clay of the bed of Lake Michigan can be dredged by this method, but also that the seaworthiness of both dredge and pipe-line is sufficient to reduce the delays on account of weather to a comparatively small amount.

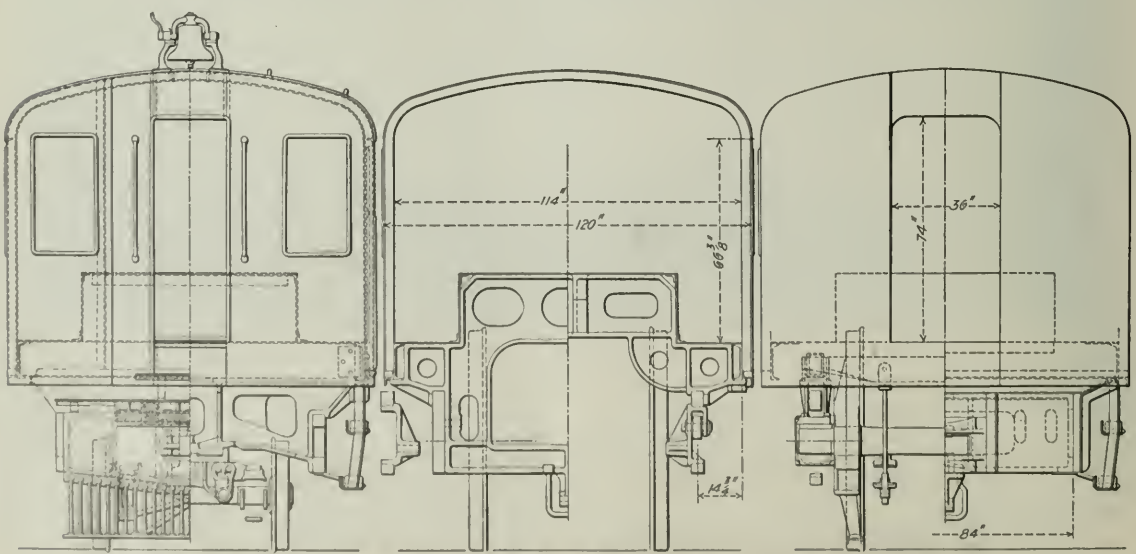
The dredge is named the "Francis T. Simmons," and its operation is in charge of Murphy & Barrett, contractors.

Electric Locomotive for the Pennsylvania Railroad.

The Pennsylvania is now testing, on the West Jersey & Seashore division, three electric locomotives with a view to determining the track stresses and other questions in heavy electric traction. One of these, No. 10,001, built at Altoona, is a single-reduction,



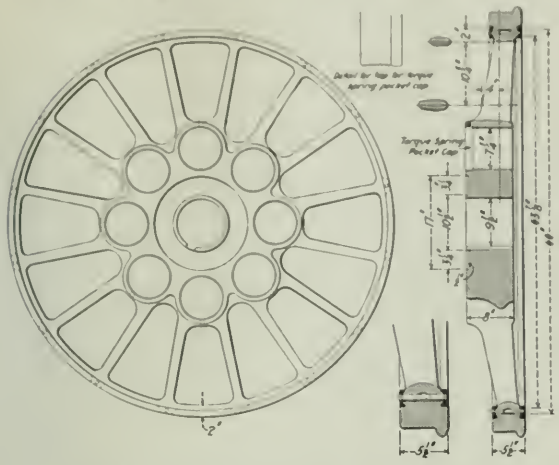
Plan and Side Elevation of Experimental Single Phase Electric Locomotive; Pennsylvania Railroad.



End Elevation and Cross Section of Single Phase Electric Locomotive; Pennsylvania Railroad.

direct-current geared type; another, No. 10,002, built at Altoona, is direct-current gearless, the third, No. 10,003, built by the Baldwin Locomotive Works, is alternating current gearless, and is shown in the drawings herewith. This Baldwin design is intended as a unit, one-half of an articulated locomotive adapted to handle a 400-ton passenger train, but complete in itself.

It is interesting to note that in the development of the electric locomotive, comparatively little attention has been paid to the experience of steam locomotive builders, and many provisions that these designers consider essential to satisfactory operation have been ignored. The electric locomotive has been looked upon merely as a vehicle on wheels, all of which could be used for driving purposes, and it has, therefore, apparently followed the lines of the street car design, from which it was directly evolved rather than those of the steam locomotive which it is intended to supplant. The axles are set in the frame and the wheel arrangement resembles that of European locomotives in the absence of the leading truck.



Driving Wheel of Single Phase Electric Locomotive.

The truck has been characteristic of and considered a necessity for the American engine since the early days, but was very slow in gaining recognition and adoption abroad. The design for the New York Central electric locomotives included a two-wheeled truck at each end, and then, after the Woodlawn derailment of last winter, a four-wheeled truck was put upon one locomotive for experimental purposes. The New York, New Haven & Hartford locomotive, on the other hand, is merely a short, heavy car carried on two bogie trucks. This engine should evidently have the same flexibility of motion as an ordinary double-truck motor car.

An entirely different view of the problem has evidently been taken in the latest design of electric locomotive built for the Pennsylvania Railroad by the Baldwin Locomotive Works, which is now being tested on the West Jersey & Seashore. In this electric locomotive the wheel arrangement of the American (4-4-0) has been followed; an arrangement that was so long and so successfully used in high-speed passenger service, and afterwards amplified for heavy trains by the addition of a third pair of driving wheels, making the ten-wheel type. Not only has this novel wheel arrangement for electric locomotives been adopted, but the diameter of the driver has been increased to 72 in., and it only remains now to increase it still further to 80 in. to parallel the standard Pennsylvania construction. As it is, the center of gravity has been carried to as great a height as possible with this diameter of wheel, and it is thought that, as it stands, it can be coupled to any number of locomotives of the same character without any danger of the engine buckling or pushing the track out of place.

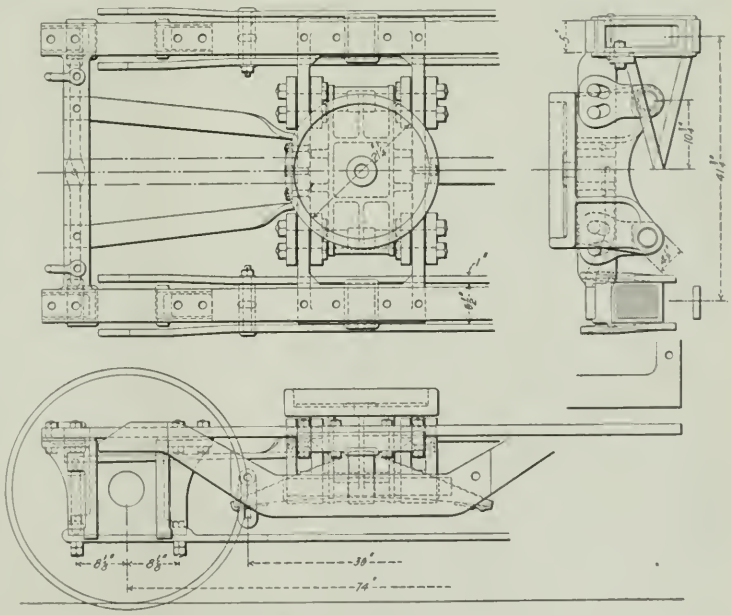
It is claimed that, inasmuch as a certain diameter of driving wheel is needed in order that the steam locomotive may be run successfully without undue heating, the same rule should hold true for the electric locomotive, or else that much less should be expected of it.

It will be noticed that almost all of this locomotive is above the springs and that even the armatures themselves are supported by springs of a peculiar design inserted in pockets in the driving wheel center. In this particular it resembles the New York, New Haven & Hartford engine which was illustrated in the *Railroad Gazette* April 13, 1906. At that time, half-tone reproductions of photographs were used to illustrate the wheels and quill with its bosses that enter the pockets. A detail drawing of the wheel is shown here from which a clear idea of its construction can be obtained. With this arrangement the armature is not placed directly on the axle but is built up on a quill through which the axle passes with a small clearance all around. The bearings which carry the field frame are mounted on this quill and from a flange at each end of the quill round pins project parallel to the axle into the pockets in the driving wheel. The torque of the motor is transmitted from these pins to the wheel through helical steel springs which are wound with their turns progressively eccentric, and which are contained between two steel bushings, the smaller of which slips over the pins, and the larger fits in the pocket of the wheel. These springs are under compression both longitudinally and horizontally so that, at all times, they fill the sockets in the wheel but permit a vertical and lateral motion.

With the heavy armatures thus provided with a spring suspension the frame and superstructure is carried in exactly the same manner as in its prototype, the 4-4-0 steam locomotive. That is to say, the weight on the driving wheels is equalized between the two with semi-elliptic springs over the driving boxes and an equalizing lever between.

As in the case of other electric locomotives, advantage is taken of the absence of rods to use outside bearings.

The truck resembles the ordinary four-wheeled truck. The load is carried on a center-plate of large diameter and ample depth of pocket, and this forms a part of the bolster which rests upon inverted semi-elliptic springs at each side, suspended between flat equalizers by which the weight is transferred to the boxes. With the long wheel base of 74 in. that is given to the truck the danger of flange binding should be entirely obviated and the action should closely resemble that of the standard 4-4-0 locomotives. Already speeds of 60 miles an hour have been obtained in the experimental work that has been undertaken.



Leading Truck; Pennsylvania Railroad Single Phase Electric Locomotive.

The principal dimensions and data relating to the locomotive are as follows:

Weight, total	140 tons
" on each of the four drivers	50,000 lbs.
" on each of the two pony trucks	40,000 "
" on each motor	19,500 "
Diameter of drivers	72 in.
Diameter of pilot wheels	36 "
Wheel base, total (half locomotive)	20 ft. 7 in.

Wheel base, rigid	7 ft. 6 in.
" pony truck	6 " 2 "
Length over bumpers (half locomotive)	31 " 0 "
Height of locomotive	13 " 4 "
Width of locomotive	10 " 0 "
Number of motors per locomotive	4
H.p. of each motor (one hour rating)	500
" " " " (maximum)	800
" " " " (cont. cap.)	375
" " " locomotive (maximum)	3,200
Tractive effort of locomotive (maximum)	40,000 lbs.
" " " " (at 1-hr. ratiog)	14,700 "
" " " " (at cont. cap.)	9,200 "
Speed, miles per hr. (at 1-hr. rating)	51
Speed, miles per hr. (at con. ratiug.)	61
Voltage on trolley	11,000
Voltage on each motor	275

Massachusetts Law Requiring Carriage of Public School Pupils at Half Price.

The Supreme Court of the United States, in an opinion prepared by Justice Holmes, has affirmed the judgment of the Superior Court of Massachusetts sustaining a law of that state requiring street railroads to carry public school pupils at half fare. The suit was brought by the Interstate Consolidated Street Railway Company. The decision in substance follows:

This was a complaint against the plaintiff in error for refusing to sell tickets for the transportation of pupils to and from the public schools at one-half the regular fare charged by it, as required by Mass. Rev. Laws, c. 112, Sec. 72. At the trial the railway company admitted the fact, but set up that the statute was unconstitutional, in that it denied to the company the equal protection of the laws and deprived it of its property without just compensation and without due process of law. In support of this defence it made an offer of proof which may be abridged into the propositions that the regular fare was 5 cents; that during the last fiscal year the actual and reasonable cost of transportation per passenger was $3^{86}/_{100}$ cents, or, including taxes, $4^{19}/_{100}$ cents; that pupils of the public schools formed a considerable part of the passengers carried by it, and that the one street railway expressly exempted by the law transported nearly one-half the passengers transported on street railways and received nearly one-half the revenue received for such transportation in the Commonwealth. The offer was stated to be made for the purpose of showing that the plaintiff in error could not comply with the statute without carrying passengers for less than a reasonable compensation and for less than cost. The offer of proof was rejected, and a ruling that the statute was repugnant to the Fourteenth Amendment was refused. The plaintiff in error excepted and, after a verdict of guilty and sentence, took the case to the Supreme Judicial Court; 187 Mass. 436. That court overruled the exceptions, whereupon the plaintiff in error brought the case here.

This court is of opinion that the decision below was right. A majority of the court considers that the case is disposed of by the fact that the statute in question was in force when the plaintiff in error took its charter, and confines itself to that ground. The act of incorporation went into effect March 15, 1901. The plaintiff in error was "subject to all the duties, liabilities and restrictions set forth in all general laws now or hereafter in force relating to street railway companies, except," etc. * * * The contents of a document may be incorporated or adopted as well by generic as by specific reference, if only the purport of the adopting statute is clear.

Speaking for myself alone, I think that there are considerations * * * that made it unsafe not to discuss the validity of the regulation apart from the supposition that the plaintiff in error has accepted it. Therefore I proceed to state my grounds for thinking the statute constitutional irrespective of any disabilities to object to its terms.

The discrimination alleged is the express exception of the Boston Elevated Railway Company and the railways then owned, leased or operated by it. But, in the first place, this was a legislative adjudication concerning a specific road, not a general prospective classification. A general law must be judged by public facts, but a specific adjudication may depend upon many things not judicially known. Therefore the law must be sustained on this point unless the facts offered in evidence clearly show that the exception cannot be upheld. But the local facts are not before us, and it follows that we cannot say that the legislature could not have been justified in thus limiting its action. In the next place, if the only ground were that the charter of the Elevated Railway contained a contract against the imposition of such a requirement, it would be attributing to the Fourteenth Amendment an excessively nice operation to say that the immunity of a single corporation prevented the passage of an otherwise desirable and wholesome law. It is unnecessary to consider what would be the effect on the statute by construction in Massachusetts if the exception could not be upheld. For, if in order to avoid the Scylla of unjustifiable class legislation, the law were read as universal, it might be thought by this court to fall into the Charybdis of impairing the obligation of a contract with the elevated road, although that objection might perhaps be held not to be open to the plaintiff in error here.

The objection that seems to me, as it seemed to the court below, most serious is that the statute unjustifiably appropriates the property of the plaintiff in error. It is hard to say that street railway companies are not subjected to a loss. The conventional fare of 5 cents presumably is not more than a reasonable fare, and it is at least questionable whether street railway companies would be permitted to increase it on the ground of this burden. It is assumed by the statute in question that the ordinary fare may be charged for these children or some of them when not going to or from school. Whatever the fare, the statute fairly construed means that children going to or from school must be carried for half the sum that would be reasonable compensation for their carriage, if we looked only to the business aspect of the question. Moreover, while it may be true that in some cases rates or fares may be reduced to an unprofitable point in view of the business as a whole or upon special considerations, it is not enough to justify a general law like this, that the companies concerned still may be able to make a profit from other sources, for all that appears.

Notwithstanding the foregoing considerations I hesitatingly agree with the state court that the requirement may be justified under what commonly is called the police power. The obverse way of stating this power in the sense in which I am using the phrase would be that constitutional rights like others are matters of degree and that the great constitutional provisions for the protection of property are not to be pushed to a logical extreme, but must be taken to permit the infliction of some fractional and relatively small losses without compensation, for some at least of the purposes of wholesome legislation.

If the Fourteenth Amendment is not to be a greater hamper upon the established practices of the states in common with other governments than I think was intended, they must be allowed a certain latitude in the minor adjustments of life, even though by their action the burdens of a part of the community are somewhat increased. The traditions and habits of centuries were not intended to be overthrown when that amendment was passed.

Education is one of the purposes for which what is called the police power may be exercised. Massachusetts always has recognized it as one of the first objects of public care. It does not follow that it would be equally in accord with the conceptions at the base of our constitutional law to confer equal favors upon doctors, or workingmen, or people who could afford to buy 1,000-mile tickets. Structural habits count for as much as logic in drawing the line. And, to return to the taking of property, the aspect in which I am considering the case, general taxation to maintain public schools is an appropriation of property to a use in which the taxpayer may have no private interest, and, it may be, against his will. It has been condemned by some theorists on that ground. Yet no one denies its constitutionality. People are accustomed to it and accept it without doubt. The present requirement is not different in fundamental principle, although the tax is paid in kind and falls only on the class capable of paying that kind of tax—a class of quasi public corporations specially subject to legislative control.

Thus the question narrows itself to the magnitude of the burden imposed—to whether the tax is so great as to exceed the limits of the police power. Looking at the law without regard to its special operation I should hesitate to assume that its total effect, direct and indirect, upon the roads outside of Boston amounted to a more serious burden than a change in the law of nuisance, for example, might be. Turning to the specific effect, the offer of proof was cautious. It was simply that a "considerable percentage" of the passengers carried by the company consisted of pupils of the public schools. This might be true without the burden becoming serious. I am not prepared to overrule the decision of the Legislature and of the highest court of Massachusetts that the requirement is reasonable under the conditions existing there, upon evidence that goes no higher than this. It is not enough that a statute goes to the verge of constitutional power. We must be able to see clearly that it goes beyond that power. In case of real doubt a law must be sustained.

Mr. Justice Harlan is of opinion that the constitutionality of the Act of 1900 is necessarily involved in the determination of this case. He thinks the act is not liable to the objection that it denies to the railway company the equal protection of the laws. Nor does he think that it can be held, upon any showing made by this record, to be unconstitutional as depriving the plaintiff in error of its property without due process of law. Upon these grounds alone, and independent of any other question discussed, he joins in a judgment of affirmance. Judgment affirmed. Mr. Justice Moody, having been of counsel, did not sit in this case.

The plans for the Rove tunnel through which the canal from Marseilles to the Rhone is to pass have been approved. While not the longest tunnel in the world, it will have the largest cross-section of any. Its length will be 4⅛ miles, width 72 ft., height

46¾ ft., and the total cubic contents twice that of the Simplon tunnel. On either side there will be a 6½-ft. roadway for an electric railway. The cost is estimated at $6,900,000, and the time required for its construction seven years.

Car Efficiency Reports.

The Committee on Car Efficiency of the American Railway Association has issued its statement of freight car balance and performance for June, 1907, Bulletin No. 10. The introduction gives the principal results as follows.

This Bulletin is more nearly representative than any previous issue, comprising reports from roads with an aggregate mileage of 211,314, and a total of 2,014,069 cars in service.

The car situation during June was, in general, much easier than at any previous time during the current year. The home movement of foreign cars continued until the average home cars in service during this period was 57 per cent. as against 54 per cent. and 55 per cent., respectively, in April and May; the per cent. of foreign cars utilized dropping from 44 per cent. and 43 per cent. in April and May to 41 per cent. in June. As a rule this condition would result in a decrease in loaded mileage. However, during June the shortages were still general enough to permit of the handling of the homeward movement of foreign cars with a minimum of empty mileage. As a consequence the per cent. of "loaded mileage" shows a slight improvement.

There is a slight falling off in the "average miles per car per day" as compared with May, and also in the "average ton miles per car per day," with a corresponding drop in the "average earnings per car on line."

Possibly the most gratifying feature of this report is the increase in "average tons per loaded car" from 19.8 in April and May to 20.4 in June. This item has shown a gradual increase since our first compilation, including tonnage figures (July-December, 1906), which is indicative of partial success in the efforts being made to reduce the wide margin between average loading and average capacity.

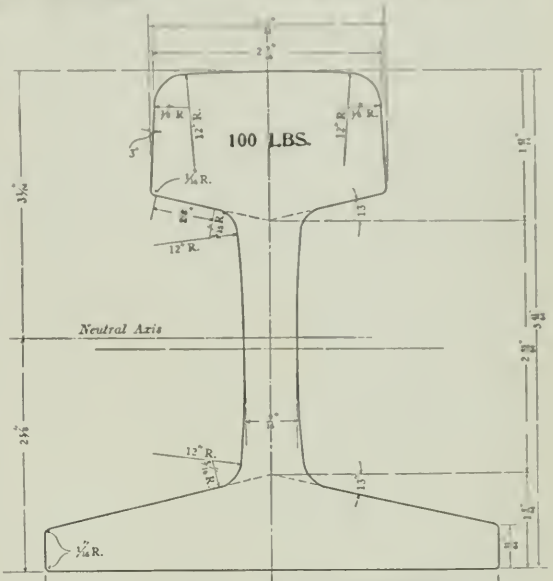
The increase in average capacity by building large cars is in the direction of economy, but to secure the full benefit of this economy it is essential that the increased capacity be fully utilized. With the exception of coal, ore and a few other dense commodities, it is doubtful if the average loading of cars has followed the increase in capacity. Roughly, the proportion of capacity utilized is about 60 per cent. Considering that approximately 64 per cent. of the tonnage of the country consists of coal, ore and other heavy commodities which should average close to 100 per cent., it is obvious that the loading of the lighter commodities falls far short of the capacity. Of the numerous causes for this condition, some are beyond the control of the railroads, but there are many which can be remedied by systematizing the loading and giving it proper supervision.

The handling of L. C. L. shipments especially is attended with considerable waste of capacity, and on railroads where this matter has been given close attention, a great deal has been accomplished in the way of improving not only the loading but the movement of L. C. L. business. The minimum loading provided by the various freight classifications also has a marked bearing on the utilization of car capacity. While the average capacity of freight cars has increased approximately 40 per cent. during the past few years, there has been little change in the classifications as regards minimum loading. The recent revision of the official classification increased the minimum on a number of commodities, which action should have a good effect in the territory covered by the change. A movement is under way for the adoption of one classification for the entire country. The proposed consolidation would undoubtedly have a beneficial effect on car efficiency, provided the question of minimum loading is given the consideration which its importance warrants.

The committee has issued Bulletin No. 9, showing car surpluses and shortages on October 16 and October 30, the number of roads reporting on the 16th being 162 and the number on the later date only two less. The shortages have reached the maximum since last winter. The shortage of stock cars in the West was severe in the first part of October, but was much improved at the end of the month. The aggregate of the shortages October 16 was 85,764, while on the 30th it was 90,757. West of Chicago the shortages were considerably smaller on the 30th, but in the eastern, central and southern states they were decidedly larger, making a net increase of about 5,000, as shown. In the central states, including the Pittsburgh district, the shortages increased from about 14,000 to about 20,000. The surpluses are small, everywhere, aggregating only about 4,000 in the whole country. The figures are net for each road and the statement gives no statistics of the number of cars owned by any road or the number on its line. Since the statement was made, that is to say, from November 1 to November 15, there has been a marked falling off in the demand of cars, principally on the grain-carrying roads in the middle west.

Proposed Standard Rail Sections of the American Railway Association.

The accompanying illustrations, which are all drawn to the same scale, accompanied the report of the American Railway Association's Committee on Standard Rail and Wheel Sections, dated Oct. 1, 1907. Further reference to these sections is made in the editorial columns.



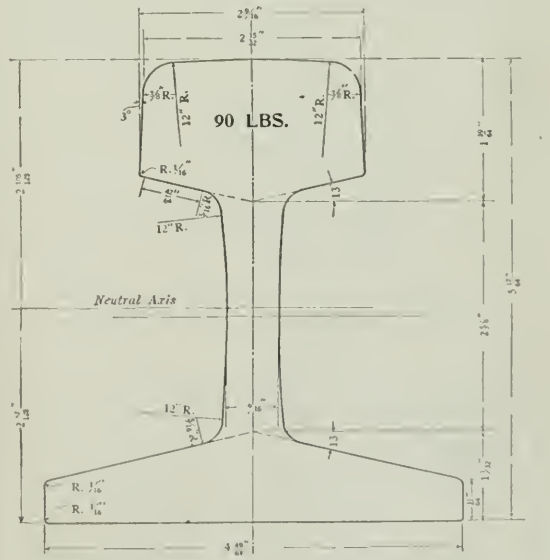
Area of Head	3.95 sq. in.		40.2%
" Web	1.89	"	19.2%
" Base	4.01	"	40.6%
Total	9.85	"	100.0%

Moment of Inertia 41.3"⁴

Section Modulus	Head	13.70"³
	Base	15.74"³
Ratio Periphery	Head to Area Head	1.64
"	Web " Web	3.60
"	Base " Base	2.49
Ratio Total	" to Total "	2.37

Calculated Weight 100.5 Lbs.

Series B.



Area of Head	3.56 sq. in.		40.1%
" Web	1.70	"	19.2%
" Base	3.61	"	40.7%
Total	8.87	"	100.0%

Moment of Inertia 32.3"⁴

Section Modulus	Head	11.45"³
	Base	13.21"³
Ratio Periphery	Head to Area Head	1.68
"	" Web " Web	3.65
"	" Base " Base	2.58
Ratio Total	" to Total "	2.42

Calculated Weight 90.5 Lbs.

Series B.

Light Freight Handling by Electric Lines.*

BY P. P. CRAFTS.
General Manager, Iowa & Illinois Railway Co., Clinton, Ia.

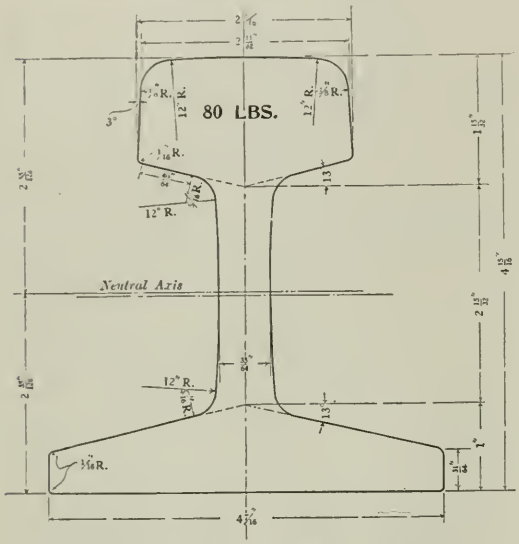
Although some of the older and slower roads began to conduct a so-called express business several years ago, the freight carrying field was not entered with spirit until the modern high-speed road, built on private right-of-way, with heavy construction, was developed. It was then discovered that the interurban could not only compete with the steam roads and express companies, but that, due to its frequent and reliable service, it could also develop a freight business that could not have been developed by them.

Whether or not a freight business will be profitable depends somewhat upon the following conditions:

1. The population served outside of the main terminal and its dependence upon that terminal as a trading center.

2. The proximity of other trading centers to the population served outside of the main terminal, and the railway facilities tending to attract business away from the main terminal.

*From a paper read before the American Street & Interurban Railway Association at its 1907 convention at Atlantic City.

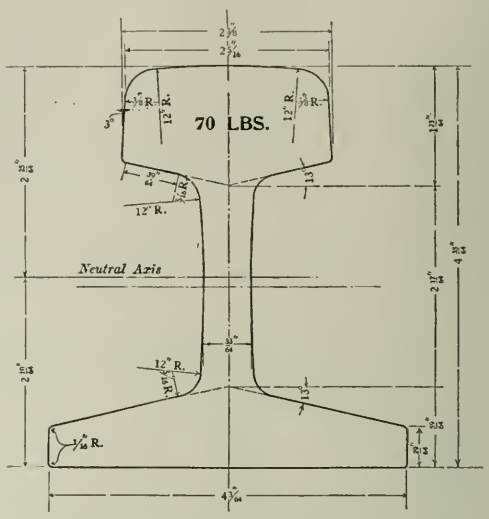


Area of Head	3.07 sq. in.	38.8%	
" Web	1.54 "	19.5%	
" Base	3.30 "	41.7%	
Total	7.91 "	100.0%	
Momeot of Ioertia	25.1"⁴		

Section Modulus - Head	9.38"³	
Base	11.08"³	
Ratio Periphery Head to Area Head		1.79
" Web " Web		3.57
" Base " Base		2.72
Ratio Total " to Total "		2.53

Calculated Weight 80.7 Lbs.

Series B.

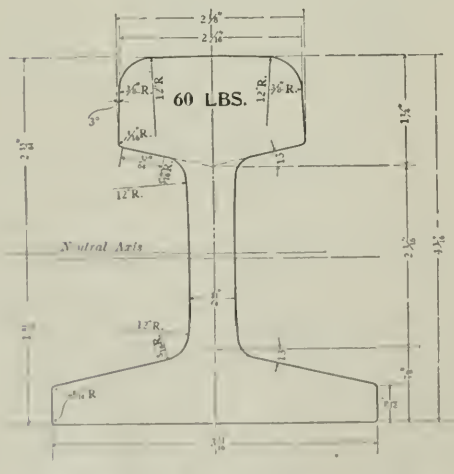


Area of Head	2.76 sq. in.	40.1%
" " Web	1.34 " "	19.5%
" " Base	2.79 " "	40.4%
Total	6.89 " "	100.0%
Momeot of Ioertia	18.6"⁴	

Section Modulus	Head	7.79"³
" "	Base	8.62"³
Ratio, Periphery Head to Area Head		1.99
" Web " Web		4.10
" Base " Base		2.76
Ratio Total " to Total "		2.72

Calculated Weight 70.3 Lbs.

Series B.

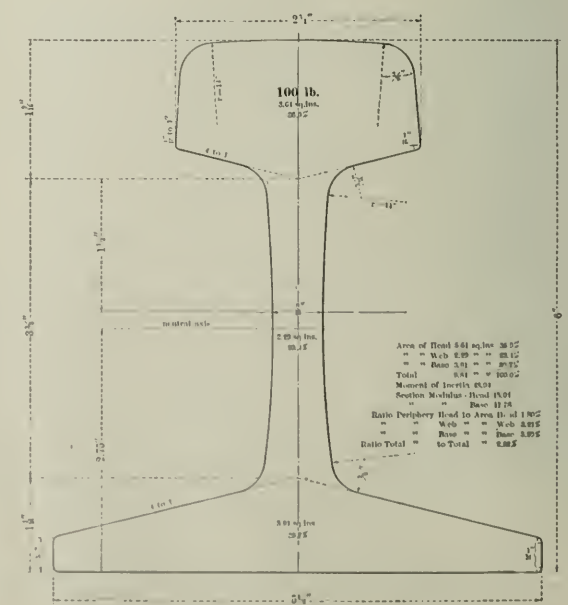


Area of Head	2.2[illegible] sq. in.	38.8
" " Web	1.14 " "	19.[illegible]
" " Base	2.15 " "	41.[illegible]
Total	5.[illegible] " "	100.0%
Moment of Inertia	13.3"⁴	

Section Modulus	Head	5.90"³
" "	Base	6.80"³
Ratio Periphery Head to Area Head		2.10
" " Web " Web		4.38
" " Base " Base		2.94
Ratio Total " to Total "		2.90

Calculated Weight 59.9 Lbs.

Series B.



Series A.

3. Steam trunk line connections leading to the main arteries of commerce and the ability of interurban roads to establish joint rates with them.

A full exposition of the third condition cannot be given without consuming too much time. In general, however, an interurban road with proper freight handling and terminal facilities, which offers quick and efficient service, together with joint rates with some trunk line, in competition with other trunk lines operating between competitive points, may reasonably expect a fair division, or a greater portion, of the freight traffic. As stated earlier in this paper, shippers desire the best service with lowest rates, but, assuming rates to be even, shippers are generally favorable to the roads which provide good passenger accommodations, consequently the interurban roads reap the reward of frequent passenger service.

Owing to the antagonistic attitude of the steam roads, however, it is generally difficult to establish joint rates except where competition does not exist between them, unless connection may be made with some competing road which disregards the pooling or territorial agreements.

Let us trust that the day is rapidly approaching when the national and state commissions will take such action as will induce our larger and more powerful brothers to recognize the despised interurban. The progressive and aggressive attitude of the interurban managers, if continued, will exert more influence in that direction than anything else that can be done.

Interurban freight traffic may be properly divided into the following classes:

1. Strictly light packages, transported only in baggage rooms of passenger coaches, at express rates or at a fixed charge per package or per hundred pounds, regardless of class, and generally termed express business.

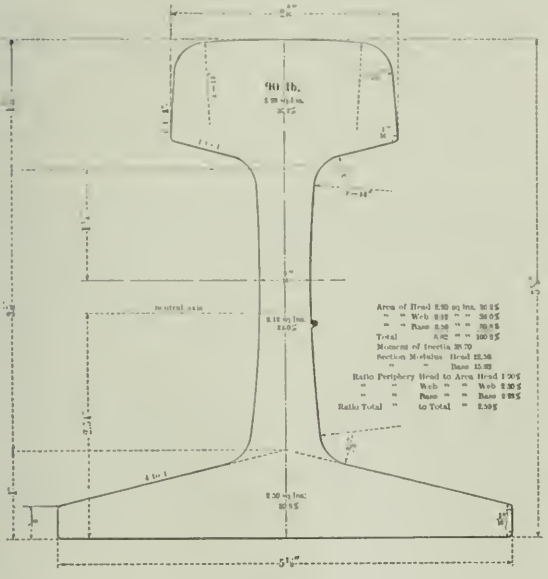
2. Less than carload freight transported on fast baggage cars at regular freight or special tariffs under regular or special classifications, generally the former.

3. A combination of class two and the haulage of a few carload shipments daily at regular tariffs and classification.

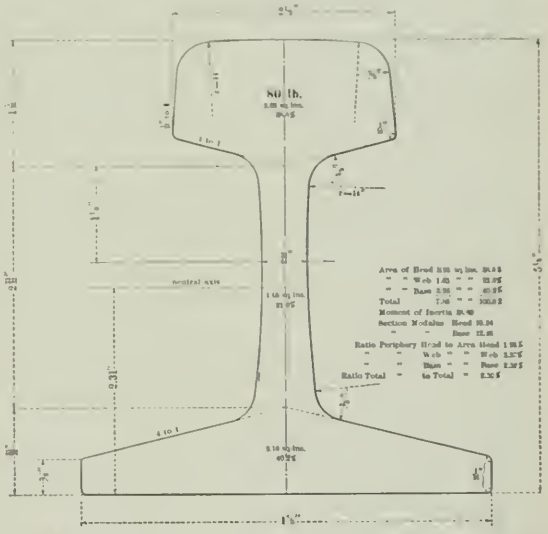
4. Regular carload tariff hauled by steam or heavy electric freight locomotives at regular tariffs and classifications. Or any combination of the above-mentioned classes.

Depending upon local conditions the freight traffic of a road may be confined to any one of these classes or it may be started in the first class and grow to the fourth class. As the fourth class will be discussed in another paper, I will treat only the first three classes, particularly the second class.

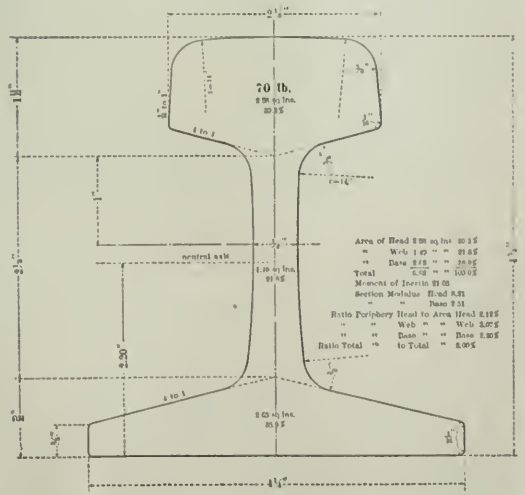
A freight business of class one may be conducted at small expense and is of material assistance in the earnings of a road.



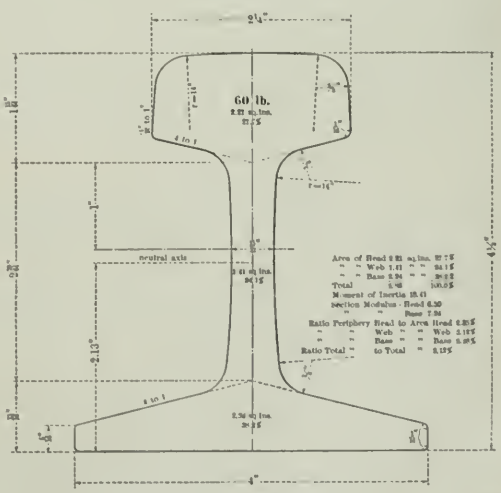
Series A.



Series A.



Series A.



Series A.

The freight carried consists generally of packages easily transported in baggage compartments of passenger cars, which are usually empty except for a very few trips per day. Usually no extra office force is required, the only expense being for stationery, books, and possibly a small storage space at the main terminal. In some cases, when the charges are a certain rate per package, regardless of weight within reasonable limitations, a proper system of tickets dispenses with way-bills, expense bills, etc.

Inasmuch as the majority of freight-handling interurban roads comes under the head of class two, that part of the paper will probably be of interest to the greater number of managers, so I shall enter into greater detail in handling the subject.

Interurban roads which conduct their freight business under the head of class two more nearly approach operating conditions parallel to the time-freight business of steam railways. The ability of the interurban roads to make fast time and to deliver at highways, farm crossings and warehouse or store doors is an inducement to either the shipper or the receiver, which assists in obtaining the business. Being usually restricted, however, to a narrow car similar in appearance to a passenger car, due to operating over city streets, an interurban road has limitations of its freight earning capacity.

The profits of such a business depend largely upon the opportunity of the management to secure combined freight and passenger depots at the terminals and in the larger local towns, so that extra labor in billing and handling at stations may be avoided, upon the charges of terminal city railways for the right to haul freight over the tracks, and upon the hour of day when freight may be delivered to receivers.

Generally speaking, the margin of profit in this class is close and only careful management will produce a profit, particularly during the first few months after the business is started. Expenses must be carefully watched and attractive freight houses and convenient hauling facilities at terminals sacrificed for something which costs less to maintain.

Damage claims must be very carefully handled, and to that end it is advisable to adopt some system of billing and accounting which permits a shipment to be easily traced from its starting point to the final destination. Some interurban roads have adopted simple billing systems, requiring only one writing to make the receipt, way-bill, expense bill and office copy. Such a system, however, does not permit of proper checking, particularly if merchandise is transported over more than one road.

After an interurban road enters class two, a good local commercial agent is a necessity. The business, consisting of a great number of small shipments, requires constant development and care, particularly if competition exists. A live commercial agent, who is a good street man, and not a desk man, earns his salary many times over, particularly if he understands how to deal with shippers. The business obtained depends considerably on the personality of the commercial agent.

I fear that many managers, in charging expenses to the freight business, do not give proper consideration to such items as additional clerks, printing and stationery, insurance on goods in freight houses, a proper percentage of the receipts to cover loss and damage, power for freight cars, proportion of track and line maintenance, telephone service, interest on the freight handling investment, etc. Neglect of these items deceives the manager as well as his stockholders, and unless receipts grow beyond the safe point the awakening will be painful and embarrassing.

Perhaps a brief description of the freight business conducted by the Iowa & Illinois Railway Company may be of interest as illustrating the point brought out in the foregoing paragraph. We went into the freight business in a very tentative manner. In fact, it took considerable time for us to decide whether or not there was sufficient business in less than carload lots to warrant the purchase of a freight car and the expense of operating a freight business.

The next grave question was that of rates, and, after considering for some time a reduction of the rate below that permitted by the Iowa state laws for class "A" roads, we finally concluded to adopt the maximum tariff and to consider the business as freight and not express.

At first our old passenger depot in Davenport served also as a freight depot, but within a very few months we outgrew the capacity of the space allowed to freight and were forced to take our passenger business to a new location. In Clinton we still have sufficient space to handle the business, but within a very few months we will be compelled to seek additional storage room.

Immediately upon starting the business, we engaged a commercial agent, and the quick growth of the receipts to the point where we are paying expenses showed our wisdom in so doing. Within one year, with one freight car engaged in the business and the use of passenger coaches to carry some freight, the business grew to a gross exceeding $10,000 a year. During the summer and fall of 1906 we were compelled to operate our freight car two round trips per day for nearly 75 per cent. of the time, and after the contract with the American Express Company was put into effect, we purchased and placed in service a trailer freight car, having the same capacity as the motor. The improved facilities which we have been able to offer shippers since purchasing the second car have increased the business at a very rapid rate.

We make a specialty, on less than carload business, of beating the time of the steam railroads twenty-four hours between Davenport and points on the Chicago & North-Western Railway in the western part of the state. For this reason we obtain considerable business which is transferred to that road.

Besides the rush shipments in small quantities of perishable goods, such as milk, cream, butter, eggs, fruit, etc., from certain stations are handled in the baggage rooms of the passenger coaches.

We find that a trailer freight car is much cheaper to operate than a motor, but, of course, it can handle only through business. It does not seriously delay the passenger coach to which it is coupled.

When the freight business was started, we adopted what we considered to be a very simple set of forms for billing and accounting, but we soon ascertained that the tracing of damaged and stray shipments was very difficult, and after carefully looking over the field we finally adopted the forms used by the Chicago & North-Western Railway. These appeared at first to be very complicated, but a short acquaintance indicated their simplicity and the ease of tracing damaged and stray shipments.

We make a specialty of rush orders by telephone via our private line. Often a merchant in Clinton who finds himself short of some particular article telephones to us, and through our Davenport office via the private line, we transmit the order to the shipper in Davenport. Shipments so ordered are frequently in Clinton within two hours from the time we were called up at the Clinton office.

At the present time the earnings from this business amount to 15 per cent. of the total gross, and we hope to see it reach 20 per cent. on the same basis, i. e., while our freight business comes under the head of class two.

Our transfer business has been developed under heavy steam road competition at lower rates, for in obeying the state laws we have been compelled to charge two local rates which are higher than the rate for the same mileage in a continuous haul on one road. The saving of time mentioned above has accomplished that result.

A recent ruling by the Iowa Railway Commission reduces the tariff on two locals 20 per cent., and although our receipts per shipment will be naturally reduced, the increase in volume of business will be gratifying.

This exposition of the freight business as conducted by the Iowa & Illinois Railway is not made so much to indicate what is being done by that road, but is rather intended to illustrate the methods generally pursued by interurbans of like character.

An investigation made of a number of roads has brought out the fact that the average interurban conducting a freight business pursues practically the same methods described in this paper. There are of course a number of roads which pursue other methods, and successfully, too, but in such cases local conditions govern to a great extent.

The percentage which earnings from freight traffic bear to the total gross earnings, of course, depends largely on local conditions, but of those roads which have favored me with statistics, I have ascertained that these earnings vary from 5 to approximately 40 per cent. of the total gross. Interurbans which handle carload business, in addition to the traffic of which this paper treats, in some cases enjoy gross earnings from freight exceeding those derived from passenger traffic.

I believe the experience of interurban railways to this date is that such satisfactory results are now being obtained, I am safe in predicting that any average interurban railway, the existence of which is warranted by prospective passenger traffic, can be assured of a profitable freight business, which within a few years, if not immediately, will become an important factor in its earnings.

The French have for some time had in operation in their northernmost Asiatic possession, Tongking, a railroad from the sea at Haifong northwesterly up a river for about 200 miles to the Chinese border at Laokay. Hoping to draw traffic from China over this railroad and to ports in Tongking, a company was organized to build from Laokay in China further northwest through a mountainous country, a further 200 miles to Yunnan-sen. The colony advanced 12½ millions of francs, bonds were issued for 76 millions, and the stockholders of the company subscribed 7½ millions. This has all been spent and the road is far from completion. From 50 to 60 millions more are required, 35 millions of which is needed in 1907. There is a controversy as to whether the company or the colony should make up the deficit; but pending arbitration the money will be advanced by the government. This indicates that the whole cost of the railroad will be something like $29,000,000, or about $145,000 per mile.

GENERAL NEWS SECTION

NOTES.

The Erie Canal will be closed December 10.

On November 4 the Pennsylvania Railroad had 52,622 stockholders, as against 49,572 on October 1. This is an increase in 25 days of 3,050, or a little more than 6 per cent.

The individual car owners have again failed to perfect their proposed organization, a meeting called to be held at Cleveland having been so poorly attended that no action was taken.

The superintendent of railway mail service at Houston, Texas, has called upon the railroads to remove from the windows of mail cars all iron bars which would prevent a man from getting out of the car through the window in case of accident.

The State Railroad Commission of Louisiana has amended its rule concerning reports of accidents, and hereafter will not require telegraphic reports except of accidents where persons are killed or seriously injured by the operation or wreck of a train.

At San Bernardino, Cal., W. A. Basore & Sons have moved an oil tank belonging to the Atchison, Topeka & Santa Fe, weighing 300 tons. The tank, used for locomotive fuel oil, is 96 ft. in diameter and 80 ft. high. It was moved from the old to the new yards of the road.

At Easton, Pa., last week $5 checks which had been issued by the Central Railroad of New Jersey, in consequence of the scarcity of currency, were counterfeited, and it was said that forged checks aggregating $8,000 face value had been presented at the railroad company's offices.

The Union Pacific has run a train wire into a business college in Omaha, in pursuance of an arrangement to have the college teach telegraphers for the service of the railroad. The Atchison, Topeka & Santa Fe is to open a school for apprentices at the company's shops in San Bernardino, Cal.

United States steamer "Marine" reached Rock Island, Ill., November 15, from Hennepin, Ill., completing the first trip through the recently opened Illinois and Michigan canal. The steamer was met by a delegation of citizens and by the blowing of whistles. The canal is 60 miles long, connecting the Illinois and Mississippi rivers.

In the United States Circuit Court at Boston, November 17, Hollis R. Bailey was appointed receiver for the Enterprise Transportation Company of Worcester. The company has been in operation for about two years as a competitor of the Fall River Line, running steamers between Providence, Fall River, Newport and New York.

The new Constitution of the state of Oklahoma went in effect November 16 and the railroads of the state (which include the former Indian Territory) are carrying passengers at 2 cents a mile. The Rock Island announces that it will ask the State Corporation Commission to exercise its authority to exempt the road from the law.

The New York City Railway Company, operating the surface street car lines in Manhattan, in the year 1904 discharged 3,491 conductors, of whom 3,017 were dismissed for dishonesty. In 1905 2,448 were dismissed for that reason, in 1906 3,924 and in the first six months of 1907 2,792. Officers of the company believe that dishonest conductors pocket about $35 a week each.

A press despatch from Montgomery this week says that the Seaboard Air Line has agreed with the Governor of Alabama to withdraw its suits against the state, brought to contest the legality of the reduced passenger fares ordered by the legislature, and that on December 1 it will reduce fares to 2½ cents a mile. On freight the Seaboard Air Line will make rates on the same basis as those charged by the road in Georgia.

In the United States Circuit Court at Buffalo, November 18, on application of the Delaware, Lackawanna & Western, a temporary injunction was granted restraining the Switchmen's Union from breaking its agreement with the railroad company. The union threatens to strike if the road does not grant a large increase of wages, though its members are working under an agreement which does not expire before January 31.

The Interstate Commerce Commission has issued general authority to make rail and water freight tariffs with a provision that they will be suspended, at the close of navigation, on seven days' notice. The resumption of such tariffs in the spring must be preceded by ten days' notice. If a shipment forwarded on a rail and water rate has to be sent through all the way by rail, the line (or combination of lines) which accept it at the low rate must pay the difference between that and the all-rail rate. On the opening of navigation shipments may be received under the rail and water rate for concentration at the port on the date that the rates take effect.

The Attorney General of Nebraska has entered suit against the Union Pacific, asking an injunction against E. W. Jones, who was "disciplined" by the road for driving his cattle into Nebraska to take advantage of reduced rates. Jones ordered cars at Big Springs, and after he reached that place with his cattle was compelled to pasture them about in the hills for twenty-five days before he could get cars. In the meantime shippers on either side of Big Springs were furnished with cars.

With a view to complying with the Federal 16-hour law, the New York Central has made experimental changes in the runs of certain freight trainmen. Men running through from Albany to Syracuse, 148 miles, are to be taken off at Utica, 95 miles, though the trains and engines will be run through precisely as before, not going into the yard at Utica. On some of the trains the crews have for some time past changed at Little Falls, half-way between Albany and Syracuse. This practice will be continued.

The Post Office Department has ordered that until December 25 equipment, supplies and empty mail bags, which for the past six months have been sent mostly by freight, shall be sent in the mail cars. The order appears to be based on the fear that in the holiday season there will be intolerable delays in freight transportation. Some of the Chicago roads are complaining at this action of the department, declaring that the additional matter will have to be carried without remuneration. This year's appropriation for the Post Office Department includes $250,000 for the outside transportation of the articles above named.

At Chicago, last week, before the Illinois Railroad and Warehouse Commission, W. A. Gardner, Vice-President of the Chicago & Northwestern, declared that the present charges for switching in Chicago are less than the actual cost of the service. The hearing was on a complaint brought by the Illinois Manufacturers' Association and the Chicago Association of Commerce that switching charges are excessive. "Switching rates are lower than they were fifteen years ago, taking into consideration the fact that the capacity of cars has doubled since that time," said Mr. Gardner. "Yet, during these years the cost and the intricacy of the work has greatly increased. The payrolls for switching are 33 per cent. greater than a year ago, but the increase in the number of cars handled has been only 10 per cent." Mr. Gardner advocated a rate per ton and a classification of freight to apply to switching movement.

The Pennsylvania Railroad announces that shop men working on repairs will henceforth work eight hours a day. Reductions will be made in the track forces and in other departments where the business of the road will not suffer. Superintendents have been ordered to suspend men wherever it can be done without crippling the forces. Similar reports of retrenchment are published concerning many railroads, but few of these reports are given with definiteness. At Chicago, Slason Thompson, representative of the General Managers' Association, estimates that 25,000 men have been dismissed by Western railroads. A considerable part of these men were engaged on new construction, but no information is given to show how many. The Chicago, Milwaukee & St. Paul has dismissed 50 freight solicitors, mostly in cities off the line of the road. The Northern Pacific has taken similar action in the Eastern states. The Erie has dispensed with the services of a number of traveling passenger agents.

Mr. Hill on the Financial Crisis.

The following extracts are taken from an address made by James J. Hill at Kansas City, November 19:

"Perhaps the controlling factor of the situation in this country is the shock given to confidence in our investments all over the world and the consequent limitation of credit. Credit is the atmosphere which inflates the lungs of business, and when it is greatly lessened business must be reduced in proportion or be quietly smothered. For this reason attacks, not on individual transgression, not on dishonest finance, but upon existing business systems representing the fabric of society itself, may destroy by impairing credit what a generation could not rebuild. Political campaigns in many states have been made on the issue of a general assault on the integrity of railroad property and management. There followed a wild raid in which over 170 acts more or less confiscatory of railroad property were enacted by the legislatures of more than a score of states. The consequences to the transportation system, to railroad construction, and through these to the price of farm products and to the success of every form of business have already made themselves felt and the country shivers under the blow. If such continue to be the atti-

tude of the public mind there will presently be no power, short of a pledge of the credit of the Government itself, able to secure the funds necessary to provide more tracks.

"Before we again realize a favoring disposition to invest, there must be a different temper, a larger view of justice, a better appreciation of what the railroads of the United States have done and are doing as compared with those of the rest of the world, and a settled policy of fair and reasonable liberal treatment, and protection for the future. The duty of the state toward the railroad property, which should have the rights common to other property, must be considered, as well as the duty of the railroad to the public.

"It is necessary to this end that the operations of our railroads should be regulated properly by wholesome and fair laws, and quite as necessary that they should not be regulated improperly. Regulative statutes are now in force of such scope and stringency that no one denies their efficacy.

"It would be easy so to multiply and add to their burdens that the confidence necessary to investment would be entirely destroyed and the development of the country prevented.

"Whether this is a time for new enactments or for a patient, fair and just enforcement of the laws as they stand may be judged from the records of the past.

"We have read of a conflict between righteousness and business. There can be no such conflict unless there is fraud at the business end or hypocrisy and cant at the righteousness end. If any man has done evil, if any corporation is sinning against the laws, let him or it be punished under the law. But put an end to wholesale denunciation and wholesale proscription, destructive of all credit and repugnant to all sense of justice, as well as hostile to every business interest in the land.

"There are but two reasons, actual scarcity of money and reluctance to invest, which overshadow the outlook. Promising enterprises can no longer be financed on any basis consistent with present rates and conditions.

"The transportation facilities of the whole country are and have been unequal to its present means. They must be made equal to the burdens they bear or the country cannot prosper. The railroad men of this country have a right to be proud of their record, and resent criticism supported by nothing better than ignorant declamation."

Profit Sharing by Stock Ownership.

Employees of the United States Steel Corporation will probably this year get their preferred stock under the profit sharing plan very much cheaper than a year ago, when $102 was agreed on. Since the profit sharing plan became operative in 1903, the corporation has sold to employees 150,496 shares, the present market value of which, at $81 a share, is $12,190,176. The amount paid for the stock was $12,558,445, so that apparently the employees have lost on paper a little over $350,000; but rebates and dividends received by employees offset this loss many times over. On Dec. 31, 1906, there were 15,568 employees who had purchased stock under offers made by the corporation. This indicates that considerable stock has been liquidated.

The Pullman Company.

Gross earnings for the year ended July 31, 1907, were $32,186,013, an increase of $2,597,371. Operating expenses were $17,388,741, an increase of $2,044,000. Dividends amounted to $7,476,878, an increase of $1,556,894. These dividends do not include the distribution of accumulated surplus made in November, 1906. The surplus for the year was $4,149,455, a decrease of $820,619. The mileage of road over which the company operated cars was 195,250, an increase of 4,817. The number of passengers carried increased 11 per cent. and the number of miles run increased 7 per cent. The company built $37,019,627 worth of cars, an increase of $9,300,635. At the annual meeting, George F. Baker, New York, was elected a Director, succeeding Charles S. Sweet, Chicago.

Irrigation in Southern Pacific Territory.

Nearly a million acres of land is being reclaimed by irrigation along the lines of the Southern Pacific. In the neighborhood of Yuma, on the Colorado river, 100,000 acres, partly in Arizona and partly in California, will be served by the canals now building, on which rapid progress is being made. Profitable cultivation of this soil has heretofore been impossible owing to the destructive floods of the Gila river. Now this section is being made ready for the settler by a dam across the Colorado above Yuma, by canals under the Gila and a system of levees which will protect the territory from overflow. The lands saved from destruction by the Southern Pacific's success in closing the breach in the Colorado are yielding phenomenal crops. Yuma has about 2,000 population. With Phoenix as a center, another vast irrigation work, covering 200,000 acres, is being carried out. Here, as around Yuma, the climate is favorable to oranges, and other fruits of many kinds, all served by the lines of the Atchison, Topeka & Santa Fe from the north and the Southern Pacific on the south.

On the Truckee-Carson project in Nevada, the government is spending $9,000,000 in reclaiming 350,000 acres. From the Southern Pacific a branch line has been built diagonally across the newly irrigated area. Further north, on the border line between California and Oregon, is the Klamath project. Through this territory the Southern Pacific is building a line which will eventually run from Weed, Cal., to Natron, Ore., and become the main line of the road in place of the present Shasta route. Nearly 250,000 acres of a fertile soil will be affected by the irrigation work now well under way here.

Railroad Strike in India.

Traffic on the East Indian Railway, 2,165 miles long and the second largest railroad in India, is rapidly becoming paralyzed by a strike, according to a Calcutta despatch dated November 20. The trouble began with the European engineers. The most important section of the road from Calcutta to Allahabad, is tied up and several thousand passengers are stranded at the junction of the road with the Bengal-Nagpur Railroad. Many engineers in their engines have left their trains at remote stations. This is an especially serious time for a strike because famine is spreading and there is need for speedy transportation of relief supplies.

American Blower Company's Exhibit at Atlantic City.

A view of the exhibit of the American Blower Co., Detroit, Mich., at the recent convention at Atlantic City of the American Street and Interurban Railway Association is shown herewith. It

American Blower Company's Exhibit.

will be observed that it includes the same interesting feature that attracted so much attention at the railroad mechanical conventions in June—that of a light sphere suspended in the blast from a high-pressure blower. It is reported that members of this convention were no better able to offer a satisfactory solution of the phenomenon than were those of the previous convention.

Inquiry on British Rates.

Now that the long strike agitation in England is satisfactorily settled, the President of the Board of Trade intends to devote his attention to another railroad matter of almost equal importance to British railroads, and that is the question of rates. It is his intention at an early date to appoint a commission, or rather committee, in which will be included several practical railroad men to consider, among other things, the whole question of railroad rates and the desirability of revision on a larger scale than could conveniently be carried out by the Railway and Canal Commission. At the same time the possibility of lowering working expenses by reducing competition and in other directions will probably be discussed. It is expected that the chairman of one of the southern lines will be asked to assist the committee with his long experience in all departments of railroad work, and a leading general manager will probably be added. Mr. Lloyd-George has been much impressed with the great waste which necessarily results from such cases as the working of three competitive routes to Scotland or four routes to Manchester. British railroad managers will be the first to welcome any means of reducing this expenditure, which does not lay them open to the charge of pooling.

Taxation Without a Hearing.

The decision of the Georgia Supreme Court holding valid an assessment of back taxes for ten years on 6,000 shares of the Western Railroad of Alabama, a foreign corporation, has been reversed by the Supreme Court of the United States. The decision will upset the laws of many states on the taxation of property upon which the owners fail to make returns. The Western Alabama shares were held by the Central of Georgia and the Georgia Railroad & Banking Company, as trustees. They refused to make returns on the ground that the shares of a foreign corporation were not subject to taxation; but taxes were assessed and the companies sought to restrain their collection by claiming discrimination in that the shares of domestic corporations were not taxed, that under the Georgia law a hearing was denied them and that the property itself was taxed in another state. The only question considered in the appeal to the Supreme Court of the United States was whether the Georgia law providing for assessment of taxes on omitted property without hearing was due process of law. The court held that it was not and that it fell within the intention of the Fourteenth Amendment to protect property from such impairment by state action.

Indian Railroad Organization.

In consequence of representations made by the Indian Railroad Board, the Government of India has decided on some modifications of the control which it has previously exercised over the capital expenditure of Indian railroads through the consulting engineers. This control, indeed, has been of a minute character, and extends not only to matters of engineering and of expenditure, but to practically all questions, both executive and administrative, connected with railroad working. The Government now admits the force of the board's argument that the altered conditions and revised contracts under which the companies now construct and work the railroads give scope for more liberal and elastic methods. The following changes in organization are, therefore, says a correspondent of *The Times* (London), to be brought into force from January 1 next. Certain powers of sanction and administration are to be delegated to the companies' boards, which are to be requested to entrust their chief representatives in India with a considerable portion of their own powers, Government reserving the right to re-impose more detailed powers of control should circumstances require it. The appointment and duties of provincial consulting engineers are to be abolished, except that their work as inspectors will be carried out by officers specially charged with that duty.

INTERSTATE COMMERCE COMMISSION RULINGS.

Rates on Butter and Eggs Reduced.

In an opinion by Commissioner Lane decision has been announced in the case of the Morse Produce Co. v. Chicago, Milwaukee & St. Paul et al. It appeared that the rate on butter and eggs from Granite Falls, Minn., to Chicago, Ill., is 56 cents per 100 lbs. in car load lots, while from Pipestone, Minn., to Chicago the rate is 43 cents, although Granite Falls is 41 miles nearer Chicago. The Commission held under the facts and circumstances of this case that the 56-cent rate of the Chicago, Milwaukee & St. Paul is unreasonable and unjust and should not exceed 43 cents per 100 lbs.

Violations of Rate Law Must be Substantial, Not Technical.

The Commission, in an opinion rendered by Commissioner Harlan, has announced decision in the case of Missouri and Kansas Shippers' Association v. Missouri, Kansas & Texas. This was a proceeding based on an infraction of the long and short haul section and involved reparation for shipments of hay from certain points in Kansas to Kansas City and St. Joseph, Mo. The Commission held that a merely theoretical or paper rate that has not been used and was unknown to the defendant until casually discovered will not be accepted as affording a just basis for an order for reparation on shipments made to an intermediate point at a slightly higher rate. The Commission is essentially an administrative body, and in the examination of formal complaints ought to get at the real substance of the issue presented unembarrassed by technical considerations.

Joint Rates Need Not be Made.

The Interstate Commerce Commission, reporting on the application of the Loup Creek Colliery Company, of Page, W. Va., refuses to order the establishment of a through joint rate where the railroads have not made one. The complainant is on the Virginian Railway, nine miles from its junction with the Chesapeake & Ohio, and desires to ship coal and coke over the Chesapeake & Ohio at the same rates which are paid for shipment from points in the same vicinity, which are situated on the C. & O. The freight is carried satisfactorily now but the roads refuse to make through rates. The Commission finds that the prices paid are reasonable, and that the rates from C. & O. points are also reasonable; that to make the desired order would compel the C. & O. to discriminate between its own shippers or else make an unnecessary reduction in some of the rates. The decision is by Commissioner Clements.

Coal Rate Upheld.

In the case of The A. M. Fellows Coal & Material Co. v. the Missouri Pacific, opinion by Commissioner Clark, the complaint was dismissed. It was alleged in this case that the rate on coal from a mine at Jewett, Kan., to Kansas City, Mo., is unjust and unreasonable. The record showed that the rate is the same as from other mines in the same field—the same as that on a competing railroad in the same field—and that it is fixed in accordance with an established relation of rates on coal from other producing points to the same market. It also appeared that the rate complained of could not be changed without disturbing rates on coal, not only from other neighboring mines, but from all coal-producing centers the product of which is sent to Kansas City. The Commission decided that under the circumstances and conditions disclosed by the record there is no justification for ordering the rate changed or declaring it unreasonable.

Express Rates Ordered Reduced.

In the case of McLaughlin Bros. v. Adams Express Co. (opinion by Commissioner Lane) it was shown that the Adams Express Co. charged a rate per car for the transportation of horses from New York to Columbus, Ohio, of $200; from Columbus to Kansas City, Mo., $350; from Columbus to St. Paul, Minn., $350. The rate per car from New York to St. Louis is $300; from St. Louis to Kansas City, $150; from New York to Chicago, $250; from Chicago to St. Paul, $200. Thus the total charge from New York to Kansas City when the shipment is stopped at St. Louis is $450; when stopped at Columbus, the total charge is $550. Similarly, the charge from New York to St. Paul is $450 when the shipment is stopped at Chicago, and $550 when the shipment is stopped at Columbus. The Commission decided from all the facts presented that the rates west of Columbus are unreasonable and excessive, and ordered that the rate from Columbus to Kansas City and from Columbus to St. Paul shall not exceed $250 per car.

Switching Charges May Legally Fluctuate.

The Commission, in an opinion rendered by Commissioner Clark, has announced its decision on six separate complaints against the Chicago, Milwaukee & St. Paul by J. H. Leonard and others. Coal carried by this road to Kansas City was delivered on the lines of other carriers which assess a switching charge of $3 a car. At one time the defendant absorbed the switching charge, later discontinued the practice and subsequently resumed it. The complainants allege that as the defendant indulged in the practice and after discontinuance resumed it that it has committed itself to the unreasonableness of requiring shippers to at any time pay switching charge and therefore reparation was asked for. The Commission decided that to support the contention of complainants would be to say that transportation charges must in every instance remain at a fixed figure or be reduced by the carrier at the peril of being called upon to respond in damages on all charges that have before that time been collected under the rates so reduced. It was admitted that there was no discrimination between shippers and the Commission ordered the complaints dismissed.

Switching Charges Upheld.

The Commission, in an opinion by Commissioner Clark, has announced decision in two cases brought by the Laning-Harris Coal & Grain Co. against the Atchison, Topeka & Santa Fe. It appeared in these cases that after arrival, and usually after sale, of grain transported in carloads by defendant to Kansas City, the owners direct the delivery to points on the lines of other carriers which assess a switching charge which defendant collects for and pays to said other carriers. The complaints in these cases alleged that defendant's published rate on grain to Kansas City includes delivery at any point in Kansas City desired by the shipper, whether on the line of defendant or on the lines of any other carrier, and that the switching charge is therefore unlawful and unreasonable.

The Commission decided that the law in specific terms provides that a common carrier shall not be required to give the use of its tracks or terminal facilities to another carrier engaged in like business. In the absence of tariff provisions to the contrary, the transportation rate shown in a carrier's tariff on a certain commodity to a given point is understood to include delivery only to industries or unloading points located on its own rails. If a consignee

or owner of the shipment desires delivery to a point located on the line of another carrier, it must pay the lawful charge for such service. The complaints in these cases are of no merit and should be dismissed.

TRADE CATALOGUES.

Storage Batteries.—The Gould Storage Battery Company, New York, has published a pamphlet which describes and illustrates the construction of the company's storage battery. Both positive and negative plates are of the Planté type; that is, pure lead plates whose active material consists of thin layers of lead peroxide on the positive plates and spongy lead on the negative, these layers being renewed by chemical action from the pure lead. The pamphlet goes into the advantages of the design of construction, describes the preparation of the material and concludes with a resumè of the general advantages claimed for the battery. It is illustrated with half-tones of separate plates, of different types of batteries and of complete installations.

Valves.—The October issue of *The Valve World*, published in the interests of the Crane Company, Chicago, contains articles on pipe threading and cutting machines, improvements to back pressure valves for non-condensing engines and a large installation of piping for the Calumet & Hecla Mining Company. Among other articles there is an interesting one on the methods employed by the Crane Company for taking care of the health of their employees.

Storage Batteries.—The General Storage Battery Co., New York, has issued a pamphlet describing an installation of Bijur storage batteries at the Johnstown, Pa., works of the Cambria Steel Company. A striking feature is the reproduction of recording ampere meter charts indicating the comparative fluctuations of current at the power house before and after the battery was used, showing the effect which the installation had on handling of high intermittent loads.

Steam Shovel News.—The October number appears with a new cover design which greatly improves the appearance of the magazine. "Steam Shovels on Light Railroad Construction" is the leading article, and is well illustrated with good half-tones from photographs. A special high-crane shovel for a clay pit is described and illustrated at work; there are a number of shorter articles and notes of interest.

Poles.—The John Simmons Company, New York, has published a folder describing the construction of tubular steel poles and the advantages of them as compared with wooden poles. The folder is illustrated with photographs of the 92-ft. steel pole made and erected by the company on top of the Singer building in New York, and by drawings of other types of flag poles and fittings.

Coal and Ash Handling Machinery.—Catalogue D of The Jeffrey Manufacturing Co., Columbus, Ohio, illustrates a large number of coal and ash handling machinery installations at different plants throughout the country. There are 56 pages of line and half-tone engravings which show the general features of the different installations.

The Otto Gas Engine Works, Chicago, is distributing a map of the Panama canal, including a profile of the canal and a cross-section of the Culebra cut. A printed note gives briefly the final plans of the canal. Above the canal map is one showing shipping routes of the three Americas.

Air-Brakes.—Two recent bulletins of the Allis-Chalmers Company, Milwaukee, Wis., deal with air-brake equipment for electric cars. One of the bulletins is devoted to type O-B pneumatic emergency equipment and the other to the type J emergency valve for straight air-brake.

MANUFACTURING AND BUSINESS.

The New York offices of the Raymond Concrete Pile Co., Chicago and New York, have been moved to 140 Cedar street, the new West street building.

The Canadian Steel & Wire Co., Hamilton, Ont., has received the contract for fencing the Grand Trunk Pacific between Edmonton, Alb., and Winnipeg, Man., about 1,000 miles.

George A. Gallinger, heretofore connected with the Chicago office of the Independent Pneumatic Tool Co., Chicago, has been appointed manager of the Pittsburgh, Pa., office at 1210 Farmers Bank building.

W. Martin Johnson has been elected Second Vice-President of the Schoen Steel Wheel Co., Pittsburgh, Pa., in charge of the sales department. Mr. Johnson's headquarters will be in the New York office of the company, 11 Broadway.

J. G. White & Co., New York, recently shipped to Manila, P. I., on the steamship "Croydon" $250,000 worth of locomotives, cars and construction material for the Philippine Railways Company.

The Allis-Chalmers Company, Milwaukee, Wis., has been awarded a gold medal for electric generators and motors exhibited at the Jamestown Exposition. A second gold medal was granted for the design and erection of the exhibit.

The Central Inspection Bureau, New York City, has an order from the Northern Electric Street Railway, Scranton, Pa., for the inspection of a number of passenger and baggage cars to be built by the J. G. Brill Company, Philadelphia, Pa.

The Expanded Metal & Corrugated Bar Co., St. Louis, Mo., is furnishing the reinforcement for the construction of three circular reservoirs, 100 meters in diameter, for the Potable Water Commission, City of Mexico. The order is for 2,600 tons of corrugated bars.

The United States Engineering Office, through S. W. Roessler, Portland, Ore., has been in the market for four hoisting engines, in addition to the three locomotives reported in the *Railroad Gazette* of November 8. Proposals for locomotives and hoisting engines were opened November 18.

Harry A. Houston, Springfield, Mo., won this year the Joseph T. Ryerson scholarship of the American Railway Master Mechanic's Association at Purdue University. This scholarship is awarded after competitive examination. Mr. Houston, who is 20 years old, entered Purdue at the opening of the fall term and will take the course in mechanical engineering.

Net income of the Union Switch & Signal Co., Swissvale, Pa., for the year ending December 31, 1907, is estimated at $1,100,000. The company has about $1,250,000 of accounts receivable and enough money in bank to meet the payroll for two months. For the nine months ended September 30, net income, after charges amounting to $2,930,000, was $853,000, an increase of $125,000.

Civil service examinations will be held on December 11 and 12 of candidates for the following vacancies: topographic draftsmen on Panama Canal, salary $125 to $175 a month; assistant superintendents of construction, quartermasters' department, at Cheyenne, Wyo., $1,200 a year, and at Fort Sam Houston, Tex., $900 a year; engineer draftsman, office of the supervising architect, treasury department, $1,600 to $1,800 a year.

The contract for the three large skylights for the new national museum, at Washington, D. C., has been awarded to Arthur E. Rendle, of New York, Chicago and Montreal, to be glazed on his Paradigm skylight system. Eleven firms bid on the work and Mr. Rendle's bid was the lowest. The glass roof and skylights (80,000 square feet) on the new union station buildings at Washington were also glazed by the same contractor.

A test was made recently by the engineers of the New York Edison Co. at the Waterside station, near Thirtieth street, New York City, of a Westinghouse turbine of 10,000 h.p. capacity. It had been sold under a steam consumption guarantee of 15.9 lbs. of steam per kilowatt hour, but the test recorded less than 14.9 lbs. per kilowatt hour. This result gained a bonus for the Westinghouse turbine of over $25,000. This steam consumption figures less than 1½ lbs. of coal per kilowatt hour.

The Societe Electrique Westinghouse de Russie has nearly finished its work of electrifying certain horse-car lines in St. Petersburg. There have been rumors lately to the effect that the company has been fined for failure to complete parts of the work by specified dates. No such fine has been imposed. The company has been paid in instalments, amounting, so far, to $2,400,000. Of the remainder due, $88,000 has been reserved by the government as a contingent fine, but the company is confident that this penalty will not ultimately be imposed.

A. L. Whipple, Assistant Treasurer of the Curtain Supply Company, Chicago, has resigned, effective November 25, to become Second Vice-President of the Telharmonic Securities Company, with office at Broadway and 39th street, New York. This company is in charge of the finances of the Cahill Telharmonic Company of New York. This company's system of transmitting music electrically consists of a number of dynamos each generating such a current as will cause a resonator to give out a particular musical note. A keyboard controls the different circuits, so that by playing on the keyboard, music can be produced at the resonator. The company plans to have central stations in different cities. One is now in operation in New York and there are a number of subscribers to the service, the installation of resonators and the terms on which they are used being similar to that of telephone service. Mr. Whipple has been in the railroad supply business for fourteen years and with the Curtain Supply Company for nine years. He became interested in

the Telharmonic company last June while trying to have its music transmitted from New York to Atlantic City for the Master Car Builders' and Master Mechanics' conventions.

Iron and Steel.

Japanese railroads are in the market for 1,500 tons of light rails.

The Mexican government is said to have issued an order permitting the free entry of 6,000 tons of rails from Russia for lines being built by the Southern Pacific in Mexico.

OBITUARY NOTICES.

N. Staat, Assistant General Freight Agent of the Chicago, Indianapolis & Louisville, died on November 13 of appendicitis. Mr. Staat was 30 years old.

Jesse Newton Seale, Manager of the Northern and Eastern districts of the Southern, died on November 11. A few days before, he had a stroke of paralysis at Salisbury, N. C., and pneumonia developed while he was being taken to Washington. Mr. Seale was born in Mississippi in 1862. He went to school at the East Mississippi University at Columbus and began railroad work in 1875 as a messenger boy on the Mobile & Ohio. He worked as telegraph operator, agent and train despatcher until 1881, when he went to the Cincinnati Southern, where he was in the office of the General Manager. The next year he went to the Texas & Pacific as chief clerk to the Superintendent and in 1883 spent a few months in the Western Union Telegraph and the Associated Press at New Orleans. He then returned to railroad work as a train despatcher on the Southern Pacific and soon went to the Alabama Great Southern as chief despatcher. In 1886 he returned to the Mobile & Ohio, being made Trainmaster. Two years later he was appointed Assistant Superintendent, and in 1890 was made Superintendent at Jackson, Tenn. In 1899 he was appointed Superintendent of Transportation and three years later went to the Southern with the same title. He was later appointed Manager of Transportation, and in the spring of the present year was advanced to the office he held at the time of his death.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad conventions and engineering societies, etc., see advertising page 24.)

Canadian Society of Civil Engineers.

At a meeting of the mining section Nov. 21, a paper on "Chrome Iron Mining in Canada," by Henry F. Strangways, B.A., was read by the author.

Franklin Institute.

At the section meeting in Philadelphia November 21, a paper was presented by Dr. Allerton S. Cushman on the "Corrosion of Iron and Steel."

Railway Club of Pittsburgh.

At the meeting of this club in the Monongahela House, November 22, an address on "Car Wheels," illustrated by stereopticon views, will be given by George L. Fowler, of New York.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Ann Arbor.—See Detroit, Toledo & Ironton.

California Railroad Commission.—A. M. Wilson has resigned.

Corvallis & Eastern.—The authority of the following officers of the Oregon Railroad & Navigation has been extended over the Corvallis & Eastern: M. J. Buckley, General Superintendent; J. F. Graham, Superintendent of Motive Power; R. B. Miller, General Freight Agent; William McMurray, General Passenger Agent; R. Koehler, General Purchasing Agent, and G. W. Boschke, Chief Engineer.

Detroit, Toledo & Ironton.—George K. Lowell, General Manager, has been elected Vice-President of this company and of the Ann Arbor.

Oregon Railroad & Navigation.—See Corvallis & Eastern.

Pennsylvania.—The legal department has been reorganized, so that instead of a General Counsel, a General Solicitor and three Assistant General Solicitors, there are now a General Counsel with three assistants and a General Solicitor with two assistants. G. S. Patterson and P. B. Prince, heretofore Assistant General Solicitors, have been made Assistant General Counsels, the third being H. S. P. Nichols. S. B. Liggett and H. W. Bikle have been appointed Assistant General Solicitors.

Toledo, St. Louis & Western.—The office of G. H. Ross, Second Vice-President and General Traffic Manager, has been moved from Toledo, Ohio, to Chicago.

Western Pacific.—J. D. Brown, Treasurer, has resigned.

Operating Officers.

Alabama Great Southern.—J. W. Evans, Master Mechanic, has been appointed Superintendent, with office at Birmingham, Ala., succeeding R. E. Boswell, resigned to go to the Seaboard Air Line.

Boston & Albany.—J. L. Truden has been appointed Acting Superintendent of the Albany division, with office at Springfield, Mass., succeeding to the duties of Charles Flinn, who has been given leave of absence.

Chicago, Burlington & Quincy.—H. W. Hamm, Trainmaster at St. Joseph, Mo., has been appointed Superintendent at Centerville, Iowa, succeeding J. P. Boyle, resigned.

Chicago, Rock Island & Pacific.—E. S. Moore has been appointed Assistant Superintendent of Terminals at St. Louis, Mo.

International & Great Northern.—E. E. Johnson, Assistant Superintendent at Mart, Tex., has been appointed Superintendent at that place, succeeding C. J. Larimer, resigned to go to another company. J. D. Whittington succeeds Mr. Johnson.

Kansas City Southern.—J. P. Spivey, chief clerk to the Superintendent of Transportation, has been appointed Superintendent of Transportation, with office at Kansas City, Mo., succeeding F. S. Rawlins, resigned to go to the Northern Pacific.

Lehigh Valley.—J. N. Haines has been appointed Inspector of Transportation, succeeding G. B. Minshull, promoted.

Mexican Central.—C. T. Norton has been appointed Superintendent of the Coahuila & Pacific division, with office at Saltillo, Coahila, succeeding E. R. Walter, resigned to go to another company.

Oregon Short Line.—See Union Pacific.

St. Louis & San Francisco.—F. D. Hahnskeen has been appointed Trainmaster at Sapulpa, Ind. T.

Trinity & Brazos Valley.—F. J. Norris has been appointed Trainmaster of the Dallas and Fort Worth branches, with office at Teague, Tex. Patrick Owens remains Trainmaster of the rest of the road.

Union Pacific.—W. E. Whitney, Superintendent of the Denver union station, has been appointed Superintendent of a new division consisting of the Union Pacific line from Rawlins, Wyo., to Green River, now part of the Wyoming division, and the Oregon Short Line's road from Green River to Ogden, Utah. Mr. Whitney's headquarters are at Ogden.

Traffic Officers.

Canadian Pacific.—W. M. Kirkpatrick, General Freight Agent of the Atlantic division, has been appointed General Freight Agent of the Ontario division, with office at Toronto, Ont., in charge of through traffic. M. H. Brown remains General Freight Agent in charge of local traffic. H. E. McDonnell, General Freight Agent at Nelson, B. C., succeeds Mr. Kirkpatrick, with office at St. John, N. B. W. C. Bowles, Assistant General Freight Agent of the Pacific division, succeeds Mr. McDonnell. G. H. Smith, Assistant General Freight Agent of the Central division, succeeds Mr. Bowles, with office at Vancouver, B. C. W. H. Robertson succeeds Mr. Smith, with office at Winnipeg, Man.

Engineering and Rolling Stock Officers.

Alabama Great Southern.—See this company under Operating Officers.

Canadian Pacific.—A. L. Hertzberg, Engineer of Maintenance of Way, has been appointed Division Engineer of the Ontario division, with office at Toronto, Ont., succeeding J. M. R. Fairbairn, who has been appointed Division Engineer at Montreal, Que. The office of Engineer of Maintenance of Way has been abolished, and its duties will hereafter be performed by F. P. Gutelius, Assistant Chief Engineer.

Purchasing Agents.

Chicago & Eastern Illinois.—See Chicago, Rock Island & Pacific.

Chicago, Rock Island & Pacific.—J. M. McCarthy, chief clerk in the General Purchasing Agent's office, has been appointed General Purchasing Agent of this company and of the Evansville & Terre Haute and the Chicago & Eastern Illinois, effective December 1, succeeding F. P. Jeffries, resigned. M. E. Towner has been appointed Assistant to E. L. Pollock, Vice-President in charge of the purchasing department.

Evansville & Terre Haute.—See Chicago, Rock Island & Pacific.

Special Officers.

Pennsylvania.—R. H. Newbern, Assistant Superintendent of the insurance department, has been appointed Superintendent of that department, succeeding Hugh B. Ely, deceased.

LOCOMOTIVE BUILDING.

The State Railroads of Chili are in the market for 60 locomotives.

The Chicago & North-Western, it is said, is considering the purchase of 10 locomotives.

The Florida East Coast did not recently order 12 locomotives from the American Locomotive Co., as reported in the *Railroad Gazette* of November 8.

The Hocking Valley, according to press despatches, has reserved space with the American Locomotive Co. for 10 switching and two passenger locomotives for 1908 delivery.

The Pittsburgh, Shawmut & Northern has not ordered 10 freight locomotives and two passenger locomotives as reported in the *Railroad Gazette* of November 15, and it does not expect to do so this year.

The Denver & Rio Grande, as reported in the *Railroad Gazette* of November 1, has ordered 28 simple consolidation (2-8-0) locomotives from the American Locomotive Co., for January and February, 1908, delivery. The specifications are as follows:

General Dimensions.

Type of locomotive	Consolidation
Weight, total	220,000 lbs.
Weight on drivers	192,000 "
Diameter of drivers	57 in.
Cylinders	23 in x 28 in.
Boiler, type	Radial stay; extended wagon top
" working team presssure	200 lbs.
" number of tubes	364
" material of tubes	Charcoal iron
" diameter of tubes	2 in.
" length of tubes	15 ft.
Firebox, length	108 in.
" width	65¼ "
" material	Worth steel
" grate area	48 sq. ft.
Heating surface, total	3,028 "
Tank capacity	8,000 gals.
Coal capacity	14 tons

Special Equipment.

Air brakes	Westinghouse
Brake-beams	National-Hollow
Couplers	Tower
Injector	Simplex
Piston rod packings	Paxton-Mitchell
Valve rod packings	Paxton-Mitchell
Safety valve	Coale
Sanding devices	Hanlon
Sight-feed lubricators	Nathan
Springs	Railway Steel-Spring Co.
Tires, driving wheel	Midvale
Wheel centers	Standard Steel Co.

CAR BUILDING.

The Pere Marquette has asked bids on 1,000 box cars.

The Detroit, Toledo & Ironton has asked bids on box and flat cars.

The Canadian Pacific has been receiving bids on some 40-ton tank cars.

The Boston & Maine is said to be in the market for passenger equipment.

The Chicago, Rock Island & Pacific is asking prices on 30 miscellaneous cars.

The Chicago, Rock Island & Pacific has been asking bids on box, gondola and flat cars.

The Chicago, Indianapolis & Louisville has asked bids on several hundred box and gondola cars.

The Tonopah & Tidewater recently ordered three chair cars, one baggage car and one smoking car from the Pullman Company.

The Coney Island & Brooklyn has ordered 10 electric car bodies from the J. G. Brill Co., but the trucks and motors have not yet been decided on.

The Grand Trunk has decided not to order the 1,000 steel coal cars for which they recently asked bids, as reported in the *Railroad Gazette* of November 8.

The New York, Ontario & Western has postponed its proposed order for 10 passenger cars, on which it asked bids, as reported in the *Railroad Gazette* of October 18.

The Zanesville & Western, according to press despatches, has ordered 500 drop bottom coal cars of 100,000 lbs. capacity from the Ralston Steel Car Co., for December delivery.

The Virginian Railway, it is understood, will not for the present buy 100 coal cars, as reported in the *Railroad Gazette* of November 15, but it is said that the company will soon buy eight special cars.

The Mexican Railway, as reported in the *Railroad Gazette* of June 7, is considering the purchase of six chair cars, six first class coaches and six third class coaches, for which they were reported in the market.

RAILROAD STRUCTURES.

Iselin, Pa.—The Buffalo, Rochester & Pittsburgh has plans ready for a number of freight and passenger stations at important points on its Pittsburgh extension. The work is to be started this winter.

Ottawa, Ont.—The Ottawa Electric Railway, it is said, will pay part of the cost of the proposed viaduct on the Richmond road.

St. Thomas, Ont.—The Michigan Central, it is said, has plans made for putting up a new roundhouse here.

Vancouver, B. C.—The British Columbia Electric Street Railroad has plans made for putting up a combined station and office building to cost $100,000. R. H. Sperling, General Superintendent.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

Allegheny Coal Railroad.—Incorporated in West Virginia, with office at 1 Broadway, New York. The company proposes to build a line from the Baltimore & Ohio near Fairmont, W. Va., southwest through Marion, Harrison, Lewis and Gilmer counties to Glenville, 65 miles. The incorporators include Harry Smith, Baltimore; U. Hanmann, G. M. Dodge and A. Lerinsohn, of New York, and F. S. Landstreet, Davis, W. Va.

Ashcroft, Bakersville & Foat Geoage.—Application will be made at the next session of the Dominion Parliament for an extension of time to start work on this proposed line. The line is projected from Ashcroft, B. C., north to Fort George, about 300 miles. Eberts & Taylor, Vancouver, B. C., are the Attorneys. (March 15, p. 394.)

Atchison, Topeka & Santa Fe.—Although President Ripley recently announced that improvements to be made by this company were to be curtailed, according to reports from Texas, engineers are still at work on final surveys for the proposed cut-off to be built from Brownwood, Tex., northwest to Texico, N. Mex., about 300 miles. (March 15, p. 379.)

Ballinger & Abilene.—This company, it is said, will let contracts this year for building its proposed line from Ballinger, Tex., north to Abilene, 55 miles. W. J. McDaniel, Chief Engineer, Ballinger.

Baton Rouge, Hammond & Eastern.—See Illinois Central.

Billings & Northern.—See Great Northern.

Brandon, Saskatchewan & Hudson's Bay.—See Great Northern.

Canadian Northern.—This company, it is said, has graded 30 miles on a line which is projected from Saskatoon, Sask., southwest to Calgary, about 300 miles. This line is eventually to form part of a through line between Calgary and Ft. Churchill on Hudson Bay. Connection is also to be made with the line under construction north from Etlomani, Sask.

Canadian Pacific.—Officials of this company at Vancouver are reported as saying that bids will at once be asked for clearing and grading 48 miles of the Esquimault & Nanaimo extension from Nanaimo, B. C., west to Alberni. (Aug. 30, p. 247.)

Surveys are reported being made to extend the Manitoba & Northwestern from Sheho, Sask., northwest to Quill Lake, approximately, 62 miles.

Chicago & Southern Traction.—This company, it is said, recently finished an extension of its road and the line is now in operation from Chicago, Ill., south to Kankakee, 65 miles. The line is eventually to be extended southwest to Indianapolis, Ind.

Chicago, Burlington & Quincy.—An officer writes in reference to the proposed line from Frannie, Wyo., northwest, to Fromburg, Mont., 35 miles, that some surveys have been made, but there is no immediate prospect of the company building the line. (Nov. 8, p. 572.)

Crow's Nest Southern.—See Great Northern.

Cumberland River & Nashville.—Rights of way have been secured and work, it is said, will at once be begun by the Monticello Construction Co., of which J. H. Shearer is President, for building the section of this proposed line from Toteville, Ky., on the Cincinnati, New Orleans & Texas Pacific, southwest to a point 15 miles beyond Monticello. The line is to run from Corbin, Ky., southwest to Nashville, Tenn., 160 miles. (April 19, p. 564.)

Dakota & Great Northern.—See Great Northern.

DENVER & RIO GRANDE.—The work of double-tracking the Eagle River Canyon on the main line of this road, just west of Leadville Colo., is finished. The contractors, the Phillips Construction Company and O'Gara, commenced work about a year ago. The new second track, built through the narrow canyon, cost more than $100,000 a mile to construct. In the five miles there are three tunnels, with a total length of 800 feet, being 100, 300 and 400 feet respectively. There are five steel bridges with solid concrete floors. The new line, which is to be used for the eastbound or uphill haul, reduces the grade from 3.3 per cent. to 2.3 per cent., and the curvature is also greatly lessened.

ERIE, LONDON & TILSONBURG (ELECTRIC).—This company is applying for an extension of time for the construction of its line already authorized. The projected route is from Port Burwell, Ont., northwest to London, 40 miles, with a branch east to Tilsonburg, 15 miles. (March 15, p. 395.)

ESQUIMAULT & NANAIMO.—See Canadian Pacific.

GREAT NORTHERN.—The report of this company for the year ended June 30, 1907, shows that during the year the Dakota & Great Northern from Aneta, N. Dak., northwest to Devils Lake, 57.72 miles, was opened for traffic; also an extension from Thorne, N. Dak., northwest to Dunseith, 7.61 miles, and the extension from Berthold, N. Dak., northwest to Crosby, 89.09 miles. The line from Walhalla, N. Dak., north to the International boundary, 5.35 miles, where connection is to be made with the Midland of Manitoba, is to be opened this fall. The Billings & Northern from Armington, Mont., southeast to Laurel, 194.29 miles, has grading about two-thirds finished, and tracklaying was started last May. Up to June 30, 17 miles of track had been laid.

The Brandon, Saskatchewan & Hudson's Bay from the International boundary north of St. John, N. Dak., north to Brandon, Man., 69.45 miles, has been opened for traffic. The Midland of Manitoba from the International boundary north of Neche, N. Dak., northwest to Portage la Prairie, Man., 77.01 miles, has been opened for traffic, and the line from the International boundary north of Walhalla, N. Dak., to Morden, Man., 15.54 miles, is to be opened this fall.

The Vancouver, Victoria & Eastern and the Washington & Great Northern have been opened for operation from Midway, B. C., to the International boundary near Molson, Wash. (V., V. & E.), 28.89 miles, and from the International boundary near Molson to Oroville, Wash. (W. & G. N.), 27.82 miles. On the section from Oroville west to the International boundary at Chopaka (W. & G. N.), 20.64 miles, and from that place to Keremeos, B. C. (V., V. & E.), 18.20 miles, tracklaying has been finished. The V., V. & E. is also building from the Pacific coast east to meet the line building west from Keremeos. On this section work is under way from Cloverdale, B. C., east to Abbotsford, 26.25 miles. The V., V. & E. and the Victoria Ferry & Railway Company is building a low-grade line from New Westminster, B. C., south to Blaine, Wash. The portion of the line from New Westminster to Olivers, 9.89 miles, is being built by the V., V & E., and from that place to the International boundary north of Blaine, 11.32 miles, is being built by the V., F. & R.

Work is under way on the Crow's Nest Southern, building a 24-mile extension from Fernie, B. C., north to the mines of the Crow's Nest Pass Coal Company at Michel, B. C.

To facilitate the handling of iron ore, a line has been built from Kelly Lake, Mich., southeast to Fermoy, 23.40 miles, which was opened for traffic in September. An extension 1.67 miles long of the Stevenson mine spur has been finished. The company also built from Neche, N. Dak., .64 miles, to a connection with the Midland of Manitoba at the International boundary. A new line from Schurmeier, N. Dak., south to Grand Forks, permitting the abandonment of the old line between these places and giving a more direct connection with the new yards at Grand Forks, was built. The extension of the Brown's Valley branch in Minnesota to Lake Traverse, 1.92 miles, was put in operation last year.

The following work has been finished or is nearing completion: New terminals, including buildings and six miles of yard tracks, at Casselton, N. Dak.; similar work, including 11 miles of yard tracks, at Devils Lake, N. Dak.; also at Grand Forks, including 10 miles of yard tracks, and a 25-stall engine house at St. Paul, Minn. Grade reduction work between Minneapolis, Minn., via Wayzata, Willmar and Breckenbridge to Aneta, N. Dak. A number of smaller stations and buildings were also put up during the year. About three miles of sea wall has been built, and 4½ miles of double-track laid between Everett, Wash., and Seattle. The net increase in side track mileage during the year, not including the tracks on new lines under construction, or opened for operation during the year, was 132.13 miles. In addition 6.44 miles of side tracks were laid in connection with the Seattle passenger station, and track material for 10 miles of extensions to logging spurs near Solway and Akeley, Minn., were furnished by the company. During the year the main tracks were relaid with 85-lb. rails on 377.86 miles, and with 70-lb. rails on 45.87 miles. Several changes in the location of lines at various points have been made to improve the alinement, aggregating 9.41 miles. During the year the company replaced wooden and iron bridges and trestles with steel bridges, aggregating 1,667 ft. and 5,429 ft. of fills. Some of the work now in progress includes: Second main track between Devils Lake, N. Dak., and Churchill's Ferry, between Everett, Wash., and Ballard, the latter including the completion of the sea wall. The erection of terminal buildings and enlargement of yards at Kelley Lake, Minn., and at Allouez, Wis. A new yard is being built on the bay front, Superior, Wis., for coal traffic, preparatory to building a new elevated line for an entrance into Duluth, Minn., over the Duluth and Superior bridge controlled by the company. A change of line at Albany, Falls, Idaho, includes putting up a new steel bridge over the Pend d'Oreille river. A new dock and grain warehouse are also to be put up at Everett, Wash., and timber bridges are to be replaced with steel structures aggregating 2,900 ft.

HIDALGO & NORTHEASTERN.—See National of Mexico.

ILLINOIS CENTRAL.—A statement is made that the present plans for the construction of the Baton Rouge, Hammond & Eastern projected from Baton Rouge, La., east to Merrill, Miss., about 170 miles, call for building the line from Baton Rouge east to Covington, 65 miles, as rapidly as the work can be done. East of that place there will be nothing done at present. (June 14, p. 878.)

ILLINOIS TRACTION.—The St. Louis & Staunton has been incorporated, with office at Champaign, Ill., to build a line from the main line of the Illinois Traction at Edwardsville, Madison county, northeast to Staunton, Macoupin county, 20 miles. The St. Louis & Northeastern, a subsidiary of the Illinois Traction, now operates a line between these places. The incorporators include: G. N. Mattis, W. H. Carnahan, R. H. Watson, Jr., B. M. Bramble and C. Zille.

LEHIGH & LAKE ERIE.—See Lehigh Valley.

LEHIGH VALLEY.—The Lehigh & Lake Erie, a 10-mile double-track terminal line in Buffalo, is finished. The line has not yet been opened for traffic.

MANITOBA & NORTHWESTERN.—See Canadian Pacific.

MEXICAN CENTRAL.—Work is under way on the Manzanillo extension, repairing the damage caused by floods last summer. About 10 miles of grade and track were washed away.

MIDLAND OF MANITOBA.—See Great Northern.

MISSOURI PACIFIC.—Contracts are reported let to L. J. Smith, of Kansas City, Mo., at $1,500,000, for ballasting with gravel the tracks of the St. Louis, Iron Mountain & Southern in Arkansas and Louisiana. It will require eight months to finish the work.

NATIONAL OF MEXICO.—Plans, it is said, have been made to extend the Hidalgo & Northeastern from Beristain, Hidalgo, northeast to the port of Tuxpan, on the Gulf coast, about 125 miles. It is said that the Government will carry out extensive improvements to make a deepwater harbor at Tuxpan.

NEW YORK CENTRAL & HUDSON RIVER.—The New York State Public Service Commission, First district, has begun legal action to condemn the rights of this company on Eleventh avenue in New York City. This is in pursuance of the law under which the company's tracks in Eleventh avenue, used mostly for freight, will have to be taken up and rebuilt either above or below the surface.

NEW YORK & STAMFORD (ELECTRIC).—This company, which operates a 16½-mile electric line from New Rochelle, N. Y., northeast to the Connecticut state line, has been granted permission to double-track its line in Larchmont, Rye and Portchester.

NORTHERN PACIFIC.—It is expected that this company will soon let contracts for piercing a tunnel from the Narrows to the water front in Tacoma, Wash. When this work is begun, it is said, contracts will be let for the new $500,000 passenger station.

ONTARIO ROADS (ELECTRIC).—A franchise has been granted to build an electric line from Cobalt, Ont., north to Haileyburg, about five miles. The line is eventually to run south from Cobalt to the Silver Queen mine and north from Haileyburg to New Liskeard. Judge C. M. Stone, of Cleveland, Ohio; M. J. O'Brien, R. J. Fitzpatrick and Frank Latchford, of Ottawa, Ont., and T. Fitzpatrick, of New Liskeard, are interested.

OREGON & WASHINGTON.—See Union Pacific.

OREGON RAILROAD & NAVIGATION COMPANY.—See Union Pacific.

OREGON SHORT LINE.—See Union Pacific.

PHILADELPHIA & READING.—Bids are wanted December 17 at the office of W. Hunter, Chief Engineer, Philadelphia, for grade crossing elimination work on the Philadelphia, Germantown & Norristown, as follows:

Contract No. 5.—Masonry, trestle and embankments from south side of Berks street to the south side of Susquehanna avenue.

Contract No. 7.—Similar work from south side of Susquehanna avenue to Broad street.

Contract No. 8.—Bridges from Berks street to Broad street.

Contract No. 14.—Masonry, embankment and paving for yards between York street and Cumberland street.

Contract No. 26.—Temporary engine yard at Wayne Junction.

St. Louis & Staunton.—See Illinois Traction.

St. Louis, Iron Mountain & Southern.—See Missouri Pacific.

San Antonio & Aransas Pass.—Plans are reported being made by this company to lay heavier rails on its road from San Antonio, Tex., east to Houston, 239 miles.

Southern Utah.—This company, it is reported, will soon let contracts for building its proposed line from Price, Utah, on the Rio Grande Western south about 20 miles to Miller creek. L. P. Elliott, Chief Engineer, Salt Lake City.

Texas City Terminal.—H. B. Moore, General Manager of this company, is quoted as saying that in the last year the railroad built four miles of track to a connection with the Gulf, Colorado & Santa Fe, and also built six miles additional, for increasing the terminal facilities at Texas City. The road now has connection with all lines entering Houston from Galveston.

Tuscarawas Valley Transit & Power Co.—Under this name a company proposes to build a line from Canal Dover, Ohio, north via Zoar and Bolivar to Canton, about 25 miles. The line may eventually be extended from the proposed southern end at Canal Dover southwest via Coshocton to Columbus. The promoters' names are not given .

Union Pacific.—This company recently opened a new branch to coal mines on its Colorado division at St. Vrain which may eventually be extended north to Fort Collins. Double-tracking work is in progress on a large section of the road through Nebraska and Wyoming. The double-track in operation and on which work is under way is shown in the following table:

	Tracks		
	Double, in operation.	Second, under construction.	Single.
Council Bluffs, Iowa, to 13th St., Omaha	3.1	.....	.....
Add'l tracks, 13th St. to Omaha city limits	.....	2.0	.....
S. O. & W. R. R.	.....	11.6	.....
Lane to Valley	11.3	.....	.....
Valley to Benton	.....	48.9	.....
Benton to Columbus	7.9	.....	.....
Columbus to Silver Creek	.....	17.5	.....
Silver Creek to Lockwood	.....	38.5	.....
Lockwood through Grand Island to Alda	13.7	.....	.....
Alda to Buda	.....	29.8	.....
Buda through Kearney to Watson's Ranch	10.1	.....	.....
Watson's Ranch, Neb., to Archer, Wyo.	.....	.....	36.7
Archer to Buford	35.3	.....	.....
Buford to Hermosa	.....	.....	11.9
Hermosa to Laramie	17.9	.....	.....
Laramie to Lookout	.....	.....	27.6
Lookout to Hanna	49.3	.....	.....
Hanna to Rawlins	.....	.....	39.9
Rawlins to Wamsutter	.....	41.4	.....
Wamsutter to Point of Rocks	.....	.....	52.9
Point of Rocks to Rock Springs	26.2	.....	.....
Rock Springs to Green River	.....	.....	13.9
Total	174.8	189.7	182.9

The Oregon Short Line is making improvements in Salt Lake City to cost $1,800,000. About 25 miles of sidings, a freight house 600 ft. long, and a passenger station to cost $300,000 are being built. A new branch is projected from Sugar, Idaho, on the Yellowstone Park branch southeast to coal fields at Victor, below the South Fork river, about 50 miles. Work is also under way building a branch from Huntington, Ore., at the junction of the Oregon Railroad & Navigation Co.'s line, north along the Oregon-Idaho state line, following the Snake river, to be built eventually to Lewiston, Idaho. This line will probably form part of a through transcontinental line; 59 miles of the line has been authorized and grading is finished for 25 miles. (Oct. 1, p. 403.)

The Oregon Railroad & Navigation Company is extending its branch from Elgin, Ore., east to Joseph, 63 miles. From The Dalles, Ore., west to Portland, 88 miles, the company has been at work for the past year reducing the heavy grades and the worst curves and improving the track; about $1,500,000 is now being spent on this work. The longest stretch of straight track between The Dalles and Portland on the present line is about two miles. On one of the improvements now under way, that between Troutdale and Bonneville, 17.48 miles, the reduction in curvature will amount to 1,454 deg. 51 min. The amount of bridging is also being greatly reduced between The Dalles and Portland, where five years ago there were 7½ miles of bridges there is now but about half a mile. Terminals have been bought at a cost of about $20,000,000 and a considerable amount of the right-of-way has been secured for the proposed Oregon & Washington, projected from Portland, Ore., north to Tacoma and Seattle, about 230 miles. This line will cost about $15,000,000. Announcement is made that work is to be begun next month at Tacoma, Wash., on an 8,700-ft. tunnel to have two tracks for this line. The cost of the tunnel will be about $3,000,000. (Nov. 15, p. 665.)

Announcement is made that this company will build a 20 mile branch from Rock Springs, Wyo., north to extensive coal fields. There are also to be three or four laterals, with a combined length of about six miles.

Vancouver, Victoria & Eastern.—See Great Northern.

Victoria Ferry & Railway Company.—See Great Northern.

Washington & Great Northern.—See Great Northern.

West Side Belt.—Work has been started by this company, rebuilding the Banksville branch, which is to be extended later to Washington county, where the Gould interests own extensive coal lands. The rebuilding of this line is thought to be the first step toward the development of the Washington county property.

RAILROAD CORPORATION NEWS.

Atlantic Coast Line.—The Directors have decided not to take action on the annual dividend on the common stock until some time in December, when a special meeting will be called. The company has been paying 6 per cent. on its $47,537,600 common stock for the last two years.

The New York Stock Exchange has listed $383,000 additional first consolidated mortgage 50-year 4 per cent. bonds, making the total listed $43,524,000. The additional bonds were sold to pay for new rolling stock.

Boston & Maine.—Gross earnings for the three months ended September 30, 1907, were $11,607,602, an increase of $388,446; net earnings $3,541,722, an increase of $188,287. The surplus after charges was $1,293,507, a decrease of $141,007.

Chicago, Indianapolis & Louisville.—Millett, Roe & Hagen, New York, are offering at 111 and interest $50,000 refunding mortgage 6 per cent. bonds of 1947, being part of an outstanding issue of $4,700,000. This offering of an underlying long term bond secured by a direct mortgage lien at a price to yield 5.35 per cent. is an illustration of the present low prices for railroad securities. These bonds sold at from 128 to 137 in 1906.

Chicago Union Traction.—A modified plan of reorganization has been approved by Judge P. S. Grosscup and Professor J. C. Gray and the reorganization committee has asked the holders of the securities of the different street railway companies in Chicago to deposit their holdings on or before November 25 under the terms of the new plan.

Illinois Central.—To President Harahan's circular letter mentioned in this column last week, Stuyvesant Fish replies that the fact that the personnel of the management has so far not been changed and is considered efficient is gratifying to him, since these appointments were made under his administration. He says that he is making the contest not because the present condition of the Illinois Central is alarming, but because he believes that domination by the Harriman interests will result in future changes which will hurt Illinois Central stockholders.

Mexican Railway.—Gross earnings for the six months ended June 30, 1907, were $1,986,162, an increase of $237,833; net earnings, $870,594, an increase of $58,782. Net income, after charges, was $635,801.

Pere Marquette.—The meeting to approve the reorganization plan has been postponed to December 9. (Nov. 8, p. 574.)

Pontiac, Oxford & Northern.—The sale of this road under foreclosure has been ordered by the Circuit Court, but pending an appeal to the Supreme Court no date for the sale has been set. The road runs from Pontiac, Mich., to Caseville, 100 miles, and has been in the hands of a receiver since March, 1905.

Southern Pacific.—Gross earnings for the three months ended September 30, 1907, were $34,254,658, an increase of $5,740,151; net earnings, after taxes, $10,062,657, a decrease of $743,623.

Tampa Electric.—This company has declared a semi-annual dividend of 2 per cent. on its $1,700,000 capital stock. The annual rate had been 10 per cent. for several years. The company owns all the street railways, 36 miles, and electric lighting plants in Tampa, Fla., and Port Tampa.

Union Pacific.—Gross earnings for the three months ended September 30, 1907, were $21,192,742, an increase of $2,493,242; net earnings, after taxes, $8,415,452, a decrease of $898,236.

Wabash.—The New York Stock Exchange has listed $416,000 additional first refunding and extension 50-year 4 per cent. bonds, making the total listed $24,366,000. These additional bonds were issued in exchange for debenture "B" bonds and the Stock Exchange has authorized the listing of $584,000 more as issued from time to time in exchange for debenture "A" and "B" bonds up to July 1, 1908.

York Railways Company.—The Governor of Pennsylvania has approved the merger of the electric railways in York county under the name York Railways Company. The new company will have $5,000,000 capital stock and will assume $3,431,000 bonds of the old companies. W. F. B. Stewart, York, Pa., is President.

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EDITORIAL ANNOUNCEMENTS.

THE BRITISH AND EASTERN CONTINENTS edition of the Railroad Gazette is published each Friday at Queen Anne's Chambers, Westminster, London. It contains selected reading pages from the Railroad Gazette, together with additional British and foreign matter, and is issued under the name Railway Gazette.

CONTRIBUTIONS—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.

ADVERTISEMENTS—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

OFFICERS—In accordance with the law of the state of New York the following announcement is made of the office of publication, at 83 Fulton St., New York, N. Y., and the names of the officers and editors of The Railroad Gazette.

CONTENTS

VOL. XLIII., No. 22. FRIDAY, NOVEMBER 29, 1907.

At last the financial disturbances and threatened industrial depression which have for some time been showing their effect by reducing the percentages of increase of railroad gross earnings have brought about the first actual decrease for over two years and a half. For the second week of November the gross earnings of 42 railroads, as summarized in the *Commercial & Financial Chronicle*, showed a decrease of 1.80 per cent. This is the first decrease so reported since the fourth week of February, 1905, when 50 roads reported a decrease of 6.30 per cent. in gross earnings. Gross earnings decreased in each of the last three weeks of that month, and for the month as a whole 117 roads reported a decrease of 3.01 per cent. in gross. Forty-seven roads reported a decrease of 3.39 per cent. in gross earnings for the second week in January, 1905. The loss in this one week, however, was swallowed up in the gains of the other three weeks so that this month showed an increase. Except for these four weeks in the winter of 1905 gross earnings have shown an increase up to this month in every week since July, 1904. In the fourth week of that month, 45 roads reported a decrease of 4.35 per cent., and in the third week 49 roads showed a loss of 1.54 per cent. in gross. For July, 1904, as a whole, 125 roads reported a decrease of 5.35 per cent. in gross earnings. Thus, the weekly figures, though for a much smaller number of roads, are typical of the trend of earnings throughout the bulk of the country's railroads. No figures of course are available for the current month. For October only 56 roads have reported to the *Chronicle*, these showing an increase of 5.91 per cent. in gross. In September 118 roads showed an increase of 9.71 per cent. following gains of 12 per cent. in August (121 roads); 14 per cent. in July (116 roads); 14 per cent. in June (121 roads); 18 per cent. in May (121 roads), and 21 per cent. in April (118 roads). The April increase followed a gain of 9 per cent in March and was the high-water mark of the present year. Since then there has been a steady and continuous decrease. Now that it is a fact that gross earnings are falling off, it is important to consider the effect of this change. What this will be depends entirely on the extent to which earnings decrease. In many ways a moderate falling off in gross would be a relief and an advantage. One great reason for the rapid rise in operating expenses during the past year was the increase of traffic beyond facilities. One year of congestion and strain had been piled on another until the tracks, terminal facilities, locomotives, cars and most of all perhaps the men, both employees and officers, were overburdened by the continued pressure. A small falling off in gross earnings will give a breathing space in which to strengthen all these different factors in railroad efficiency and straighten out difficulties whose settlement has been brushed aside by the one urgent necessity of moving the traffic. How far the decrease in gross earnings can go before it begins to reduce net in the same proportion or faster is a question which the experience of the next six months will go far to answer.

THE WANING SUPPLY OF HARDWOOD IN THE UNITED STATES.

An apparently well founded guess as to when the hardwood supply will be exhausted has some interest both as an incentive to the development of substitutes and to planting and reforestization. The Forestry Bureau gives us some facts, some estimates and some well founded guesses. Heretofore we have had treatment by the bureau of the timber supply as a whole and not separating the hardwoods as it has done in this instance. In the past the center of hardwood supply may be said to have been in Ohio and Indiana; the far western states produce so little, that the quantity is negligible. At the present time the Ohio-Indiana supply, so easily accessible, has been exhausted and west of the Mississippi river the only state that need to be considered as a producer of hardwoods is Arkansas, which furnished about seven per cent. of the whole amount cut in the United States in the year 1906.

Of the hardwood trees cut into lumber, the production in 1899 was 8.6 billion board measure feet. In 1906 this cut was reduced 15.3 per cent. to 7.3 billion, although the wholesale prices of hardwood lumber advanced from 25 per cent. to 65 per cent. It is plain, therefore, that the decrease of production was due to a waning supply. The main production is now in the Lake states, especially in Michigan and Wisconsin, the lower Mississippi Valley and in the states containing portions of the Appalachian mountain ranges.

There is little hope for successful reforestization of lands adaptable to agricultural or other purposes, and this consideration disposes of any hope for other than sporadic reforestization in the Lake states and Mississippi Valley. The Forestry department believes, however, that there is a chance for successful work in the Green mountains, the Alleghany, the Blue Ridge and minor ranges

in the Appalachian group. The present lumber cut of 7.3 billion board measure feet is probably less than one-third of the amount of hardwood cut and used; for the records do not include the amounts cut for railroad ties, poles, piles, fence posts and fuel based on the measured cut, the guessed cut is therefore 25 billion board measure, or a trifle more than 3 billion cubic feet a year.

The amount of standing hardwood is also uncertain, but there are a number of reasonable bases for estimate, and the highest estimate is 50 billion cubic feet. At the present rate of cutting, therefore, the supply will be exhausted in about 16 years.

As to the chance of reforestization with a view to making a constant supply of three billion cubic feet a year, the Forestry department has made estimates by counties in the Appalachian mountain ranges south of Pennsylvania, and less accurate estimates in the mountains of Pennsylvania, New York and New England, and finds that there are 75 million acres primarily adapted for hardwood timber and having little or no value for other purposes. Most of this has been more or less closely cut over, but its reforestization is not considered difficult. The careful studies made by the department in East Tennessee show that under protection from fire and with good management, such lands are capable of producing 50 cubic feet of hardwood per acre per year and these figures applied to the 75 million acres in the Appalachians would make a possible annual production of between three and four billion cubic feet. Of course, at the beginning of the undertaking the maximum production would not be reached.

The Forestry department estimates that at the beginning the average production would be 10 cubic feet per acre, increasing gradually to the estimated 50 cubic feet per acre per year. It seems probable, therefore, that if active steps were taken now by this Government to so make permanent its hardwood supply the product would soon keep pace with the demand. There is a wide difference between constructive and destructive governmental enterprise. A man does more good, but attracts less attention when he is hoeing potatoes than when he is killing snakes.

THE LIQUIDATION IN RAILROADS.

It is a good time now when the word "liquidation" comes up so often in the vocabulary of stressful finance to recall briefly, for comparison and contrast, some of the phenomena of the panic of 1873 and the long strain which followed it for several years. That long crisis, it will be remembered, had its origin in railroad finance and, in one sense, "high" finance, though of a different, less malignant and less culpable type than the high finance of to-day. High finance then was simply a kind of honest craze for railroad overbuilding. It was only in a limited way speculation. It was still less stock watering. And it was not in any noteworthy degree stock manipulation, recapitalization, holding corporations and other recent devices of control. Municipalities shared in the frenzy of railroad construction and inflated ideas of its local benefits, and put the dollars of the taxpayers into railroad projects only to see the dollars swept by the board and the obligations incurred by "loan aid" bonds remain—and many of them remain unto this day. Still it was generally cash and not water that went into the unwise railroad enterprise. It was the railroad project, not the railroad security that, in the up-to-date adjective, was "undigested."

But the results were profoundly disastrous. As it was the railroads that brought on the 1873 crisis so it was the railroads that felt its brunt. Other and normal symptoms of general financial contraction—tight money, trouble in banking institutions, recession of business—were apparent enough; but it was upon railroads that the hardest shock fell and among the railroads that the longest and widest swath of calamity was cut. The shock came very suddenly and at a time when ever so many railroads were either under construction or had barely passed that stage. They were unfinished or had not reached a period of earning power and had also, at that initial stage, been incompletely financed. Hence the sequel in receiverships, foreclosures and reorganizations on a great scale attended with heavy losses in junior railroad securities and often in senior securities also. And it took years to "liquidate" and set the crippled roads on a bedrock of solvency during a painful process of cure in which the roads which were "going" concerns had to suffer too.

It is from history with its parallels and contrasts that we best learn. When we apply that "liquidation" experience beginning in the autumn of 1873 with the situation now, almost exactly a third of a century later, one finds some important elements of reassurance. On the negative side we of course have just had the high finance which we did not have then or, at least, not in anything like the same degree. But of late high finance has had some awful and disciplinary jars which ought to give it a quietus for a good while to come. On the same negative side we have the state and federal attack on capital mixing innocence and guilt in its assault. But is not experience now beginning to teach also federal and state authority its sharp lesson to be driven in yet deeper when the courts, on the one hand, and popular sentiment on the other, responsive to the pocket nerve, begin to get in their work? On the positive side the contrast with 1873 is cheering. There has been, to be sure, vast shrinkage in railroad values. But the financial trouble has not focussed on the railroads in anything like the same measure that it did in 1873 and after; it has hit them not as inchoate ventures half born or newly born but as going concerns with earning power often very high and not even yet much diminished; it has struck at a single branch of railroading, the financing of improvements, not at the original values; and the losses in such financing have fallen in a large number of cases on the underwriters, not on the railroad corporation. The long trail of railroad receiverships that began so quickly in 1873 has not begun now nor is there the slightest probability that it will begin at all. Even dividends remain almost entirely unaffected. The fundamental conditions of the two periods of "liquidation" are different—all the difference, in fact, between railroad stability and railroad infirmity and their relative power in resisting adverse market prices.

One can go farther and point out other disparities between the "liquidations" of 1873 and of 1907 in their bearing on railroad investments as well as others. The protective high organization of conservative capital at the later period might, for example, be contrasted with the looser and less effective organization of 1873 as well as differences in the character and size of the national prosperity. But such broader reasonings are needless. That liquidation of 1873 as a starting point of time and reaching through the painful years in railroad affairs which followed, finds in 1907 a railroad condition not only not analogous but, intrinsically, almost exactly the reverse. A few months, perhaps weeks, will set forth the fact in clearer terms of railroad stability.

AN EQUIPMENT ACCOUNT FOR EACH CAR AND LOCOMOTIVE.

Equipment accounting is a subject of particular interest at this time because the rules of the Interstate Commerce Commission covering this department of railroad accounting are still under discussion and are soon to be decided—in time to be put in force to cover the year beginning July 1, 1908. The Baltimore & Ohio's system of keeping a separate account with each locomotive and car is therefore of interest. A debit and a credit account is opened with each individual unit of equipment. This is done in books 18½ in. x 24 in. of 150 folios each. Each "folio" represents two facing pages, so that when the book is open on the desk the space occupied is 18½ in. x 48 in. The left-hand page is for the debit and the right-hand page for the credit account. Four such books are used for the individual record of locomotives and 60 for the individual passenger and freight car record.

Each page contains in three parallel columns space for the record of 50 cars, so that each book of 150 folios contains the complete debit and credit record of 7,500 cars. The debit page shows the number of the car, the month, day and year on which it was put in service, the builder and the original cost; these each in parallel columns. The last column shows the cost and character of betterments; which, for passenger cars, are listed under eight heads, as follows: Brakes, couplings, Westinghouse air signal, heating apparatus, vestibuled, capacity increased, number of wheels, lighting. There is a further column for remarks. This side of the account records the existence of the car, its cost and the kind and cost of betterments applied.

The credit account, on the right-hand page, records for the same 50 cars individually the month, day and year on which put out of service, how this came about, the book value of the car ("amount in rolling power"), how this amount was credited and a column for remarks. The credit side, therefore, records the going out of existence of the car, the amount at which it stood in the equipment account and the name of the account to which this amount is credited. Each page has a recapitulation at its foot, of the cost or value items of the 50 cars recorded on that page.

While it is not pretended by the company that this individual

record represents the actual value of each car based on a set percentage of annual depreciation, it is found valuable because it results in having a pretty accurate knowledge and necessitates constant and careful checking of the equipment, a process of which there can hardly be too much in keeping track of the rolling stock of a large system. The individual record was established at the time of the financial reorganization of the company. At that time the equipment was much overvalued and the records were in unsatisfactory shape. The company had an indicated profit and loss credit balance of about $50,000,000, but its rolling stock was badly run down and insufficient for its needs. At the time of the reorganization a revaluation of the equipment was made and the individual record established on the basis of this revaluation. For a time the locomotives and cars stood in the equipment record at this revalued figure or, in the case of new cars, at their original cost.

Then the company began to burden operating expenses with cost of replacement. Since that time the amounts charged to operating expenses for depreciation, and as credit to equipment account because of locomotives or cars put out of service, have been distributed among the individual cars and locomotives. This is a process which cannot be done with exactness. In practice it is done largely according to the judgment of the man in charge of the record, which is guided by the principle that the older the car, the more it will naturally require of the depreciation expenditures. Dividing the total amounts set aside for depreciation and because of destroyed cars, among the different cars individually, the total of the individual record agrees with the monthly summary of depreciation charges. Although this is an arbitrary process, the individual record has to be carefully checked over in doing it, which means increased watchfulness over each unit of equipment.

It is not always realized how difficult it is to keep track of 80,000 to 100,000 cars scattered over the 400,000 miles of track on the continent of North America. The individual equipment account helps to do this because the men in charge of the record (which is kept in the motive power department) check once a month with the men in the office of the superintendent of car service who keep the record of car movement. This is done in order to keep track for the individual car record of cars which have for one cause or another gone out of service. All cars which in this monthly check between the two departments are found not to have moved for a month are at once traced by the car service department. Thus the individual book-keeping account for each locomotive and car serves as an added check on the transportation records.

As the individual record is entirely too detailed to be used for getting a general view of the changes and the condition of the equipment as a whole, these facts are summarized in a monthly statement covering the whole rolling equipment. This is printed on a sheet 24 in. x 19 in., on one side of which is a summary of the individual physical changes in the equipment and on the other a summary of the result of the changes in the value of the equipment during the month and period from the end of the last fiscal year. Both statements are summarized under the four general classes of equipment: locomotives, passenger equipment, freight equipment and work equipment. In the value statement these four classes are summarized in totals.

Under the summary of physical changes, each of these general classes is separated into the individual kinds of equipment. Locomotives, for instance, are divided as passenger, freight and switching each with a further division for narrow gage, and electric motors. Passenger equipment has 18 sub-divisions, freight equipment 40, and work equipment 42 sub-divisions. The separate columns opposite each of these accounts are as follows: "On hand ....., 19...," "Bought during month," "Built," "Rebuilt," "Change of class," "Put out in error—now brought back," "Total additions," "Total to be accounted for," "Put out of service," "Sold," "Change of class," "Total deductions," "On hand ....., 19...," with a further column for remarks. This, therefore, is a complete summarized record of all equipment changes during the month. If more detailed information is wanted it can at once be found by turning to the individual record.

The statement of changes in value during the month and period is called a monthly balance sheet of rolling equipment. This has recently been revised to conform to the tentative rules of the Interstate Commerce Commission for equipment accounting. In this statement freight-train equipment is divided in two groups, wooden cars and steel cars. Opposite the classes are four double columns, one-half of the column for the month, the other half for the period. The first is for Capital Value (General Ledger Account—"Equipment"), the second for Depreciation (General Ledger Account—"Replacement"), the third for Changes in Equipment (General Ledger Account—"Equipment Renewals"), and the fourth a total of the three previous. As thus revised, the Interstate Commerce Commission headings of "depreciation" and "renewal" are kept separate. In the left hand margin under each class of equipment, including the two kinds of freight cars, there are the following headings, each on a separate line:

Capital value as of——
Increase in value by change of class
New equipment added
Equipment erroneously reported "Out of Service" now brought back.
Betterments applied.
Total,
From which should be deducted
Deductions by reason of change of class
Equipment put "Out of Service" by reason of sale, wreck or condemnation.
Monthly depreciation
Total deductions.
Net total.

This is as complete a summary of the changes in value of the equipment during the month as the statement on the other side of the same sheet is a summary of the physical changes during the same period. By the three parallel columns for Capital Value, Depreciation, and Changes in Equipment, a complete record of the changes in value as distributed among these three separate accounts is kept. The fourth column gives the total of the other three. Thus on the two sides of one sheet can be summed up all the changes in number (physical) and in value (financial) of the entire equipment of the Baltimore & Ohio system.

These two summaries combined with the individual locomotive and car record form a complete detailed showing and at the same time a clear and understandable record of the condition, value and changes in the equipment. Keeping the individual equipment record on the Baltimore & Ohio takes the whole time of two men at a cost of $175 a month, or $2,100 a year. As the books in which the record is kept are so ruled as to give three or, at a push, four lines for each locomotive or car, the books will last for many years. There is nothing automatic about this system. It does not ensure an accurate record of the value of each locomotive or car, nevertheless it records the life history, makes re-inventorying or corrections easy, and the results when summarized in totals by classes of equipment are likely to be much more accurate than when records by classes are the most detailed that are kept. The fact that the Baltimore & Ohio and the Pennsylvania both keep such records of each locomotive and car is some proof of the value of such individual equipment accounting.

Train Accidents in October.[1]

Our record of train accidents occurring on the railroads of the United States in October, 1907, includes 14 collisions, 14 derailments and three other accidents, 31 accidents in all. This record is not published in full except in the cases of the few accidents which are especially prominent—in the present instance four collisions and one other accident. The record of "ordinary" accidents—which term includes, for our present purpose, only those which result in fatal injury to a passenger or an employee or which are of special interest to operating officers—is given at the end in the shape of a one-line item for each accident, showing date, location, class and number of deaths and injuries. In this tabular statement italics are used to indicate the items concerning which details are given. This record is based on accounts published in local daily newspapers, except in the cases of accidents of such magnitude that it seems proper to send a letter of inquiry to the railroad manager.

The record for October shows no collision or derailment of

[1]Abbreviations and marks used in Accident List:

rc.....Rear collision.
bc.....Butting collision.
xc.....Other collisions; as at crossings or in yards. Where only one train is mentioned, it is usually a case of a train running into a standing car or cars, or a collision due to a train breaking in two on a descending grade.
b.....Broken.
d.....Defective.
dr.....Defect of roadway.
eq.....Defect in car or engine.
n.....Negligence.
unf.....Unforeseen obstruction.
unx.....Unexplained.
derail....Open derailing switch (negligence of engineman or signalman).
ms.....Misplaced switch.
acc. obst..Accidental obstruction.
maltce....Malicious obstruction of track or misplacement of switch.
boiler.....Explosion of boiler of locomotive on road.
fire.....Cars burned while running.
Pass.....Passenger train.
Fr.....Freight train (includes empty, engines, work trains, etc.).
*Wreck wholly or partly destroyed by fire.
†One or more passengers killed.

startling magnitude, and in this respect October is the lightest month of the year, thus far. January had the Alta Vista collision and February the Williams-Bridge derailment; March, Colton, Cal.; May, Honda, Cal.; July, Salem, Mich., and September, West Canaan, N. H. June had the Hartford collision, killing eight. April and August were free from cases causing more than six fatalities, and in the present report the maximum appears to be three.

Perhaps the worst case in October is the collision at Rudd, N. C., on the seventeenth. The only report which has been published concerning a cause is that it was due to a misplaced switch opened by the front brakeman of a freight train. Press despatches say that this brakeman had been on duty for 23 hours without sleeping, but this is a statement which lacks confirmation. The facts will probably come out in the government report.

The collision at Chicago, on the 19th, is peculiar in that Engineman Cushing, an experienced runner, had with him, as passenger on the engine, another runner of experience who testified that Cushing was at fault for overrunning a signal, having taken his fireman's word for it that the signal indicated "all right." The collision occurred not far from the terminal station and the trains were running at very moderate speed. It occurred at 7 o'clock in the evening, a westbound passenger train running through a crossover and striking an eastbound train on the adjacent main track.

The collision at Leiters Ford, on the 25th, affords an illustration of lax discipline in block signaling. A freight train entering a side track broke in two before it had fully cleared the main line, but the block signalman, who was unable to see the whole of the train, assumed that it had cleared the main line when it had not.

The collision at Dallas, Tex., is notable as being the first train accident in the history of the Missouri, Kansas & Texas Railway in which a passenger has been killed. The passenger train was filled with about 1,000 excursionists. Only one of them was fatally injured, the other two fatally injured being an engineman and a fireman.

Near Fontanet, Ind., on the 15th, all of the windows in the cars of a passenger train of the Cleveland, Cincinnati Chicago & St. Louis were broken by an explosion at a powder magazine, four miles distant. The explosion destroyed a village, killed 20 or more persons and injured several hundred others.

TRAIN ACCIDENTS IN THE UNITED STATES IN OCTOBER, 1907.

Collisions.

Date.	Road.	Place.	Kind of Accident.	Kind of Train.	No. persons reported Kil'd.	No. persons reported Inj'd.
2.	Boston & Maine	Worcester.	hc.	P. & Ft.	0	8
12.	L. & N., St. L. & S. F.	Pratt City.	xc.	P. & Ft.	1	8
12.	Nor. Central	Troy.	hc.	Ft. & Ft.	1	0
12.	Chic. & North-Westn.	Marquette.	xc.	Ft.	1	0
15.	Pennsylvania	Riverside.	rc.	Ft. & Ft.	1	0
*17.	*Southern*	Rudd.	hc.	P. & Ft.	3	37
18.	Pere Marquette	Palms	xc.	P. & Ft.	2	5
19.	*Chic. & North-Westn.*	Chicago.	xc.	P. & P.	1	20
20.	C., C., C. & St. Louis	New Carlisle.	xc.	P. & Ft.	1	0
21.	Erie	Marion.	hc.	P. & Ft.	1	3
25.	*Erie*	Leiter's Ford.	rc.	P. & Ft.	1	20
25.	Kalamazoo & Mich.	Langsville.	xc.	Ft. & Ft.	3	2
26.	Texas & Pacific	Baird.	hc.	Ft. & P.	2	0
27.	*Mo., Kan. & Texas*	Dallas.	hc.	P. & Ft.	3	40

Derailments.

Date.	Road.	Place.	Kind of train.	Cause of derlmt.	No. persons reported Kil'd.	No. persons reported Inj'd.
2.	Long Island	Flushing.	Pass.	washout.	1	0
7.	Northern Pacific	Weston.	Ft.	runaway.	2	3
8.	Phila. & Reading	Arcola.	Pass.	acc. obst.	1	1
8.	Mo., Kan. & Texas	Jolly.	Pass.	loose rail.	0	18
13.	Norfolk & Western	Montvale.	Ft.	b. flange.	1	12
13.	Norfolk & Western	Montvale.	Pass.	acc. obst.		
17.	Atch., Top. & S. Fe.	Bengal.	Ft.	washout.	1	0
*17.	Boston & Albany	Everett.	Ft.	unx.	0	0
†18.	Atch., Top. & S. Fe.	Earl.	Pass.	b. rail.	3	3
19.	Southern	Savage Creek.	Ft.	cow.	1	6
25.	Chesa. & Ohio.	Klondike.	Pass.	spr. rail.	1	0
*26.	Wabash	Thompson.	Pass.	spr. rail.	2	7
26.	Louis. & Nash.	Blockton.	Pass.	unx.	1	4
27.	New York Central	Nehasane.	Pass.	b. truck.	0	1

Other Accidents.

Date.	Road.	Place.	Kind of train.	Cause of derlmt.	No. persons reported Kil'd.	No. persons reported Inj'd.
12.	Central of Georgia	Reynolds.	Ft.	boiler.	3	0
15.	C., C., C. & St. Louis	Fontanet	Pass.	explosion.	0	3
*19.	Erie	Crown Point	Pass.	fire.	0	0

Of the 18 serious accidents to electric cars noticed in the newspapers in October, eight were reported as having been attended with fatal results. In one case, a butting collision in the city of Chattanooga, four persons were reported killed. The other seven fatal cases were in Steubenville, Ohio; Rapid City, S. Dak.; Cincinnati, Ohio (2), Worcester, Mass.; Cuyahoga Falls, Ohio, and Chicago, Ill.

We have received the return of the total number of persons injured by the third rail in England from 1901 to 1907. The return undoubtedly shows that as people become more accustomed to the third rail, the number of accidents tends to decrease and this in spite of the steady increase in the electrified mileage. While in 1904 there were 28 accidents, eight of which were fatal, during the first eight months of the present year there were only 14 accidents, two of which were fatal, and even this small number of accidents was largely made up of trespassers. The grand total, 1904-07, is 16 killed and 71 injured, but out of this number 12 of the fatal accidents and 25 of the injuries were to trespassers. On the whole, in view of the increase of third-rail mileage which has taken place, more especially in the London district, the number of accidents from this source seems small. It is very doubtful if the record would have been any better with overhead conductors.

NEW PUBLICATIONS.

Railway Enterprise in China. By Percy H. Kent. 304 pages; 5½ x 9 in.; with maps. Published by Edward Arnold, London, 1907; agents for the United States, Longmans, Green & Co., New York. Price, $3.50.

The transportation system of the Far East, and especially of China, has recently been discussed by a number of authors and has been made the subject of magazine articles and consular reports, but we have seen no other reference book which goes into the subject in as full and orderly a manner as the book at hand. The author divides the history of railroad enterprise in China, covering a period of rather more than 40 years, into three stages, the first being that of foreign attempts to persuade the Chinese to allow the introduction of railroads, between 1863 and 1878. The next development was a progressive movement emanating from the Chinese themselves (1879 until the outbreak of the Chinese-Japanese war in 1894), while lastly comes the era of concessions in which the dominant feature is foreign control, this period extending from 1894 to the present time. The author comments that a history of this sort reflects the main characteristic of the Chinese official classes and the tendency of the Far Eastern policy of foreign powers, and says wisely that it is not best to prophesy of the future, but that it may be remarked that the tendency at the moment is towards the elimination of foreign control.

The enthusiastic promoter of railroad enterprises in far lands and the prospective investor to whom the promoter talks, should both of them read this book, because it shows with picturesque clearness some of the kinds of trouble that can be gotten into by well-intentioned business men in the Orient. Those who sought to build railroads in China in early days found that Chinese official relations with foreigners were characterized with deep-seated and bitter prejudice and hostility, a feeling which reflected long years of unjust usage of the Chinese people by foreign nations with which they came in contact, as well as it did the natural disposition of the people. On the other hand, Chinese merchants, always characterized by a strong utilitarian sense, had only to be convinced of individual benefit to adopt the means that conduced to so desirable an end; therefore railroad builders had support on the one hand and constant discouragements on the other. Many queer things happened to concessions, both before granting and after, but apart from this preliminary and fundamental difficulty, petty annoyances which often assumed first-class magnitude sprang up on all sides. For example, in a land of ancestor worshippers you cannot build a line through or over a graveyard. As it is customary in China for most families to have their own graveyard, this becomes at once a serious obstacle, which will only occasionally yield to the influence of silver.

In 1876, a few weeks after the first completed part of the line between Shanghai and Woosung was opened, another source of trouble arose. A native, who committed suicide by throwing himself in front of a train, started a state of hostility so great that the viceroy ultimately ordered the line demolished and the rails and rolling stock dumped on the beach of the island of Formosa, while a temple to the Queen of Heaven was erected on the site of the Shanghai station.

An entirely different difficulty against which early builders of railroads in China had to struggle was that of receiving too much assistance from local authorities. In 1887, prior to the conclusion of the Japanese treaty with regard to Formosa, the governor of the neighboring province in which Formosa was at that time included, decided to build a railroad connecting the capital with the sea. It was necessary, of course, to employ foreign engineers, and the Chinese governor found that one of his hardest tasks was to reconcile this with the anti-foreign feeling prevalent at the time. The governor, therefore, decided to superintend the survey of the first few miles himself, and cheerfully laid out a route so widely at variance with the recognized principles of railroad building that his railroad either washed away or filled up with mud after every rain. Moreover, the Chinese soldiers employed on the necessary earthworks were only answerable to their own officers, and persistently ignored the instructions of the engineers. As might have been expected, most of the railroad built in this way had to be built over again, and the work took a long time.

But from first to last there were always some wise ones in the government councils who saw the need of railroads, so that railroads were gradually built and extended. From localized con-

lists between individual railroad builders and individual viceroys, the diplomacy of communications shifted to a contest between foreign nations to obtain concessions and the objections to the fundamental idea of a railroad gradually faded away. The author shows that there are at the present time 3,539 miles of railroad in operation in China, of which Russian capital has built 1,596 miles (the Chinese Eastern Railroad), Belgian capital 760 miles (the Peking Hankow Railroad), Chinese and British capital together have built 588 miles (Imperial Railroads of North China), German capital has built 280 miles, Chinese capital working alone has built 143 miles; British capital working alone has built 95 miles, Japanese capital has built 48 miles and American capital, 30 miles. There are also 1,285 miles of road now being built, and the French are interested in a greater amount of this new mileage than any other nation, with Great Britain second and native capital third. An additional mileage of 4,174 miles has been projected and sanctioned by the Chinese government, something like half of the whole amount to be built by Chinese capital and the rest to be divided between German, British, French, Belgian and Japanese capital. Including railroads which have been built and those now building in China (1907), and comparing returns with Japan, India and the Russian Empire (1901), it appears that China and Manchuria have almost 369 square miles to every mile of railroad, as against not quite 221 in the Russian Empire, $40\frac{1}{5}$ in India and $38\frac{1}{3}$ in Japan, while the population to one mile of railroad amounts to 77,114 in China and Manchuria, 10,446 in Japan, 8,603 in India and 3,379 in Russia.

At the present time, with the apparent exception of the German line in Shantung, there is not one line built or authorized in China of which the government has not secured the right to assume at some time or other the sole control; therefore it may be said that a state system of railroads has been evolved, and that, so far as can be seen, the Chinese policy of the day is to follow in the same path. But as the author points out, these things cannot be considered in the light of adherence to a well-planned policy, but rather as the designedly chosen form of the expression of the native dislike to foreign enterprise.

The three principal economic questions that now present themselves in China are: (1) How far will the policy of foreign powers interfere with the future development of this state system; (2) is a system of state railroads the most desirable for China, and (3) assuming such a system to be the most desirable, on what lines can it be most usefully developed? The author believes that, at least for the present, the development by the Chinese of their own system of railroads on their own particular lines is not likely to be interfered with by the territorial aggressions of foreign powers. He believes also that government ownership is preferable to private ownership in China on account of the peculiar conditions which obtain there. As regards future development, the Chinese are determined at all hazards to preserve their sovereignty in railroad matters, and yet the railroad question of the future must be primarily a financial one; since the Chinese investor is a negligible quantity, foreign money will inevitably be required. It is incumbent on the Chinese government, therefore, to provide sufficient guarantees to the investing public to tempt this foreign capital to come. The great difficulty arises from the fact that China has not a strong central government really capable of controlling the powerful viceroys throughout the empire. The author believes that the policy of the future should be to weld the existing railroads as far as possible into one uniform system under a central authority, but he is not sure that China has the will to face the situation and give up or alter the policy of seclusion that has been its fundamental characteristic since the memory of man.

Deformations of Rail and Tracks and the Means of Remedying Them. By G. Cuenot, Chief Engineer Bridges and Highways, Paris, Lyons & Mediterranean Railroad. Translated by W. C. Cushing, Chief Engineer of Maintenance of Way, Pennsylvania Lines West. 6 in. x 9 in., 150 pp.; 50 drawings. Price, $2.00. The *Railroad Gazette*, New York, Chicago and London.

The author sets his pace in these words: "The time seems to have come, therefore, for making a minute study of the track, to ascertain what forces it is subject to, and how it can be made stronger." His study is minute and covers five years of accumulation of facts, including accurate observations, with cunningly contrived instruments of precision, of rail and tie movements and bending.

The results of his experiments to determine the economic length of ties are particularly interesting. Under both a stationary and moving load he finds that "the most advisable length for a tie for diminishing its flexure ought to be in the neighborhood of 7 ft. $2\frac{1}{2}$ in." With longer and shorter ties there is a greater deformation of the ballast. He goes farther than this:

"Therefore it is impossible to diminish the sinking of ties by increasing their length; moreover, independent of its uselessness, this elongation produces a grave disadvantage, for it increases the bending. It is not by this means that we should seek to reduce the deformation of track, but by widening the crosstie, by concentrating the material about the points of support, and, above all, by increasing its moment of inertia."

The engineer should carefully study the experiments leading to this highly important conclusion, which largely affects the amount of first cost and maintenance of ties. He makes both service and instrumental observation tests of wooden metallic and composite ties, with a resultant strong leaning toward a composite tie. In the form of an inverted channel slightly widened at the base with a wood filler 27½ in. long, under each rail. In detail this seems to be an economical design, six times as rigid and in all observed ways more effective than wooden or all metal ties. The short length and position of the wood fillers make an automatic guide to tamping only in the proper place under the rail. It would be difficult to tamp this tie so as to make it "center bound" and also, the design prevents lateral movement.

The observations on the creeping of track and resultant effects on gage are minute and interesting and some of them are new.

The value of the book lies in its success in developing, by painstaking empirical methods, a true science in track work. It is quite in line with several present undertakings in this country to find and record the stresses on track, such as George L. Fowler's "Pressure of locomotive wheels against rails," in the *Railroad Gazette* September 20, and the elaborate experiments now being made by the Pennsylvania, on the West Jersey & Seashore division, to determine the actual and comparative blows delivered by electric and steam locomotives, and the experiments for a like purpose now being made at Schenectady by Mr. Fowler for the New York Central.

Two things are evident. We are wasting money in the attempt to make track strong enough to meet the new kinds of traffic, and, we are running great risks in using electric motors for heavy service and high speed without knowing more precisely their effect on track. As a basis for study, no engineer can afford to ignore the experiments detailed in Mr. Cuenot's book.

The Way to Ship from Chicago to the South.

The Freight Traffic Committee of the Chicago Association of Commerce has issued a 69-page pamphlet of shipping instructions, which it describes as intended for the protection and acquisition of Chicago's freight in the Southeast. The committee believes that every package of goods for the Southeast shipped by routes listed in this guide will be delivered with the greatest safety and despatch possible under present conditions and arrangements and received with satisfaction to the consignee and increasing prestige to Chicago. Every road serving southeastern territory from Chicago is now operating a system of through package cars, each car performing a particular service which cannot be duplicated. Every shipper shipping by these routes at once profits by one of the important constructive acts of the Chicago Commission of Commerce, acting through its Freight Traffic Committee to promote the efficiency of through car service. In the routes given, every effort has been made to use to the fullest extent the through package car service, thereby placing the shipment as near its final destination in through cars as is possible, so that transferring at a large number of points is avoided. Every effort has been made to route shipments into joint transfer stations, thus avoiding delays caused by team or switching transfers.

The plan followed is to give an index number to each of the 12 main routes to the Southeast from Chicago and to each of 22 connecting routes, and an index letter to each of 33 junction points involved. The succeeding pages in the pamphlet are devoted to a list of each railroad station in the states of Alabama, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee and Virginia, and each station has after its name the index numbers and letter which determine the route. Thus: Biltmore, N. C., is indexed 2-B, which indicates that the route is by the Monon, via Asheville; West Point, Miss., is indexed 6-M-55, indicating that the proper route is over the Wabash and the Mobile & Ohio, via East St. Louis.

The pamphlet puts at the service of every shipper advice which is usually confined to houses having a well organized traffic department and is a very convenient and valuable publication. The Association is now working up the Southwest and ultimately expects to work up the northwestern territory in the same manner. It has spent nearly a year in working up the territory covered by the guide at hand.

CONTRIBUTIONS

Walschaert Valve Gear.

Boston, Mass., Nov. 13, 1907.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I notice in various accounts of locomotives that the name of the valve gear that is now being put on so frequently is spelled "Walschaerts." This I believe to be erroneous, and that the final "s" should be omitted. The error appears in so many accounts that I am afraid it will mislead people and cause them to believe that the "s" belongs there.

F. W. DEAN.

Tank Locomotive for the Midland Railway.

A large tank locomotive has recently been built at the Derby shops of the Midland Railway, which is intended for long distance running in a service somewhat similar to that performed by the suburban class of locomotives used in the United States. The cylinders are inside-connected and the engine is intended for working in either direction after the manner of the Forney engines, to which class it belongs. The wheel arrangement is 0-6-4, which in itself marks a departure from previous Midland Railway standards, and apart from this the engine is considerably in advance, both in size and power, of the largest tank locomotives hitherto used on this line. In designing the new engines, R. M. Deeley, M. Inst. C. E., Locomotive Engineer of the Midland Railway, has kept in view the inevitable requirements of traffic in the future at the present rate of expansion, and he has provided a locomotive which is capable both of exerting a high tractive power and of running reasonably long distances without having to stop to replenish the water and coal supplies.

The cylinder and boiler volumes are large for a tank engine, and by the use of six-coupled wheels distributed favorably for weight carrying, the adhesion force is well calculated to be in ratio with the tractive effort. The substitution of a four-wheel truck for the more common single radial axle under the bunker permits of an ample coal carrying capacity without undue heaping, the latter being a highly objectionable if not dangerous practice in engines which run as frequently bunker first as the other way about.

The customary practice, in radial or other tank locomotives with shorter bunkers, is to pile the coal up almost to a level with the cab roof, with the result that the engineman, when the locomotive is running cab in front, is obliged to lean over the side to obtain a view of the line ahead. With the longer and lower coal bunker, certainly does not accord with the idea of the fitness of things. The reason for it is to be found in the occupation of the whole space between the frames by the cylinders and the crowding of the crank pins in toward the center of the engine and beyond the cylinder centers by the boxes and the cheek pieces of the axles. The virtual offset in the connecting rods that is thus occasioned is about ½ in.

The equipment includes automatic vacuum and steam brake, also hand brake, and carriage warming apparatus.

Steam sanding gear is fitted, sand being delivered under the tread of the driving wheels on both sides. Lubrication is effectively performed by sight-feed lubricators to each axle-box, sight-feed displacement to the cylinders, and special suction lubricators for the slide valves.

Below we give the leading dimensions:

Cylinders, diameter	18½ in.
Cylinders, stroke	26 in.
Cylinders, stroke	26 "
Coupled wheels, diameter	5 ft. 7 "
Bogie, diameter	3 " 1 "
Boiler, barrel, length	4 " 9⅛ "
" barrel, length	10 " 5¹⁵/₁₆ "
" length between tube plates	10 " 10⅝ "
Tubes (copper) number	242
Tubes External diameter	1¾ in.
Tubes, length	10 ft. 10⅝ "
Fire-box shell, length	7 ft.
Firebox shell, width at bottom	4 ft. ½ in.
Heating surface, firebox	125 sq. ft.
" " tubes	1,206 "
" " total	1,331 "
Grate area	21.1 "
Working steam pressure	175 lbs.
Weight on drivers	117,960 lbs.
Weight, total	162,200 "
Wheel base, rigid	16 ft. 6 in.
Wheel base, total	29 " 0 "
Total length over buffers	40 " 4½ "
Tank capacity, water	2,250 gals.
Coal capacity	3½ tons.
Tractive effort	19,756 lbs.

Six-Coupled Tank Locomotive for the Midland Railway.

unprovided with railings, of the present case it should be at all times possible to look ahead through the end windows.

The engines are fitted with water pick-up apparatus adapted for operation in either direction. The scoops let down between the rear coupled and forward bogie wheels, the apparatus being manipulated by hand gear, while a flap valve closes the mouth that is not in use. The water is taken up through a Y pipe to the hind tank and it passes thence into the two side tanks through other pipes having equilibrium connections.

The boiler is of the Midland standard pattern with semi-circular fire-box shell, the barrel portions being built in two rings with a telescopic joint just in front of the steam dome.

The engine main frames are of steel plate 1 in. in thickness. The valve motion is of the Stephenson link pattern actuating balanced slide valves which work between and at the sides of the cylinders, the latter being bolted to the insides of the frames. Special attention has been given to rendering the movement of the engine around curves easy. The small ends of the connecting rods are fitted with a ball and socket arrangement, and the side rods are provided with ball and socket bushes at the pin joint connection in front of the driving wheel crank pin. The leading axle has the Cartazzie axle boxes in a modified form, allowing of 1¼ in. side play. The bogie at the trailing end has a total side play of 5½ in., and by the combined means adopted for imparting to the engine a readiness to take curves it will be possible to pass around curves of four chains radius with ease.

There is one feature of this engine that is a decided novelty. The centers of the crank pins are not in line with the centers of the cylinders and piston rods. It is doubtful if this has ever been done intentionally before. It may have occurred through a mistake of the designer or in the shop, but to do it with deliberate intention

$$\frac{\text{Weight on drivers}}{\text{Tractive effort}} = 5.97$$

$$\frac{\text{Total weight}}{\text{Tractive effort}} = 8.21$$

$$\frac{\text{Tractive effort x diameter of drivers}}{\text{Heating surface}} = 980.96$$

$$\frac{\text{Heating surface}}{\text{Grate area}} = 53.60$$

$$\frac{\text{Firebox heating surface}}{\text{Total heating surface}} = 11.05^{*}$$

$$\frac{\text{Weight on drivers}}{\text{Total heating surface}} = 104.29$$

$$\frac{\text{Total weight}}{\text{Total heating surface}} = 121.86$$

Volume, 2 cylinders = 8.09 cu. ft.

$$\frac{\text{Total heating surface}}{\text{Volume 2 cylinders}} = 164.52$$

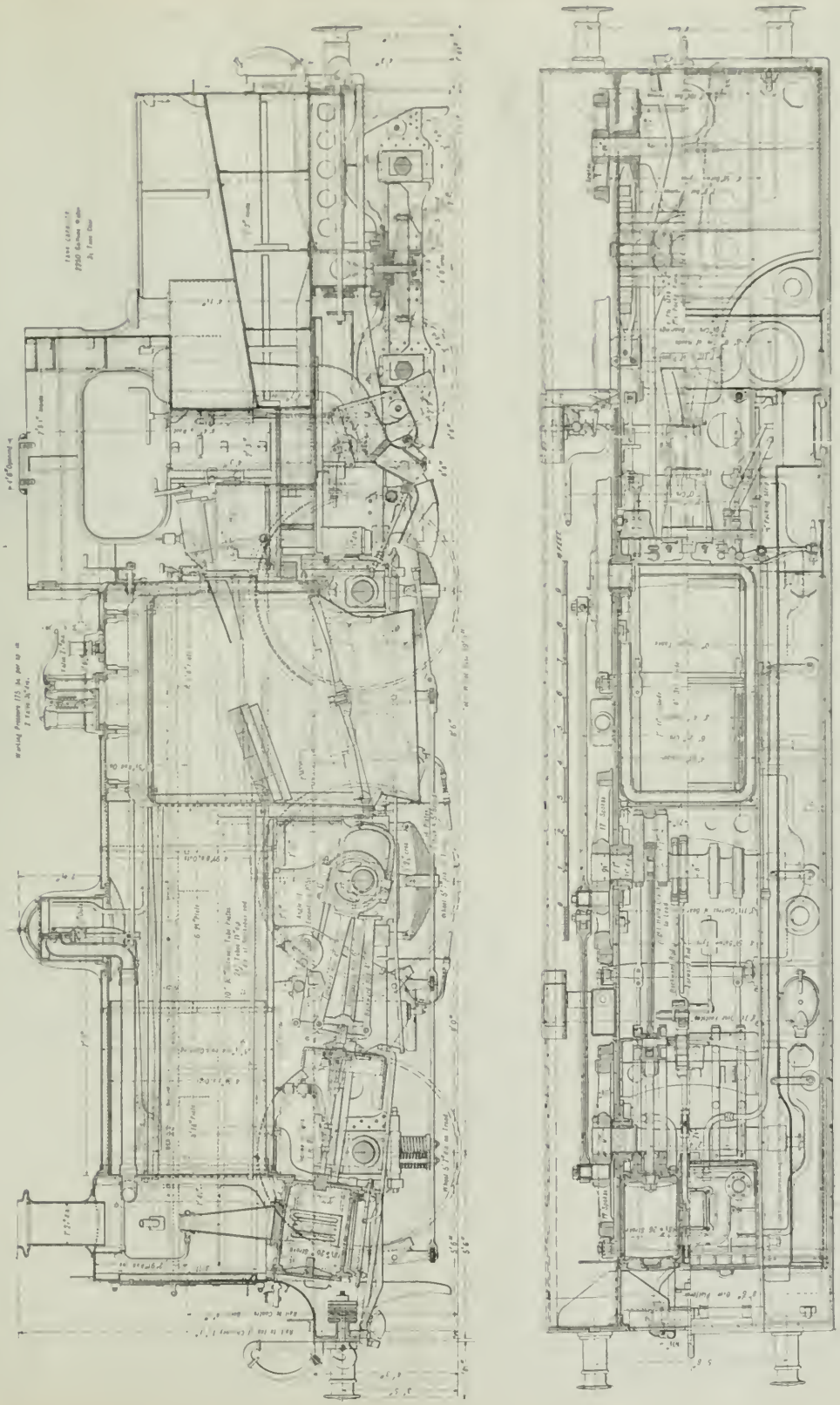
$$\frac{\text{Grate area}}{\text{Volume 2 cylinders}} = 2.60$$

Tube heating surface equated to firebox heating surface (Vaughan formula) sq. ft. = 368.48

Total equated firebox heating surface = 493.48

$$\frac{\text{Total heating surface}}{\text{Total equated firebox heating surface}} = 2.69$$

*Per cent.



Plan and Elevation of Tank Locomotive for the Midland Railway.

New Haven Suspended Signals.

The semaphore blades shown herewith, Fig. 1, are those recently adopted as standard by the New York, New Haven & Hartford, of which C. H. Morrison is Signal Engineer. The different forms, Nos. 1, 2, 3, 4 and 5, are described on the drawing. The principal difference between these standards and the standards approved by the Railway Signal Association is the addition of the round-end stop-signal blade, which is designed for home signals at interlockings and other places where it is desired to allow trains (when necessary) to pass a signal in the stop position by the use of a hand signal. The permissive signal blade, No. 3, can be used not only on automatic signals, but also, in special cases at the approach to a facing-point switch. It is proposed to use No. 4, not only as a distant signal, but also at any place where it is desired to control the speed of trains.

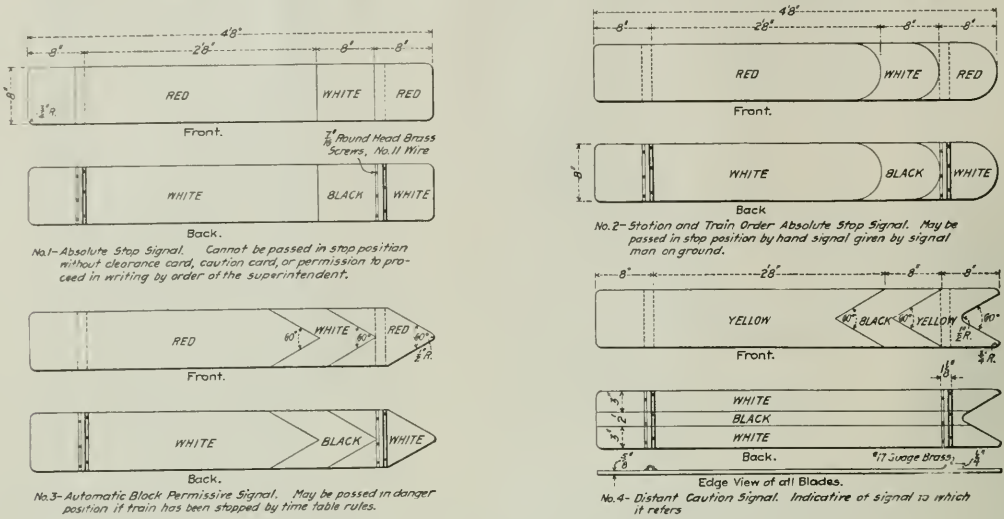


Fig. 1—Standard Signal Blades; New York, New Haven & Hartford.

Blades made by these standards are now in use. Square-end blades are used at drawbridges, as no train is allowed to pass such a signal when in the stop position without a written order. At interlockings where, in case a signal is deranged, engines are allowed to pass on receiving a hand signal, the round end blade will be used.

The blades shown in Fig 1 are designed for suspended signals like those shown in Fig. 2. These are used on the electrified lines between Stamford and Woodlawn, where bridges span the main tracks every 300 ft.; but the designs of blades are standard throughout the whole of the company's lines, except in regard to the details of fastening to the spectacle casting. The standard dwarf (not shown) has a round-end blade. A number of suspended signals are already in use and are said to give entire satisfaction. Although in this arrangement the benefit of a sky background is often sacrificed, the system has the advantage of a uniform height for all signals and the signals can be better seen under highway bridges. As indicated in Fig. 1, the stop signals are always painted red, and the distant signals yellow. The vertical member of the suspended signals, which takes the place of the post, is painted black, the same as the rest of the bridge.

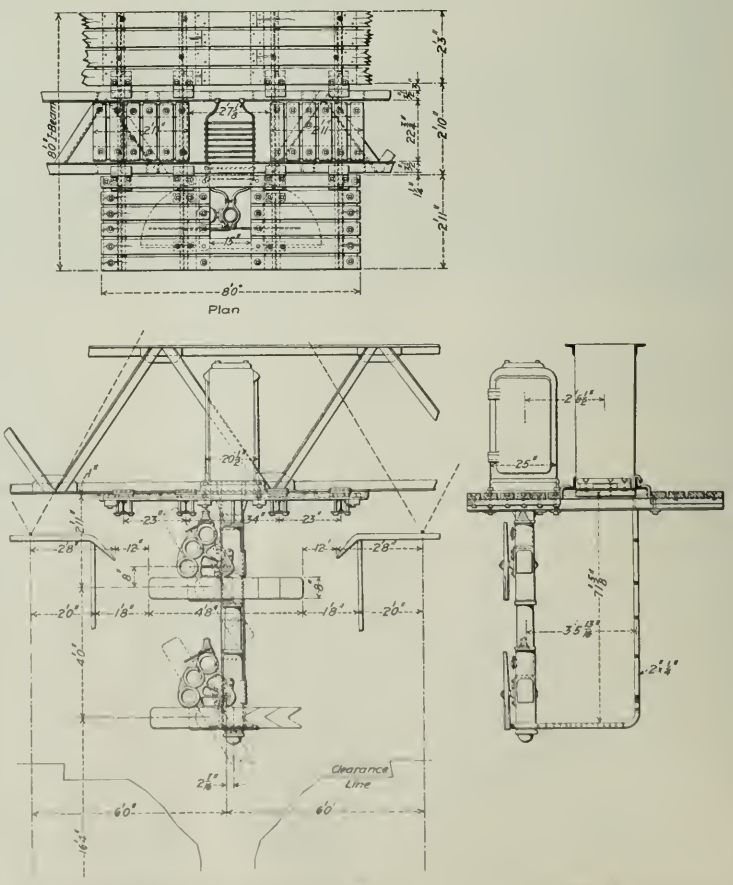


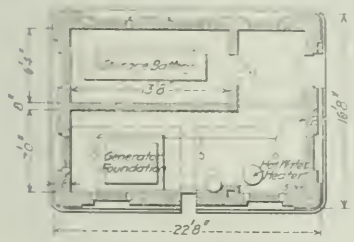
Fig. 2—Suspended Semaphore Signals; New York, New Haven & Hartford.

The Austrian State Railroads, which bought its lines of the state at a time when the latter had to have money and had no credit, is accused of letting its property fall greatly out of order in anticipation of its re-acquisition by the state, which has been decided upon, though the time for it is not yet fixed. Among other things cited in evidence of its inadequacy to meet present requirements is the fact that 5,700 of its freight cars, more than half the whole number, are more than 40 years old, while it runs 23 passenger cars built before 1849, 136 built before 1857, and 330 built before 1872.

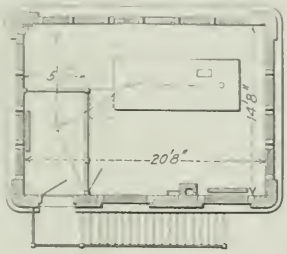
Concrete Interlocking Tower on the New Haven.

The New York, New Haven & Hartford has recently installed a new all-electric interlocking plant at Naugatuck Junction on the New York division and the machine, storage batteries and charging generator are housed in a concrete tower. The tower is 22 ft. 8 in. by 16 ft. 8 in., two stories high, of plain concrete with concrete arch floors supported on I beams. On the ground floor are the generator

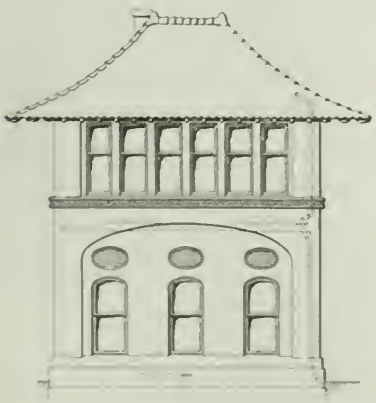
Concrete Interlocking Tower at Naugatuck Junction.



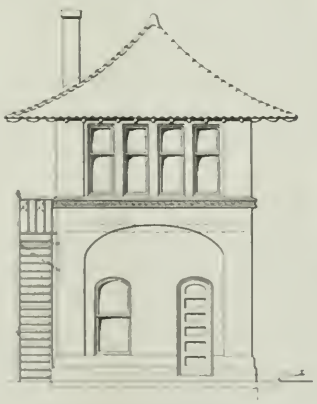
First Floor Plan.



Second Floor Plan.



Front Elevation.



End Elevation.

Concrete Interlocking Tower at Naugatuck Junction; New York New Haven & Hartford.

set, storage battery room, heater and lavatory. The battery room is 13 ft. 8 in. by 6 ft. 4 in., and is partitioned off by an 8-in. concrete wall extending from the floor to the ceiling. The batteries are mounted on shelving in the center of the room, so that they may be examined from all sides. There are two large windows on the side, and at the end so that good light is obtained to look through the battery jars. The main battery for the interlocking plant consists of 55 cells, of 120 ampere-hours capacity, delivering 119-volt current to the switch and signal motors. In addition there are two sets of 6-cell, 84-ampere-hour capacity batteries for operating the lock and block instruments. The generator set is a Fairbanks-Morse 6 h.p. direct-connected gasoline engine and dynamo mounted on a concrete foundation.

In the second story is mounted the 47-lever Union all-electric interlocking machine, which occupies a space 10 ft. 9 in. by 4 ft. 5 in. The track side and both ends of the tower are practically solid glass and there are two large windows in the rear. Entrance to the second floor is by an ornamental iron stairway on the outside of the building at the rear.

Electric Railway and Public Service Legislation.*

BY HENRY J. PIERCE,
President of the International Traction Co., Buffalo.

It would be well for the country, for the welfare of its financial institutions, for its business prosperity, for the stability of the investments of people both rich and poor if, when those high in authority speak, they should not judge all corporations by the few who have done wrong, but also should bear in mind that the great majority of corporations are conducting their affairs honestly and in the interests of the people whom they serve.

During the Old Home Week celebration in Buffalo a few weeks ago the greatest curiosity was a street car drawn by horses, yet it was an exact reproduction of the mode of transportation furnished only so short time ago as 1891. The very car had been pulled through the streets at that time by the horses which hauled it in 1907. The driver and conductor had performed similar service in horse-car days. The straw was on the floor to keep the feet warm. The four oil lamps were in their places. It seemed the product of a thousand years ago compared with the 30-ton electric cars between which it was sandwiched—vehicles lighted with half an hundred electric lamps, heated by electricity, and which it would have taken the power of 100 horses to propel at speed.

In 1891 the horse-car plant was sold for scrape and replaced by electricity. By 1896 increase in travel made it necessary to practically rebuild the entire system, requiring the installation of heavier rail, larger cars, up-to-date machinery, and within the past three years many electric railway systems have again, for similar reasons, been practically rebuilt. These expenditures could not be paid for out of earnings, and had to be provided for by new issue of bonds and stock. Thus while many electric railways could be replaced for less than their capitalization, yet the excess is accounted for largely in many cases by the cost of rebuilding to meet new conditions.

The dual duty of a public utility corporation is to provide good service to the people from whom its franchise was obtained, and to return to its stockholders a reasonable profit on their investment. The electric street railway may not increase its fare, yet wages have increased, and the cost of material has advanced over 40 per cent. in three years. The public are ever expecting greater facilities, which require heavier track, larger cars, increased power, more car-houses, more efficient and therefore higher-priced trainmen, better and more frequent renewal of pavements, extension of tracks into sparsely settled neighborhoods, while the state and municipalities are constantly increasing taxation.

Under the combination of circumstances one of four things must inevitably occur.

First.—Poor service.

Second.—Price of labor and material reduced.

Third.—Rate of fare increased.

Fourth.—Taxation reduced.

The manufacturer or the private corporation may close their plant for a time when business is not profitable, or need not maintain their plant at a high state of efficiency; but the public service corporation is always in the public eye—it must keep on, it must keep up the quality of its service to highest standard. The business of an electric railway in fast growing communities is increasing to be sure, but not nearly in the ratio of increase of expense of operation, maintenance and necessary betterments. Of course poorer service cannot be permitted under any circumstances; in fact it

*From an address at Madison Square Garden, New York City, Oct. 1, 1907.

should be constantly improved. A proposal to increase the rate of fare is not practical.

Real estate may be developed and a building left for years without improvement, addition or even a coat of paint on its woodwork. Not so with a street railway. The public, not unnaturally, insists on the newest type of cars, on more cars, on better and still better service, on greater comfort, on perfect hygienic conditions. An unpainted or old-time battered car would no more dare to run on a modern city street railway system than a caravel of Columbus would dare venture to cross the bows of the "Lusitania" in defiance of the new queen of the seven seas. In Buffalo there are buildings on the foremost streets which are three and four and even five and more times as old as the oldest type of street cars in the entire system. And Buffalo is no eyesore in this respect—not at all. The same is true in other cities. The public is more exacting with street railroads than with any other form of business.

Public officials reflect the attitude of the public in this regard. Municipalities yearly require more and more from street railways. Repaving, re-tracking and new paving, new tracks, new cars, care of street and other items, constantly increasing in number, heavily swell the total of expenditures. Added thereto are taxes; and all these requirements causing increased expenditures to the street railway are in turn used as a basis for increase in taxes. Here we find the one feasible and valid method of relieving the existing situation. The municipality or state can lighten the burden. In view of the heavy expenditure yearly required and the tremendous cost of operation and maintenance, resulting in greater conveniences and facilities to the public and materially benefiting the municipality as a whole as well as each individual citizen thereof, this added load of taxes could or should be greatly lessened or removed. The street railway then could better fulfill the public demand and could turn to its owners for authority for further improvements, at the same time permitting a reasonable income on genuine investment.

When the Public Service Commission Act was in process of passage, I opposed it for two fundamental reasons—the bestowal of such vast powers for the regulation of the business affairs of corporate citizens, and because it denied the foundation principle of our Republic that every citizen should have the unrestricted right of appeal to the courts. But the Public Service Commission Act has now become a law, and while if in the hands of unjust or arbitrary commissioners it would bring hardship and perhaps ruin upon the corporations affected, yet the wise choice of commissioners by Governor Hughes insures that while the interests of the people will be looked after, yet that corporations, which are citizens of the state, will undoubtedly be treated fairly, and no unjust demand be made upon them. I am confident that in requiring that betterments and changes be made in the plants of the corporations over which they have supervision, the commission will take into consideration the almost impossibility of raising money at this time, a condition largely brought about by unwise, cruel and sometimes unwarranted attacks made upon public utility corporations.

The majority of street railways are no more overcapitalized than real estate is overcapitalized. I believe every fair and informed student of conditions will corroborate this. Whether it be a trolley line or a 10 or 20-story building, the method and proportionate extent of capitalization are the same. But there the similarity ceases, for after capitalization the building goes its way serenely, the initial cost being the final cost as well; but the street railroad through the long period of construction encounters difficulties on every hand, not only labor but questions of consents and adjustments, and through each succeeding year the demands in service and maintenance and operation increase and multiply.

Capital requires and is entitled to a fair return on investment. It is estimated that fully 80 per cent. of the street railways of the United States are not paying dividends. Capital invested in street railways finds the electric railway situation of to-day a problem requiring the most serious consideration. Any who would blindly heap further burdens of expense on the electric railways of the country, either know little of or care less for the best interests of the people at large.

This is no calamity cry. I have endeavored briefly to outline conditions as we who are in the street railway business know them to be. I believe that to-day, considered from the business standpoint as between the electric railways and the "value received" which they give to the people in return for their fare, in most communities the people have the best of it, that the electric railways that are in need of the most help from their father (the state), their mother (the municipality), that they require the "first aid for the injured" from their doctors (the Public Service Commission) to keep them out of the ravenous clutches of their uncle, the money lender. The electric railway cannot sell its bonds, and the only money it can secure is what it can beg from its stockholders, borrow from the banks, or coax from its conductors.

Trolley lines are no experiment in the upbuilding of the country. They are welcomed and sought. Where they are wanted to-day, they should be built not later than to-morrow. The future years should hold in their history a wondrous record for electric railways—a record dependent on fair and liberal treatment of one of the foremost utilities of the world.

Suppose at this moment that every electric railway in the state were to be blotted out of existence—not a return entirely to primitive conditions, but simply so far as street railroads and trolley lines are concerned. A glance at a map will show what disaster would be wrought—not with a view to invested capital, but to communities. The mere loss of power and stopping of cars for an evening hour throws a whole city into confusion, inconveniences thousands of people and causes complete rearrangement of countless plans. The withdrawal of suburban and interurban trolley service would well nigh isolate whole sections of the state. Electric railways not only are essential to the development and prosperity of the state, but they are an institution, a utility in closer constant contact with the people than any other form of services known to society.

The electric railway situation of to-day, summed up, shows existing systems beset by tremendous expenses, which make relief from heavy burdens of taxation imperative. It shows the great need for extension of electric railways, with capital hesitant to enter where the risks are so numerous and the financial burdens so heavy, and the dividends return on the investment practically nothing. It shows the whole nation eager for the closer communication of localities. Where trolleys were fought bitterly a decade ago, the opening of new lines to-day is the occasion for a holiday and celebration, with congratulatory speeches, blowing of whistles, ringing of bells, music and cheers of welcome.

It is well for the community; it is well for the passenger; it is well for the employee. In all fairness, should it not be made well also for the man whose money makes all this possible? Is he also not entitled to a fair return on his investment—a fair return, a moderate dividend? I tell you, gentlemen, the government of a state or city or town can far better afford to throw off the burdens of taxation in such an instance as this of an electric railway. In the country the farmer is allowed to work out his road tax, and why not let the street railway perform its full duty to the state and municipality through furnishing every reasonable facility for the comfortable, rapid transit of all the people, instead of compelling it to cripple its resources by paying money into the public treasury for the benefit of other taxpayers who do not represent one-tenth of those who daily utilize the street cars, and whose constant comfort would be thus vastly improved?

We can picture the future day—the day of accomplished deeds, the day of satisfied needs—when that which waited to be done waits no longer. Between now and then lies an era of tremendous endeavor, of ceaseless labor—and through it all we will have no time for needless turmoil, we want no senseless strife. We do want earnest, honest co-operation, not alone with the private investor, but also with the public official—and the day of complete success will come when the investor, builder, operator and official, all four act in a harmony and unison, based on a common confidence that all are working together for the common good.

Individual Car Owners' Association.

Mr. C. O. Johnson, President of this Association, writes that the meeting called to be held at Cleveland was not a failure, as reported. At the first meeting, held in Cleveland last summer, the attendance represented about 25,000 private cars of all lines of trade. At Chicago in September a constitution and by-laws were adopted and a temporary organization was formed. It was deemed best to give ample opportunity to all new members to have a voice in the election of permanent officers, and for that reason the election of permanent officers was deferred until November. At Chicago last week permanent officers were elected, as follows:

President, C. O. Johnson, H. J. Heinz Company, Pittsburg.
First Vice-President, Geo. Oslus, Michigan Ammonia Works, Detroit.
Second Vice-President, W. E. MacEwen, National Refining Co., Cleveland.
Third Vice-President and Secretary, R. J. Bailey, Monongahela River Consolidated Coal & Coke Co., Pittsburgh, Pa.
Treasurer, A. M. Bell, Fayette Coal Co., Pittsburg.

Executive Committee.

Silas A. Shafer, Assumption Coal Company, Assumption, Ill.
Geo. Oslus, Michigan Ammonia Works, Detroit.
Chas. P. Fink, Louisville Cotton Oil Co., Louisville.
R. L. Somerville, Georges Creek Coal & Iron Co., Farmington, W. Va.
H. D. Williams, H. D. Williams Cooperage Co., St. Louis.
Davis Elkins, Elkins Coal & Coke Co., Morgantown, W. Va.
W. E. MacEwen, National Refining Company, Cleveland.

The purpose of the Association is to bring about a uniform, lawful and equitable system for the handling and use of individual cars throughout the United States, and to provide for a just and legal compensation to be paid for the use of individual cars by others than their owners.

The Association was not formed in any spirit of antagonism. It seems desirable that the different conditions applying in different parts of the country on different classes of private cars shall be discussed at called meetings of the private car owners. In dealing with the difficulties experienced, it is hoped to have conferences with railroad officers, discussing all matters from the standpoint of both classes of owners.

Home Route Slip Bill Used by the N. C. & St. L.

On account of the increase in the per diem rate, and to facilitate the prompt home movement of foreign and line cars, the Nashville, Chattanooga and St. Louis began using on August 1 the "home route" slip shown herewith. It is not original with this line, some other roads already having it in use, but information concerning its object and advantages will doubtless be of interest to roads not acquainted with it. Its purpose is to inform all concerned in handling cars the home route, or the point where and road from which such cars were received on the N. C. & St. L., thus reducing all unnecessary delay and facilitating the home movements of cars in accordance with the code of car service rules. In addition, the slip shows all road movements and the date the car arrived at its destination, thus enabling the agent to know at a glance how long the car has been delayed. The original home route and number of days the car is delayed at stations is reported on the daily car report to the superintendent or car distributer, enabling him to make prompt and proper distribution of all foreign road and line cars on his division.

At large terminals unnecessary delays to cars are minimized, since the persons handling the cars have the proper home route, thus facilitating the movement of cars through the terminal. Another objectionable feature obviated by the use of this slip is that of telegraphing for information necessary to dispose of cars, which lightens the burden on the wires.

The instructions governing the use of the slip are as follows:

(1) The agent at point where car is originally received from a connection makes out the home route slip and attaches it to the way-bill or slip-bill that accompanies the car.

(2) Conductors are not allowed to take cars from stations unless accompanied with slips properly made out.

(3) Slip must follow car to destination if on this line, or to junction point where delivered to a connection for final destination, and when car is returned, or ready for return home movement, the original slip will follow car to point where car was originally received.

(4) Conductors moving cars must indorse on the back of this form, train number from, to, date and name of conductor handling car.

(5) When car is returned to road from which originally received, agent must show to what road, and date, delivered, and send slip to the office of the superintendent of transportation for future reference.

Form 1340

Nashville, Chattanooga & St. Louis R'y

HOME ROUTE SLIP BILL FOR FOREIGN CARS

Initial ..... Car No

HOME ROUTE

Received from

at ..... Date ..... 190.

Made by

INSTRUCTION

Agents at all Junctions where cars are originally received must fill in accurately the above information for each foreign road, or line car received from connections.

Conductors must not take cars from stations unless accompanied with slips properly made out.

When handling cars from stations where there is no agent, conductors must deliver to car receiver from the agent who makes billing for such stations a card of this form. When empty foreign cars are handled on running slip, Form 1344, such form must be attached to this card.

Conductors will turn in slips at terminals to be delivered to conductors moving car from terminal to final destination if on this road, if beyond this road slip must follow car to junction point where delivery is made to connection.

Slips must be conveniently filed at junction points or destination until car is returned or ready for return home movement, then to follow car to junction point car was originally received from.

If slip is lost ask Car Accountant for Home Route, and make new slip. Conductors must carefully fill in the movement spaces on the back hereof.

M. J. C WRENNE,
Superintendent of Transportation.

Home Route Slip Bill; Front.

Conductors' Movements

FROM	TO	TRAIN	DATE	CONDUCTOR	FROM	TO	TRAIN	DATE	CONDUCTOR

The final Junction Agent on the return Home Movement will fill in space below, and promptly mail slip to Superintendent of Transportation, Nashville, Tennessee.

Delivered to *R.R. at* *Station* *190—*

Agent.

Home Route Slip Bill; Back.

The pigeon holes of the left hand half of the case are numbered with the odd numbers and those of the right-hand half bear the even numbers. This case being for the double ending numbers, a slip for a car numbered 14,165, for instance, would be filed in pigeon hole 65.

The smaller case, for small terminals and intermediate stations, has only 10 of the two part pigeon holes for filing slips according to the single ending numbers of the cars. The upper row of five holes has the even numbers and the lower ones the odd. The dimensions of the compartments are the same as for the large case.

We are indebted to J. T. Manry, Car Accountant of the N. C. & St. L., for information. He advises that the good results of the scheme have fully met their expectations.

African Railroads.

The total length of all railroads in Africa is 17,500 miles, divided as follows:

Gage	Gages and mileage of railroads in the possessions of: Eng land	Fran ce	Ger many	Portu gal.	Italy	Congo	Egypt	Miles, total
4 ft. 10 in.	120	2,165	..	..	..	555	555	2,880
3 " 6 "	7,214	..	93	461	..	2,865	2,865	14,653
3 " 3½ "	584	1,107	423	226	71	..	..	2,700
Various gages, less than 3 ft 3½ in	227	..	689	41	..	..	..	1,727
	8,145	3,512	1,205	728	71	399		17,500

The costs per mile of finished road are:

	Cost per mile
1 ft 10½ in. Gage.	
Otavi R. R. (German West Africa)	$9,750
Swakopmund Windhoeck (German West Africa)	15,150
Mayumba R. R. (Congo)	26,280
2 ft 5½ in. Gage	
Congo R. R.	50,250
2 ft 6 in. Gage	
Freetown-Baima (Sierra Leone)	20,430
3 ft. 3½ in. Gage.	
Togo Coast R. R. (West Africa)	9,670
Bingerville Kong (Ivory Coast)	19,500
Lome, Palime (West Africa)	24,740
Usambara R. R. (Ger. East Africa)	28,960
Dar-es-Salaam Mrogora (Ger. East Africa)	36,150
Dona Manongo R. R. (Kamerun)	41,070
Massaua-Asmara (Eritrea)	61,840
3 ft 6 in. Gage	
Egyptian private railroads	14,030
Port Herald Chiromo (State of East Africa)	14,790
Tugela Somkole (Natal)	25,950
Natal State railroads	80,780
4 ft 10 in. Gage	
Egyptian State railroads	51,900
Algerian state railroads	40,200 to 210,260

The Maintenance of Way Painters' Convention.

The Maintenance of Way Master Painters' Association held its fourth annual convention in the Great Northern Hotel, Chicago, November 19 and 20. The association now has 57 members, about one-third of whom were in attendance. Capt. Robt. W. Hunt made the opening address. The President, A. B. Phelps (L. S. & M. S.), was in the chair, and in his address said:

"I doubt if the maintenance of way painting of our railroads is given the thought and attention by the maintenance of way engineers that it should receive. Painting is done primarily for protection, and secondly, which to my mind is of equal importance, for appearance sake. Too often we get the order to "do no painting for looks sake," to paint only such buildings or bridges as are in actual need of it to protect them. Thousands of dollars are spent in some cases in grading and seeding lawns, horticultural display, in landscape gardening and the like for no purpose but appearance sake, while the buildings are left in a shabby and unkept condition. There is nothing, I think, that adds more to the apparent thrifty condition of any railroad than neatly, tastefully painted buildings and structures. And I

An essential feature to the successful use of this slip is the filing system. Agents at large terminals are supplied with cases for filing slips with the double ending numbers of cars, and small terminals and intermediate stations are supplied with cases for filing slips with the single ending numbers of cars. The larger case has 100 pigeon holes, each divided into an upper and lower part. The upper part is for through cars and the lower for local cars. The upper part is 4 in. x 4 in. x 8½ in. deep, and the lower is the same, with the exception of the height, which is 2 in. The

believe that this condition is somewhat of a revenue magnet.

"The maintenance of way painting should, I believe, be a separate and distinct department on all roads, accountable to no one below the engineer of maintenance of way, or possibly the general manager, reporting the expense, of course, to the accountant of the engineering department. The best results are not usually obtained when we are placed under the master car and locomotive painter, the superintendent of bridges and buildings, or the master carpenter. There is always a temptation, and sometimes more than a temptation, to make the road painting stand a portion of the expense which should be charged to other parts of the work; besides, the road painting is not always looked after and kept up as it should be when it is made a part of some other department. No matter how small the road may be, even though but one man be required to do it all, it should be given to some one with proper judgment, and allow him to use that judgment at all times, subject, of course, to certain limitations."

The old officers were re-elected for another year. They are: President, A. B. Phelps (L. S. & M. S.); First Vice-President, W. D. French (N. Y., O. & W.); Second Vice-President, M. F. Ebel (C., H. & D.); Secretary and Treasurer, H. J. Schnell (New York). The next meeting will be held in St. Louis, Nov. 17 and 18, 1908.

Extracts from some of the papers are given below.

OBSERVATIONS FROM PRACTICAL BRIDGE PAINTING EXPERIENCE.

By J. R. Shean, Pacific Electric Railway.

The whole future of a bridge depends upon the thoroughness of the cleaning it gets when new, as well as the first coat of paint applied. Most bridges get a coat of linseed oil or red lead at the works. The oil is to be preferred for two reasons, (1) because it is transparent and allows any rust or dirt to be plainly seen and removed, and (2) because the red lead coat usually applied at the bridge works is nothing more than an oil stain, which runs down and forms pools on the flanges and in the corners, and which covers up every sign of rust that may have been left on the iron, which it is so essential to remove at this time. The only way to get these light rust stains entirely out of the pores of the iron is the sand blast. This can get as deep into the iron as the rust can, while steel brushes and scrapers get only the top of the rust, and the real seat of the rust is still left deep in the pores.

As it is seldom that a painter has a sand blast at his disposal, the best known method of painting the bridge to keep the moisture and gases away from the iron should be used and thus retard the action of the rust as much as possible. Nothing will do this as well as the first coat of good solid red lead well brushed on. Red lead will keep the moisture away and will withstand the action of the gases as well as any of the other pigments. This fact was established several years ago when pieces of bridge iron painted with red lead, graphite, white lead, lampblack and mineral red were placed in the Hoosac tunnel for a test. This tunnel is nearly always filled with coal gas. When the pieces were taken out all traces of paint were gone except on the ones painted with red lead and mineral red, the former being the better of the two.

There has always been a prejudice against red lead on account of its liability to run unless brushed out evenly and with much care. This objection can be overcome by mixing the dry red lead with boiled oil and adding about one-fourth white lead and a little dryer. The white lead will serve to hold the red lead in suspension, and will help it to dry as hard as flint.

After the first coat comes the problem of getting a paint for the finishing coats which will not dry so hard. For general results, so far, carbon is far ahead of any other paint base, although the writer has seen mineral red give better satisfaction around the coal mines in Indian Territory. The greatest trouble with rust is encountered on low overhead bridges, where no paint seems to stand. The writer has a belief that the quick destruction of the paint on these bridges is caused by the red hot sparks being driven with such force against the parts overhead that the paint is burned off or pitted so badly that the iron is left bare and at once becomes a prey to the rust, induced by the soot that the smoke deposits on it and which forms an acid of some kind by absorbing the moisture from the air and from the steam that condenses on it. This conclusion is strengthened by the fact that the higher a bridge is over the track the longer it will take for the rust to eat through; also, from the fact that a bridge over double track on a hill will be affected quicker over the track used by the trains going up the hill than over the track on which they run down without using steam at all. A wooden shield shaped like an inverted V, as wide as the track and placed over the center of it so as to take the force of the sparks and smoke and deflect them downward, would do much to prolong the life of these bridges; or a galvanized or corrugated iron shield might be used.

There are two tools which deserve mention for the removal of rust which the writer uses. One is a short steel bar made of ¾ in material and sharpened at one end like a cold chisel. This bar is invaluable for getting into the corners of chord boxes, footings, between the ties, and any place where it is impossible to use a hammer. The other is a hammer first used by the Terminal Railroad of St. Louis. It has a cold chisel edge at both ends of the head. One is parallel to the handle, the other at right angles to it. It is exceptionally good for getting around rivets on the flanges, webs, etc., and it is light enough to keep from cutting the metal too much.

The length of time which should elapse between general paintings of a bridge is a matter of location and of the thoroughness of the previous painting. A bridge across the Hudson river at Mechanicsville, N. Y., was given one coat of red lead and two coats of white lead paint colored with chrome yellow, and at the end of nine years was in fair shape. It was gone over and the rust scales knocked off and touched up every three years. The best painted set of bridges on any one road which has come to the writer's notice are on the Oregon Short Line. These bridges get one coat of lampblack every four years and are bright and clean all the time.

Cinders and dirt should not be allowed to collect on the abutment of bridges until the bridge seat is buried in them. The water which soaks through these cinders and dirt forms an acid which no paint can stand, and many a bridge has been practically ruined by the part resting on the abutment being eaten up with rust from this cause.

PAINTING STRUCTURAL STEEL.

By H. Clapham, Louisville & Nashville.

Contracts for structural or bridge iron call for one coat of paint at works before delivery. This paint often contains, beside the specified amount of oil, an equal amount of turpentine or benzine.. It is applied by incompetent workmen working piece-work. There is no cleaning or scraping; the paint is simply slushed on. As soon as the steel is erected, trouble begins. We should receive our steel without the shop coat.

CARE OF BRIDGES AND STRUCTURAL STEEL WORK.

By W. S. Morgan, Pennsylvania Lines.

The only way to get the blue mill scale off is to let the steel stand from six to eight months after erection, then go over it thoroughly with chipping hammers and steel wire brushes, wiping it off with benzine, always allowing plenty of time for this to evaporate. From my experience I find that no matter whether the steel has been covered with paint or oil, this is the only way to get an absolutely clean surface to begin painting upon, and we all know that this is about half the game in this work. We have had bridges sent to us both with and without shop coats. I have found that those sent with shop coats, although we gave them exactly the same care as those without shop coats, seldom last over four years before requiring repainting, while those sent us clean have lasted in a great many instances seven and eight years. On the first coatings I have had better results from red lead than any other pigment, it being the firmest of all paints, although it is necessary to watch the painters pretty closely to see that they brush it out thoroughly.

PAINT STOCK ON THE ROAD.

By H. J. Barkley, Illinois Central.

Many different ways of handling paint supplies have been tried. On some roads it is the custom to ship only enough material from headquarters to do each piece of work. Often some item is forgotten or enough not sent, and the crew must either wait until it arrives or make some change to get through on the estimate of cost. The most satisfactory way is to have a car with the necessary tools and a supply of paint—a paint shop on wheels, with tanks for turpentine, oil and other supplies, and racks for barrels to avoid loss from rough handling of trains.

On roads where standard colors are used for bridges or buildings the paint should be sent to the crews mixed. The mull stone and paint mill have no place in a paint car. They are not only inconvenient and expensive, but impractical. When a batch of color is needed the cars may be switching or the foreman gone, or the light not good, and the color will not be exact. Often new and inexperienced men will not know every condition, and all these difficulties are expensive.

While the material sent out will not always be suitable for every structure, it should be thick enough to allow re-mixing or thinning, as conditions require, either for new or old work, or as the weather conditions demand. Very often colors mixed in a steam heated shop will be too thin to use in the hot summer months, or too thick in the winter. Often it is necessary to change the color for first or second coats or for jobs where smoke, steam or dust are troublesome. These are things which can be overcome easily enough, and at a reasonable expense, if the color is sent out of the proper consistency. The principal thing is to have all structures of a uniform color, and it is next to an impossibility to obtain these results with "batch mixing" in the cars on the job.

It often happens that a crew will run short of a certain color and must either write or wire for supplies, and either the supply

department or the office does not know what is wanted. To prevent this it is best to have all standard colors numbered and a color board in the paint car, at the division offices and in the supply department.

Painters generally are not in favor of supplies coming to them ready to use, arguing that all paints are not suitable for all kinds of work and that the "stir and use" system is not best, but it has been proved that if proper care is taken and the maker and the supply department understand what is wanted the work can be done cheaper and more satisfactorily. Often those who purchase or mix the paint for use out on the road have not had sufficient experience in this particular line of work, and do not realize how important it is that material should and can be had that will be better suited to the work, all of which will help to lighten the cost and bring better results.

It is the practice on the Illinois Central to carry a stock of material in the cars as nearly suitable for the work as possible, so that a crew could go to any piece of work as it often happens, on short notice, and be prepared to finish it. Generally speaking, this system has proved satisfactory and has been the means of saving much inconvenience and expense. While there are some objections to this plan, yet it has many advantages over the "batch mixing" and proves that mixed color for road work has come to stay and is the best means of bringing uniform results at a minimum cost.

Floral Prizes on the Boston & Maine.

The Boston & Maine has lately announced its regular annual prizes to station agents for the best flower displays. The first prize is $50 and others are $40, $25, $20, $15, $10 and $5. Altogether several scores of prizes were granted. The first prize went to Lake Street station, Arlington, Mass., and second-class prizes to Brattle (also in Arlington), and to Hill Crossing, in Belmont. From photographs with which we have been favored by the *Boston & Maine Messenger* we show views of the floral displays at Lake Street, Brattle and Meadowview.

Lake Street Station, Arlington, Mass.; Boston & Maine.

Keeping Track Free of Vegetation.

In a report on this subject to the Roadmasters and Maintenance of Way Association J. W. Coffey, Roadmaster of the Santa Fe at Guthrie, Okla., said:

I have about 35 miles of dirt track with a rich sandy soil. It is in a hilly country where it is necessary to keep the track almost clear of weeds and grass, and we have to keep it out about six months in the year. In the spring when the weeds and grass get up high enough to commence to give us trouble we take our shovels and cut the grass from the ends of the ties and between the ties from the outside, and only cut inside the rails as far as the shovel will cut by running it under the rail between the ties. This can be done at a cost of about $7.50 per mile. We repeat this about every six weeks, just cutting the grass from the outside until about the first of October, we then cut it clean, inside and outside at a cost of about $12.50 per mile. The total cost is:

Three cuttings at $7.50 each	$22.50
Final clean up.	12.50
Total per year per mile	$35.00

This will keep the grass out of the way of trains, but will not keep the track clean, as it provides for a thorough clean-up once a year only. We use a light steel shovel with a handle about 3 ft. 10 in. long.

I have had no experience with a weed burner and understand that so far they have been a failure, as they do not kill the grass, but only crop it off, and the grass is as fresh and green as ever in a few days, just as plentiful as it was before the burner was run over it. Thirty-five dollars a mile looks to be a big cost for cutting grass for one season, but it is approximately what it has cost this year on the dirt track that I have charge of.

The mileage of steam railroads in Greece is 865 miles, and their total capitalization $42,200,000. They are not owned by the Government, but are built after its permission, supervision and control through the department of public works, railroad section. The state shares in part of the construction, and hence controls the passenger and freight rates and other details. The Government participates in the benefits and has the option of buying over the roads within a specified period, while at the lapse of another period the railroads become the property of the state. The motive power of the first railroad built in Greece was put in operation in 1869, running from Athens to Piraeus, six miles. Its motive power was changed from steam to electricity about two years ago.

Brattle.

Meadowview.

Boston & Maine Station Grounds at Brattle and Meadowview, Massachusetts.

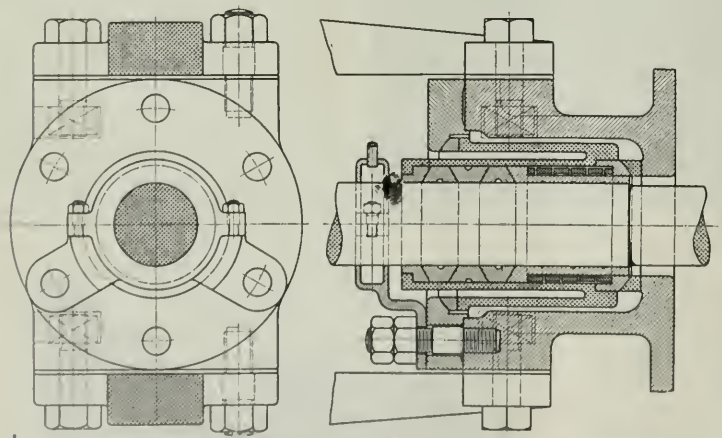
Pistons and Valves for Superheated Steam.

When superheated steam was introduced on the Prussian State Railways as few changes as possible were made in the regular standard running parts of the locomotives to which it was applied. At the same time there was a full appreciation of the fact that it would be necessary to make some changes in those parts with which the steam came into direct contact. The redesigning of these parts was undertaken by Herr Schmidt, and this has been so successfully accomplished that the usual wear and tear of the valves, cylinders, pistons and stuffing-boxes, inherent previously to the use of superheated steam, does not now exceed that of ordinary saturated steam locomotives. Even where the temperature has been as high as 720 deg. Fahr. no trouble has been experienced, though the ordinary temperature of the superheat is but 650 deg.

In working out these details it was found that the cylindrical walls of the valve chest should be separated from the shell of the cylinder itself in order that injurious strains, due to the inflowing superheated steam and the unnecessary transmission of heat and consequent heat losses, may be prevented, as would be the case if the piston-valve casing and cylinder were made in one. Relief valves must be fitted to the cylinders, and snifting valves to the valve chest or steam pipe. Forced lubrication, with mineral oil having a high flash point is essential for the purpose of ensuring efficient lubrication.

In order to insure that the piston shall be steam-tight and produce the minimum amount of friction, the so-called Swedish pistons are generally used. These are provided with three small rings, having specially arranged circumferential grooves and holes, so that the steam entering behind the rings merely presses them lightly and evenly against the cylinder walls. Neither the piston-rings nor the stuffing-boxes ought to carry the weight of the body of the piston; for this reason tail-rods are employed, so that the weight of the piston is taken at the front end by a specially provided guide and at the back by the cross-head.

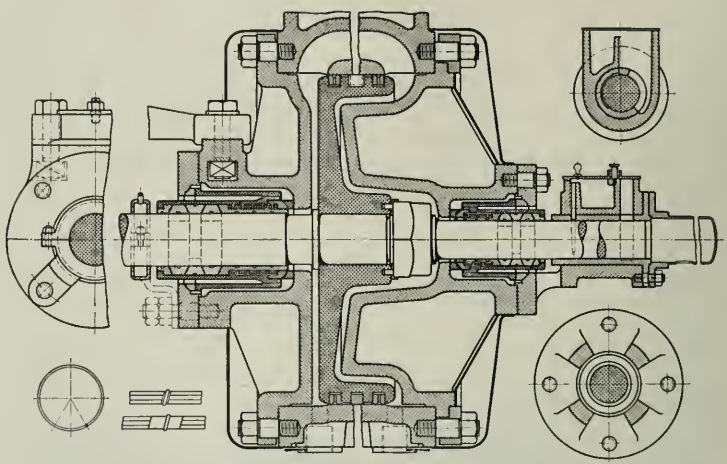
In order to obviate overheating of the stuffing-boxes special provision is made for cooling them by air. As the rigid stuffing-box had no provision at all for cooling, it was not at all satisfactory when superheated steam was used. For such conditions metallic packing only is suitable, and the stuffing-boxes have been so designed as to allow of a lateral movement of the piston-rod without, at the same time, permitting leakage, while the gland containing these rings has been so designed as to be continually cooled by air, so that a moderate temperature may be maintained. As may be seen, each stuffing-box is fitted with movable spherically seated packing rings. The sleeve containing the white metal packing rings and the cast-iron ground ring is cored out to obtain cooling by air over its entire length. The necessity for this air-cooling was forcibly illustrated at the trials of the first superheated steam engine, in which no provision for cooling had been made, and, consequently, the white metal rings melted as soon as a high degree of superheat was reached.



Stuffing Box for Piston Rod.

The outer packing ring is placed in the same transverse plane as the middle packing rings, in order to avoid canting the latter. In the same manner excessive pressure of the cast-iron ground ring against the piston-rod is prevented, so that overheating of the rod is impossible. The packing rings are held in position by the steam itself, aided by a spring. The latter prevents the rings from being carried along by the returning rod, and it also forces the packing rings on their seats without in any respect impairing the flexibility of the whole arrangement.

In order to reduce the frictional resistance of the valves, and with it the wear, to the smallest amount solid rings have been used.



Piston for Superheated Steam Locomotive.

As the difference in expansion between the valve and its case would be considerable, it was necessary to reduce the diameter to a minimum. For this reason double admission ports have been adopted, so that it is impossible to keep the diameter of the valve almost as small as the exhaust pipe. This has made it possible to use a diameter of but 6 in. on all of the engines of the Prussian State Railway, and this has been found to be amply sufficient.

The tendency of ordinary piston valves to seize, if too tightly fitted, has been avoided by jacketing the walls of the valve case with steam. This insures a uniform expansion throughout the whole length of the case and steam leakage is reduced to a minimum, and even this loss is more than compensated for by the reduction of friction. Preliminary warming up of the casing, before starting the engine, is unnecessary; nor is there any liability of the valve seizing during working. The wear, also, is very slight, and, in some cases, none can be detected after a year of service. The quantity of lubrication required is very small and the load on the reversing gear is light. The construction of the valve is clearly shown in the engraving.

Although excellent results have been obtained with this valve, one with a split ring has also been designed in order to avoid the accuracy of manufacture that is required with the solid ring.

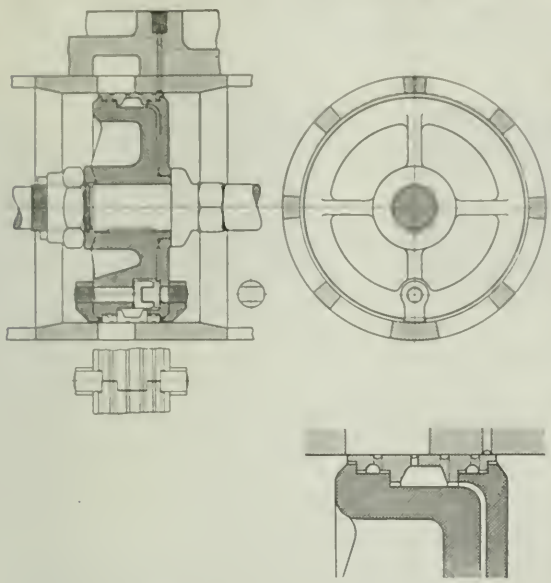
In this second type wide rings are used instead of the usual narrow ones, as experience has shown that the narrow are not suited for use with superheated steam. These broad rings are provided with several steam-tight spaces on the inside of each ring, which communicate with the steam port by means of radial holes about $^{3}/_{16}$ in. diameter, arranged circumferentially around the ring. Thus pressure on both sides of the ring is equalized, so that it is only pressed against the lines by its own tension which is sufficient to secure tightness.

In order to obtain a good fit between the valve end and the ring, and between the ring and the valve body, without jamming the ring between the two, the valve end is made with a certain amount of elasticity, and is only screwed up against the valve body at the center, leaving the outer periphery to be pressed on by the steam.

The steam pressure in the valve chest is thus made to insure the tightness of the rings, while at the same time the elasticity of the cover gives the ring sufficient freedom for expansion. As during admission the pressure on both sides of the cover is the same, the ring adjusts itself independently of the valve end or cover. During

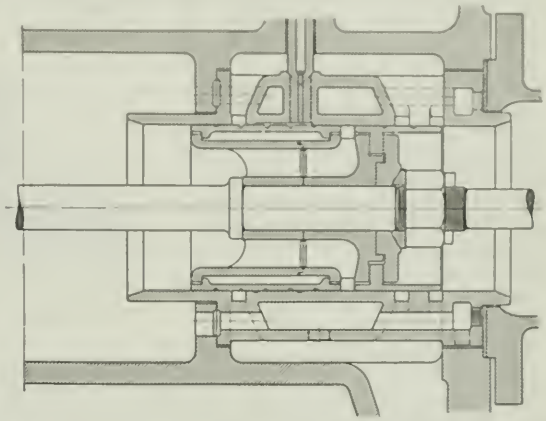
exhaust, however, the ring is held in position by the cover until readmission takes place. Excessive outward pressure of the ring against the liner, and consequently excessive friction is thus prevented.

The resistance to motion of this type of piston-valve is very small and the wear of the rings correspondingly slight.



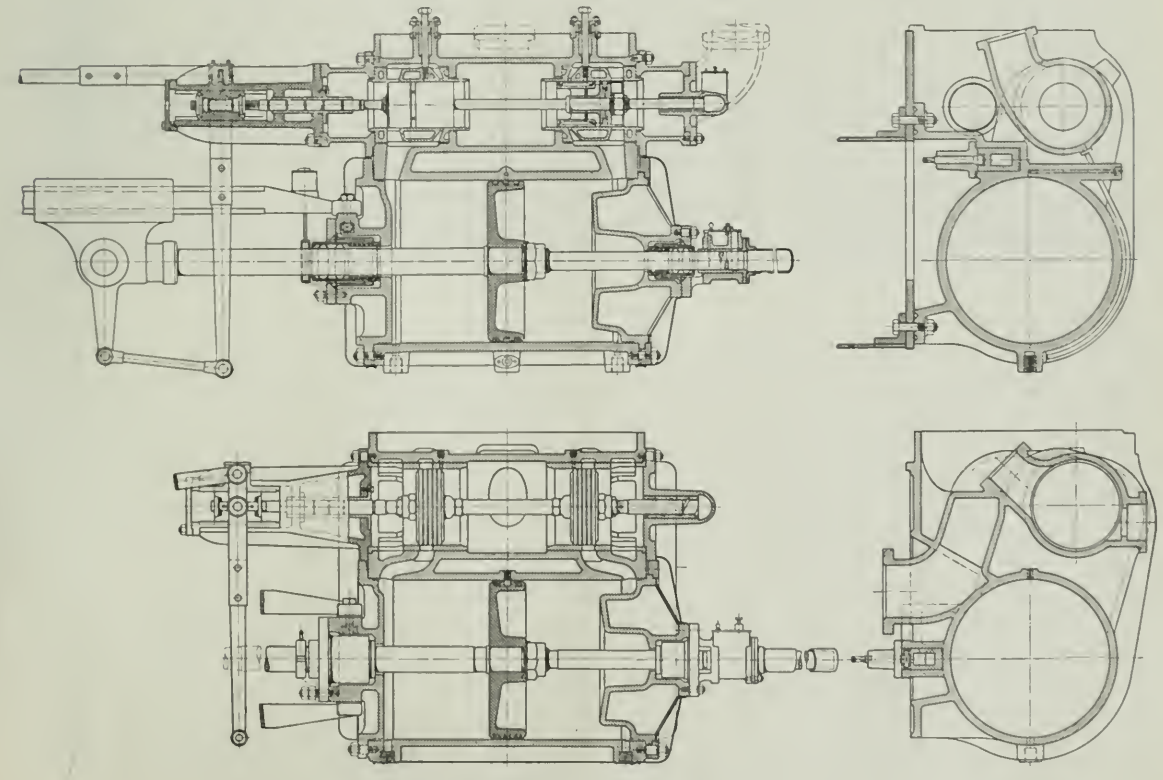
Schmidt's Piston Valve with Steam Jacketed Casing, Double Admission and Solid Rings.

As compared with the solid ring type of valve, this modified type has the advantage of remaining absolutely steam-tight so long as there is any elasticity in the rings. The split or cut in the rings must always be placed opposite the broad bridge of the liner, so as to prevent leakage through the cut. The cut in the ring is protected on the outside by a cover, which is fixed respectively to the valve body and to the valve end or cover. The screws holding the split covers prevent the rings from turning. Hence, in cases where the split covers are cast on, special set-screws must be provided for this purpose.



Schmidt's Piston Valve with Steam Jacketed Casing, Double Admission and Solid Rings.

These piston-valves, with split-rings, have been in use for a number of years with marked success, and have been adopted by most railways using superheated steam.



Cylinder and Valve for Superheated Steam Locomotive; Schmidt's System.

A Removable Driving Box Brass.

The scheme illustrated herewith for holding driving box brasses, instead of pressing them in, was devised by Charles Markel, shop foreman of the Chicago & North-Western at Clinton, Iowa. It is simply the use of a wedge-shaped steel key, which is driven between one extremity of the brass and a shoulder of suitable size and shape in the box. A movement of the key of 1⅝ in. is provided for, and it is claimed that when driven home it holds the brass so securely that a hydraulic pressure of 40 tons is required to start it. Removal of the key is accomplished in the manner shown in one or the illustrations. There is a tapped hole in the end of the key for this purpose, and also for the insertion, loosely, of a hexagonal-head bolt which, besides keeping the hole closed ordinarily, is used to drive against, saving the end of the key from injury. Also, there is a tapped hole in one end of the brass to receive a bolt for removing the brass by hand. A set-screw through the side of the box prevents the key from working out.

The scheme insures an effective fit of the brass in the box, it is claimed, avoiding one of the bad points of the pressure method. For in the latter, even though 30 or 40 tons pressure may be exerted in forcing the brass in, the bearing is uncertain and may be on a few points only. The working of the locomotive soon pounds it to a better bearing, producing a loose brass. By the method here shown the brass is turned $\frac{1}{32}$ in. smaller than the box fit, and when the key is driven the brass is forced to a tight, solid contact with the box.

If heating or some other cause loosens the brass it can be tightened at once by further driving of the key. To remove a brass for shimming or replacement it is only necessary to lift the weight of the box from the journal and pull key and brass; the operation is as simple in reverse order, the whole being done in a minimum of time. This latter is one of the important advantages, of course, as a full change of brasses by present methods means two or three days' work and $16 to $24 in labor cost. By the new method it can be done in from two to 12 hours, depending on the number of driving wheels and the kind of valve gear. The new method also permits satisfactory shimming of the brasses, a practice which most roads have abandoned because of the troubles with it; the brasses may therefore be worn down as thin as desired and be held tight at all times by the key.

The boxes are in service on several North-Western locomotives and the results have been entirely satisfactory. The first engine equipped was an Atlantic type, in fast passenger service, in April, 1906. There has been no trouble with the brasses and they are in good condition at the present time. Other engines of the same type have been equipped since with equally good results. The Duluth, Missabe & Northern has had a box in very heavy service since May, 1906, likewise with satisfactory results. In the general use of the device the box openings can be made to a standard for each class of locomotive and brasses and keys kept in stock. The only machine work at time of application therefore is to fit the brass to the journal. Jigs and templets and methods of machining to produce all parts in exact duplicate with the least work have been devised by the Inventor. The Locomotive Improvement Co., Clinton, Iowa, has been formed to sell this and other devices. As the removable brass can be applied to boxes now in service, the company does not intend to make boxes and brasses at present. Instead, the use of the scheme by railroads will be licensed on a royalty basis.

Fig. 1—Markel Driving Box Brass.

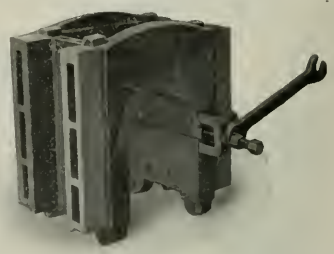


Fig. 2—Markel Driving Box Brass.

Roadmasters' and Maintenance of Way Association Convention.

The Roadmasters' and Maintenance of Way Association held its twenty-fifth annual convention in the Sherman House, Chicago, Nov. 12, 13 and 14. President C. H. Cornell (C. & N.-W.) was in the chair and about 70 members were in attendance. The opening address was made by R. H. Alshton, General Manager of the Chicago & North-Western. President Cornell followed with an address in which he stated that the association, which for a time was exhibiting signs of weakness and decline, is again in vigorous and prosperous condition. The secretary reported the addition of 48 members. The subjects discussed by the convention were: Maintaining Track in Line and Surface in the Winter; Wrecking Outfits—Organization and Working; Cost of Ballasting Old Track and Renewing Ties; Organization and Working of Rail-Laying Gangs; Method of Destroying Vegetation in Track.

Two of these reports were reprinted last week; others will be found in the present issue and in subsequent issues.

At the Thursday forenoon session, W. M. Camp, editor of *Railway and Engineering Review*, read a paper entitled "Why Efficient Track Work is Skilled Labor."

Following the custom recently adopted by this association, the supply men were given the privilege at one of the sessions of explaining their devices, five minutes' time being allowed the representative of each firm. A number availed themselves of the opportunity.

The officers for the ensuing year are: President, J. A. Kerwin (Mo. P.); First Vice-President, A. E. Hansen (C. & N.-W.); Second Vice-President, W. A. Brant (C. & N.-W.); Secretary and Treasurer, W. E. Emery (C. & A.), re-elected; Members Executive Committee, T. Thompson (A., T. & S. F.), W. H. Kofmehl (C., M. & St. P.), J. Muschott (P. M.), and B. A. West (A., T. & S. F.). The next place of meeting is Milwaukee, Wis.

Following is a list of the exhibits at the convention:

Adams & Westlake Co., Chicago.—Switch, semaphore and other signal lamps.

American Flange Frog & Railway Improvement Co., St. Louis, Mo.—Models of the "Graham" flange frog.

American Hoist & Derrick Co., St. Paul, Minn.—Photographs of "American" ditchers.

American Rail Joint Company, Niagara Falls, N. Y.—Models of the "American" rail joint.

American Railway Device Co., Chicago.—"Economy" separable switch joints, "Odenkirk" switchstands, anti-rail creepers.

American Steel & Wire Co., Chicago.—Samples of woven wire fencing, wire rope, "Cooper" rail bonds and electrical wire.

The American Track Barrow Co., Lowell, Mass.—Models of track barrows and rail pony cars.

American Valve & Meter Co., Cincinnati, Ohio.—"Economy" switchstands, and catalogues of Ponge water columns and tank fixtures.

Atlas Railway Supply Co., Chicago.—Atlas rail joints, braces and tie-plates; Atlas improved switchstands.

Louis Blessing and Alfred Johns, Jackson, Mich.—Cable-loop reinforced concrete ties and adjustable keyed nut-lock.

Border Bolt & Nut Lock Co., Richmond, Ind.—Samples of bolts and nut locks.

Buda Foundry & Manufacturing Co., Chicago.—Track jacks and rail drills; hand and push car wheels; switchstands; track gages and levels; track-tool grinders.

The Cleveland Frog & Crossing Co., Cleveland, Ohio.—The "Prentice" anti-rail creeper.

Commonwealth Steel Co., St. Louis, Mo.—Photographs and pamphlets of cast-steel gasolene weed burner.

Cook's Standard Tool Co., Kalamazoo, Mich.—Track drills, track tool grinders and cattle guards.

Coulter & Paxton, Longmount, Colo.—Models of improved track wrench and clamp.

Dilworth, Porter & Co., Ltd., Pittsburgh, Pa.—Samples of Glendon flange and Goldie claw tieplates.

The Eyeless Tool Co., Newark, N. J.—Eyeless picks and solid steel track tools.

Fairbanks, Morse & Co., Chicago.—Gasolene motor car, Barrett track jacks and rail drills.

Gibraltar Manufacturing Co., Chicago.—Model of "Gibraltar" pumping post.

Wm. Goldie, Jr., & Co., West Bay City, Mich.—Goldie perfect tie plugs.

Grip Nut Company, Chicago.—Samples of grip nuts.

Hart Steel Company, Elyria, Ohio.—McKey rolled steel shoulder tieplates and open hearth steel spikes.

Hayes Track Appliance Co., Geneva, N. Y.—Hayes derails, with operating and target stands.

Hussey Binns Shovel Company, Pittsburgh, Pa.—Shovels, spades and scoops.

Kalamazoo Railway Supply Company, Kalamazoo, Mich.—Hand and velocipede cars, Moore track drills, and Kalamazoo track jacks; track gages and levels, and curve lining gages, pressed steel wheels.

National Lock Washer Co., Newark, N. J.—Samples of spring nut locks.

Pennsylvania Steel Co., Pittsburgh, Pa.—Manard manganese anvil-faced frog, design 160.

Quincy, Manchester, Sargent Company, Chicago.—Bonzano rail joint, Q & C compromise and insulated joints, Cafferty tie tongs, anti-rail creepers.

The Rail Joint Company, New York.—Rail joints of the continuous, Weber and Wolhaupter types.

Railroad Supply Co., Chicago.—Tieplates and derailers.

Railway Specialty & Supply Co., Chicago.—Mansfield combination guard-rail, clamp and tieplate, manufactured by the Otto Gas Engine Works, Chicago; P. & M. and vise grip rail anchors, Smith improved nuts.

M. M. Riley, Ironwood, Mich.—Model of steel tie and rail.

John M. Scott & Son, Racine, Wis.—Models of "Hercules" and "Little Giant" bumping posts; Racine nut locks.

Sellers Manufacturing Co., Chicago.—Tieplates, rail joints and splice bars.

Stover Motor Car Co., Freeport, Ill.—Gasolene motor car.

Thomas Boltless Rail Joint, Watertown, Wis.—Model of boltless rail joint.

Universal Portland Cement Co., Chicago.—Samples showing different stages in the manufacture of "Universal" Portland cement.

United States Wind Engine & Pump Co., Batavia, Ill.—Switchstands, semaphores and water supplies.

Worth Wire Works, Kokomo, Ind.—The "Clinch" wire fence stay.

The Beech Grove Shops of the Big Four.

The Cleveland, Cincinnati, Chicago & St. Louis (Big Four) expects to have the locomotive department of its new shops at Beech Grove, Ind., ready for occupancy by December. The principal buildings, with the exception of the storehouse, are near completion and the installation of tools and equipment will follow as fast as practicable. This plant, when fully completed, will be one of the notable railroad shop plants of the country both in size and all other features that characterize the most recent practice in such shops. It is of interest therefore to review briefly the conditions attending the inception and planning of the plant, as well as to study the grouping and operating conditions.

Indianapolis is the central and most important point of the Big Four system, with lines radiating in six directions. At the present time the road is without facilities suitable to care properly for modern motive power. The Brightwood shops at Indianapolis, which were built when 35-ton engines were the standard, have long been hopelessly outgrown, with no room for enlargement and rebuilding. Some of the shops at other points, while more modern than the Brightwood plant, have neither the capacity nor the facilities for present needs. The construction at Indianapolis of a new plant entire to care not only for the equipment of the divisions entering there, but also for the heavy locomotive repairs of the whole road, and on a scale which looked well into the future, had therefore become a necessity. Preliminary work was begun early in 1906. It will be recalled that a committee of motive power men of the New York Central Lines, of which the Big Four is a part, was appointed to visit the largest of the different new railroad shops and from their study of same determine the nature and general characteristics of the plant required for the Big Four. This committee consisted of Messrs. H. F. Ball, E. D. Bronner, F. M. Whyte, R. T. Shea, W. Garstang and B. D. Lockwood.

Besides shops, the Indianapolis situation also required relief in the matter of freight yard facilities. It was therefore decided to build the new shops and a large concentration yard on a new site where not only would there be ample room for present needs, but where future growth would not be restricted. The tract selected is at Beech Grove, about six miles southeast of the city on the line to Cincinnati—the Chicago division of the road. The proximity of shops and freight yards naturally influenced the layout of the former.

The Arnold Company, Consulting Engineers, Chicago, was commissioned to prepare a preliminary report and estimate of cost of the proposed shop plant. Several block plans suitable for the particular requirements at Beech Grove were prepared and fully discussed with the railroad company's engineers, and the decision was finally made in favor of the one shown herewith, in which the eastbound classification yard is immediately north of the shops. The Arnold Company then prepared complete plans and specifications for the entire plant, including buildings, water and sewer systems, power plant equipment, air, heating and steam systems, together with electric light and power systems. This company is now acting as inspector for the entire work.

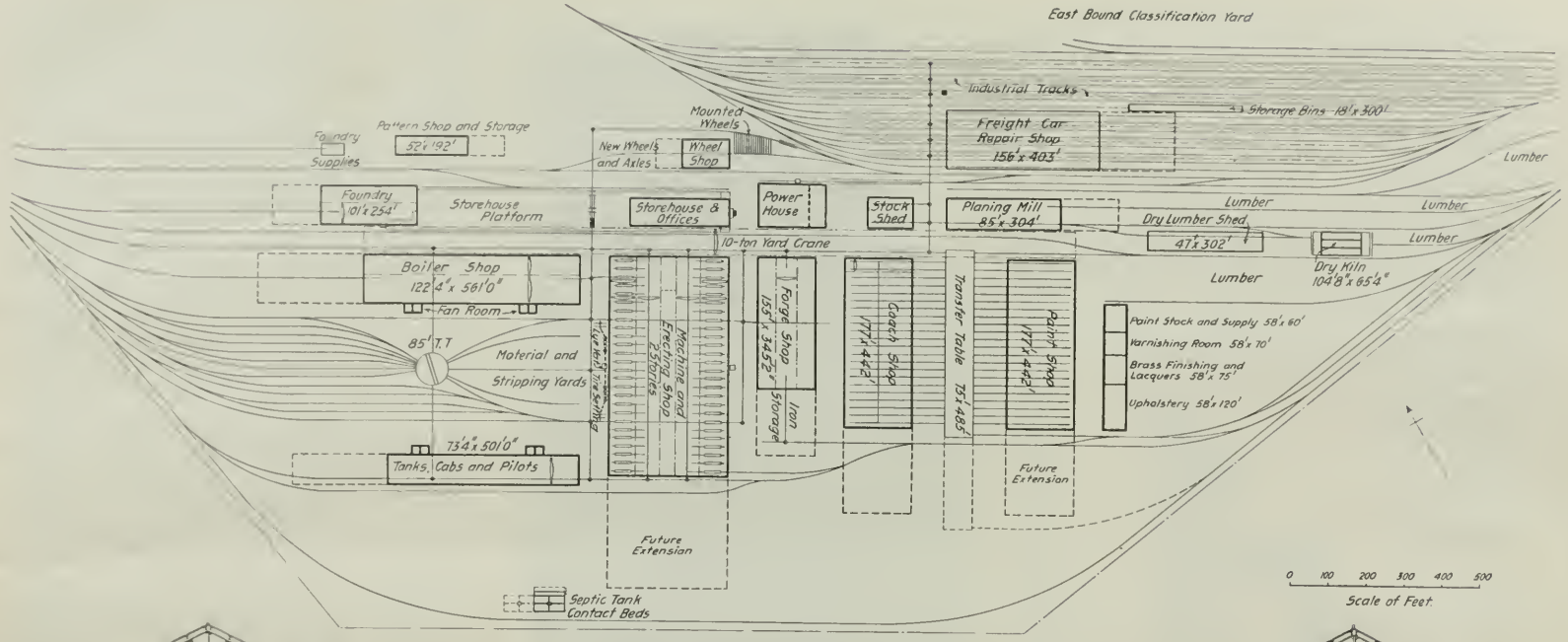
Examination of the general plan shows the central feature to be a "midway" or general supply avenue on which all of the important buildings front. This is midway is 75 ft. wide, about 2,000 ft. long and is served by a 10-ton overhead traveling crane. There were no site limitations on the arrangement of the plant, so that the engineers were without any restrictions of this sort in their effort to secure the most efficient grouping. One of the basic conditions governing the arrangement and relation of the different departments was that the forge shop should be able to serve conveniently all three of the principal departments, the locomotive and the two car departments. Another was to have the planing mill serve the latter two and also be convenient to the power station for disposal of its refuse. The car departments have been assigned to the east end and the locomotive department to the west end of the site, the machine and erecting shop, as the central and most important unit of the latter was put on the south side of the midway where it can be extended to double its present length if need be. The forge shop was put east of it, between it and the passenger car shop, and where product for the freight car shop can be carried across quickly and easily by small cars and the midway crane. Locomotives to be shopped are brought in at the western end of the shop yard to the hospital tracks, a part of which lead to an 85-ft. turntable, which feeds the machine and erecting, the boiler and the tank shop as the case may be. The engines

Blacksmith Shop; Beech Grove Shops of the C. C. C. & St. L.

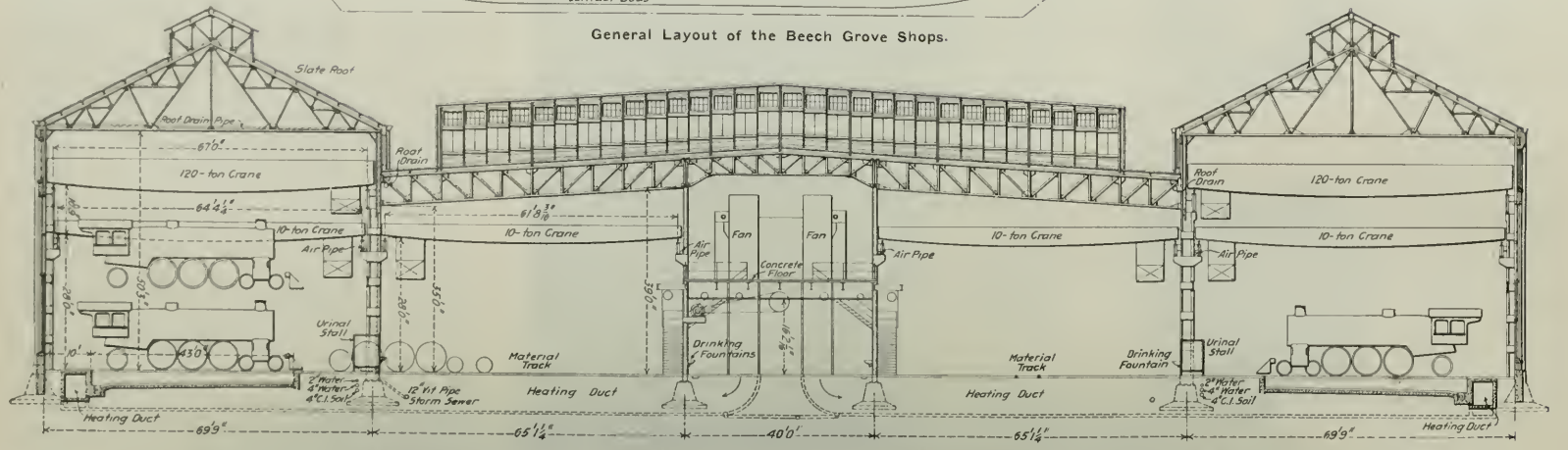
will stand with their head-ends toward the center of the machine and erecting shop and therefore will cross the table in entering and leaving this shop only when a reversal of direction is necessary. Likewise, the normal routing for the cab and tank shop is through the end doors. For the boiler shop it is by way of the turntable, with emergency entrances at the ends.

The storehouse is placed nearest to the locomotive shop—directly across the midway from it—since the majority of the supplies carried are for the locomotive department, but is where the supplies may be received with freedom and distributed to the different departments with equal ease by means of the yard crane, its length being parallel to the runway. The location of the foundry gives plenty of scrap yard room adjacent to it and also permits raw material to be received and castings to be delivered without unnecessary handling or reverse movement. A heavy-material platform 460 ft. long, connects foundry and storehouse and has its south side under the yard crane. The pattern shop is close to the foundry, but is isolated from the rest of the plant for fire protection.

The power station has a central location on the midway and all electric cables, steam, air and water piping, etc., are carried from it to the principal buildings in a large reinforced concrete tunnel, 6 ft. 9 in. x 7 ft., under the midway. The car departments receive and store their lumber at the east end of the yard, from which it progresses through the dry kiln and dry lumber shed to the planing mill and thence to the car shops on each side. The transfer table of the passenger department connects with the yard



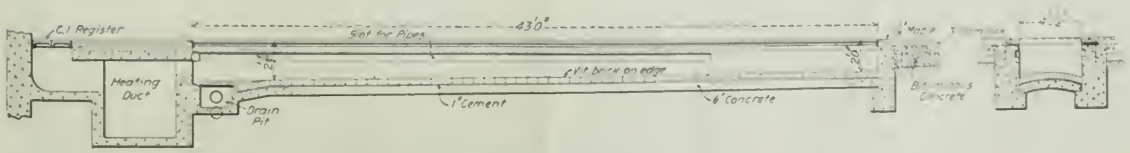
General Layout of the Beech Grove Shops.



Transverse Section and Floor Details, Machine and Erecting Shop; Beech Grove Shops of the C. C. C. & St. L.

Machine and Erecting Shop.

Interior View of Machine and Erecting Shop; Beech Grove Shops of the C. C. C. & St. L.



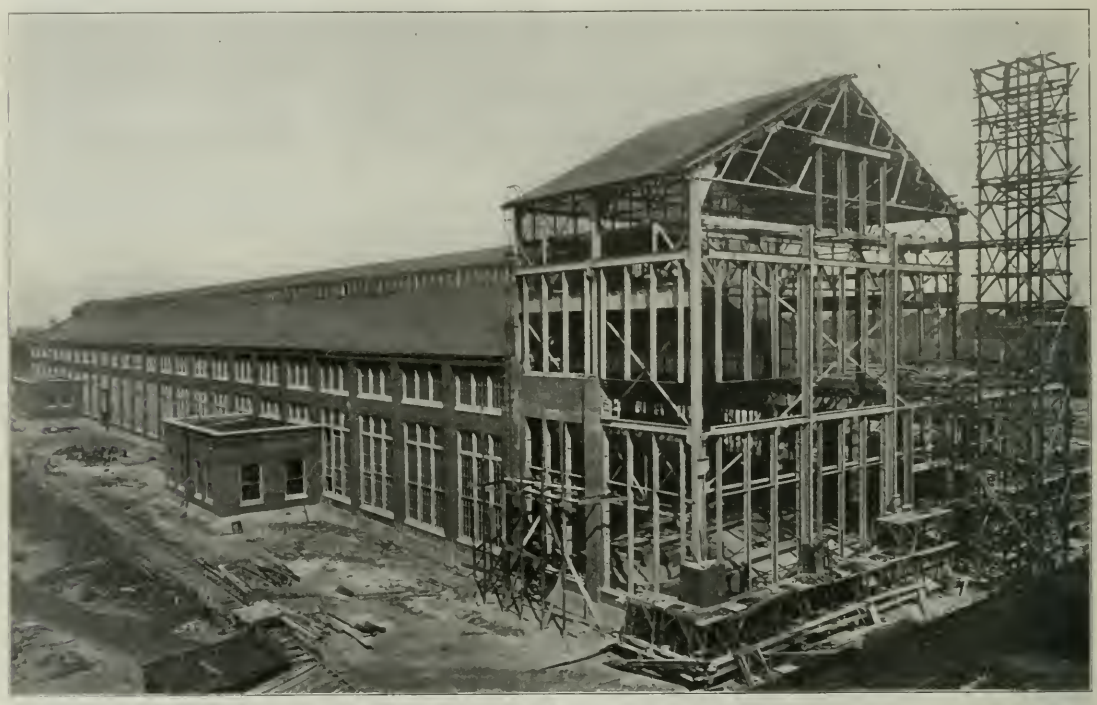
Sections Through Erecting Pits in Locomotive Shop.

crane. The freight car repair yard is adjacent to the large switching yard where cripples may be classified for the shop repair tracks and delivered to them with the least amount of switching. A minimum spacing of 75 ft. has been observed for all buildings for fire protection.

Exterior and interior views of the machine and erecting shop are shown which give an excellent idea of the building. It is 315 ft. wide and 578 ft. long. It is a structural steel building with 17 in. Colonial brick curtain walls and is supported on ample concrete foundations reinforced with steel bars. There are five bays—an erecting

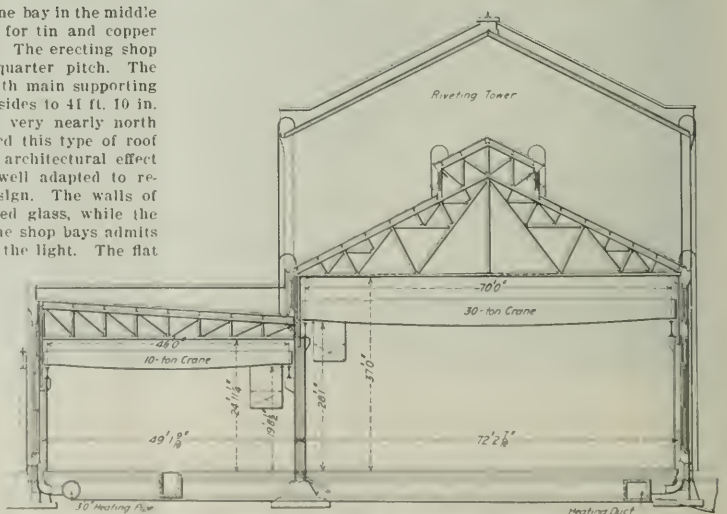
umns of the middle bay. The remaining space between machines and material track is for the storage of material, and the space on the opposite side of each material track is for locomotive wheel storage, as shown.

A detail of the erecting pits is shown. They are concrete, with bottoms lined with vitrified brick. The heating duct runs along the outer, or wall, ends of the pits, with connections to the latter as shown. Each pit is supplied with air, steam, water and electric connections. There are two of the air outlets equipped with air-hose connections. When not in use these fit into recesses in the



Boiler Shop; Beech Grove Shops of the C. C. C. & St. L.

and a machine bay on each side and a light machine bay in the middle common to each. Over this latter is a balcony for tin and copper shop, lavatories, locker rooms and heating fans. The erecting shop roofs are covered with slate and have a one-quarter pitch. The three intermediate bays have a saw-tooth roof with main supporting trusses rising from a head room of 35 ft. at the sides to 41 ft. 10 in. at the center. The fact that the building lies very nearly north and south in the direction of its length permitted this type of roof to be used to the best advantage. The general architectural effect of the building is good, while the section is well adapted to requirements, as well as being economical in design. The walls of the building are fully 60 per cent. factory ribbed glass, while the difference in height between erecting and machine shop bays admits of large clere-story windows, further increasing the light. The flat portion of the roof surrounding the saw teeth is to serve as a hose cart runway for fire protection. All roof drains are inside, as will be observed from the cross-section of the building. Each erecting bay has a 120-ton crane 50 ft. above the floor for traversing locomotives, and a 10-ton messenger crane 28 ft. above the floor. Each machine bay likewise has a 10-ton crane. The heavy cranes have two trolleys and with full load, trolleys 30 ft. apart, they are to maintain a hoisting speed of 8 f.p.m., 100 f.p.m. trolley speed, and 175 f.p.m. bridge speed. The small cranes have a hoisting speed under load of 25 f.p.m., a trolley speed of 125 f.p.m., and a bridge speed of 400 f.p.m.



Cross Section of Boiler Shop.

There are 52 erecting pits divided equally between the two outside bays. There is about 1,100 sq. ft. of machine floor space per pit, on the basis of 48 pits, since the four pits on the through tracks are for wheeling and unwheeling locomotives. The machine floor comprises a central section extending 15 ft. out from the col-

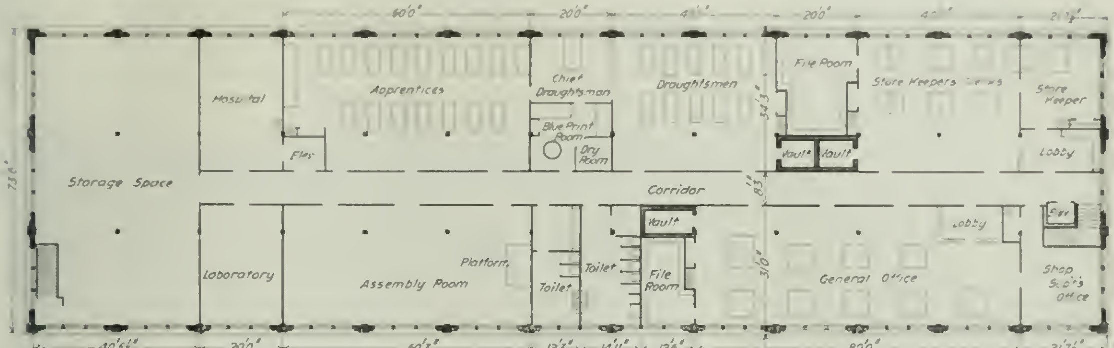
sides of the pit. The steam is supplied at 225 lbs. pressure for testing. Heavy work benches with cast-iron frames, fitted with drawers and tool racks, will be placed between pits. On the posts at each bench, 8 ft. above the floor, are triple outlet boxes for either light or power connections. Two air outlets fitted with air-hose connec-

tions, and one 2½-in. hose valve water connection, are located on alternate columns between machine and erecting bays at a suitable height above the floor. The air piping is run overhead with drops at these columns. There is also an air connection on each alternate column on both sides of the light machine bay. Water hose connections are made to the roof at intermediate points for fire protection. The floor of the shop is 1⅝-in. maple covered on 3-in. hemlock planks, the latter nailed to 4 in. x 6 in. sleepers bedded in 7 in. of bituminous concrete. Beneath the concrete is 6 in. of screened gravel. The balcony floor is concrete.

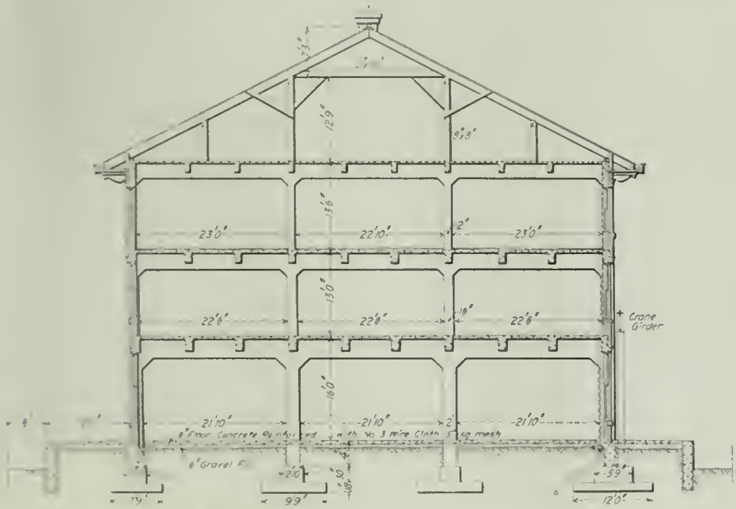
The building is heated by six separate hot blast outfits. Each outfit consists of two 210-in. full-housed fans, each fan direct connected to a 12 in. x 12 in. vertical enclosed side-crank engine. The intake of air is through 20 sections of heating coils, 9 ft. x 9 ft. 3 in., arranged in four groups. The coils are heated by exhaust steam from the power station. A vacuum system is maintained by piping condensed steam returns to vacuum pumps in the power are built on the south side of building, as seen in the photographic view.

The blacksmith shop is 1?? ft. x ??? ft., in three bays. The dimensions and details of the main and side bays are the same as the similar bays of the boiler shop and [illegible] a cross-section is not shown. The central bay will have a 10-ton electric overhead travelling crane, a feature which few railroad blacksmith shops possess as yet. The operator's cage will come to within 8 ft. 6 in. of the floor to get below the smoke and gases as much as possible. The floor of the shop is formed of 2 in. of front-end sparks over laying 6 in. of cinders on a foundation of 10 in. of clay and gravel. There is a mezzanine floor for the foreman's office [illegible] et. The building is heated directly from steam piping.

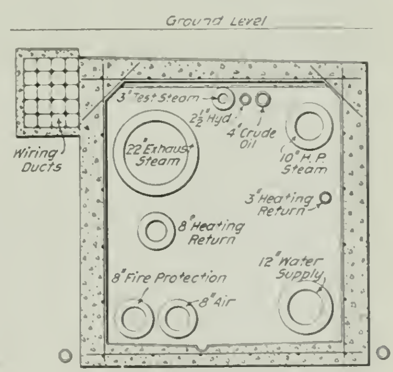
The storehouse and office building is to be of fireproof construction, except the roof timbers and their supporting [illegible]. It will be 73 ft. x 263 ft., three stories high. It will have a self-supporting reinforced concrete frame with Colonial brick exterior



Third Floor Plan of Storehouse; Beech Grove Shops.



Cross Section of Storehouse; Beech Grove Shops.



Section Through Power Tunnel, 6 ft. 9 in. x 7 ft.

station. The fans and coils, as already mentioned, are located in the balcony. They discharge downward to reinforced concrete ducts under the floor, each of which runs across to connection with a duct which encircles the entire building just inside the walls. Outlets from the latter discharge into the erecting pits and through registers in the floor under each window. The duct around the building also carries the air, steam and water piping for pit service.

The boiler shop is 126 ft. x 564 ft. A view of it from the riveting tower end, which is the end adjacent to the machine and erecting shop, taken before completion, is shown. The cross-section of the building shows it to consist of a main bay and a side bay, 72 ft. and 49 ft. wide respectively. The former is served by a 30-ton, and the latter by a 10-ton crane. The general structural features of the building are similar to the machine and erecting shop. However, the west wall of the riveting tower, which is carried by the main bay truss, is made of concrete on expanded metal in order to minimize the weight. The building will be heated in the same way as the machine and erecting shop. The fan rooms

walls, cut stone sills, slate roof and copper cornice. A 12-ft. platform will extend the full length of both sides of the building. It also will be reinforced concrete, with a granitoid top finish, which will likewise be the finish for the storehouse floors. The two lower floors are to be for store purposes and the upper floor for offices, as shown by the plan of same. It will be seen that it includes a hospital, to care for employees injured in the shops, and a room for apprentices, where they will be given daily instruction in accordance with the scheme now in force on all New York Central Lines. The third floor offices will have maple floors and be trimmed in oak. The hospital and toilet rooms will have tile floors with marble base. There is also a large assembly room on this floor for committee meetings, conventions, lectures to shop men, etc., and a lavatory. There will be one electric elevator for passengers and two for freight. The building will be heated directly from steam radiators. It will be equipped with a telephone exchange with connections to all departments of the shops.

The power station is shown partially completed in one of the

views. It is 114 ft. wide and 128 ft. long, the architecture harmonizing with the buildings already described. The substructure is concrete, the column piers being reinforced, and the substructure masonry is shale brick of a dark color lined with sand lime brick. The turbine room is finished with a red pressed brick wainscoting about 6 ft. high. The roof is slate on wood sheathing.

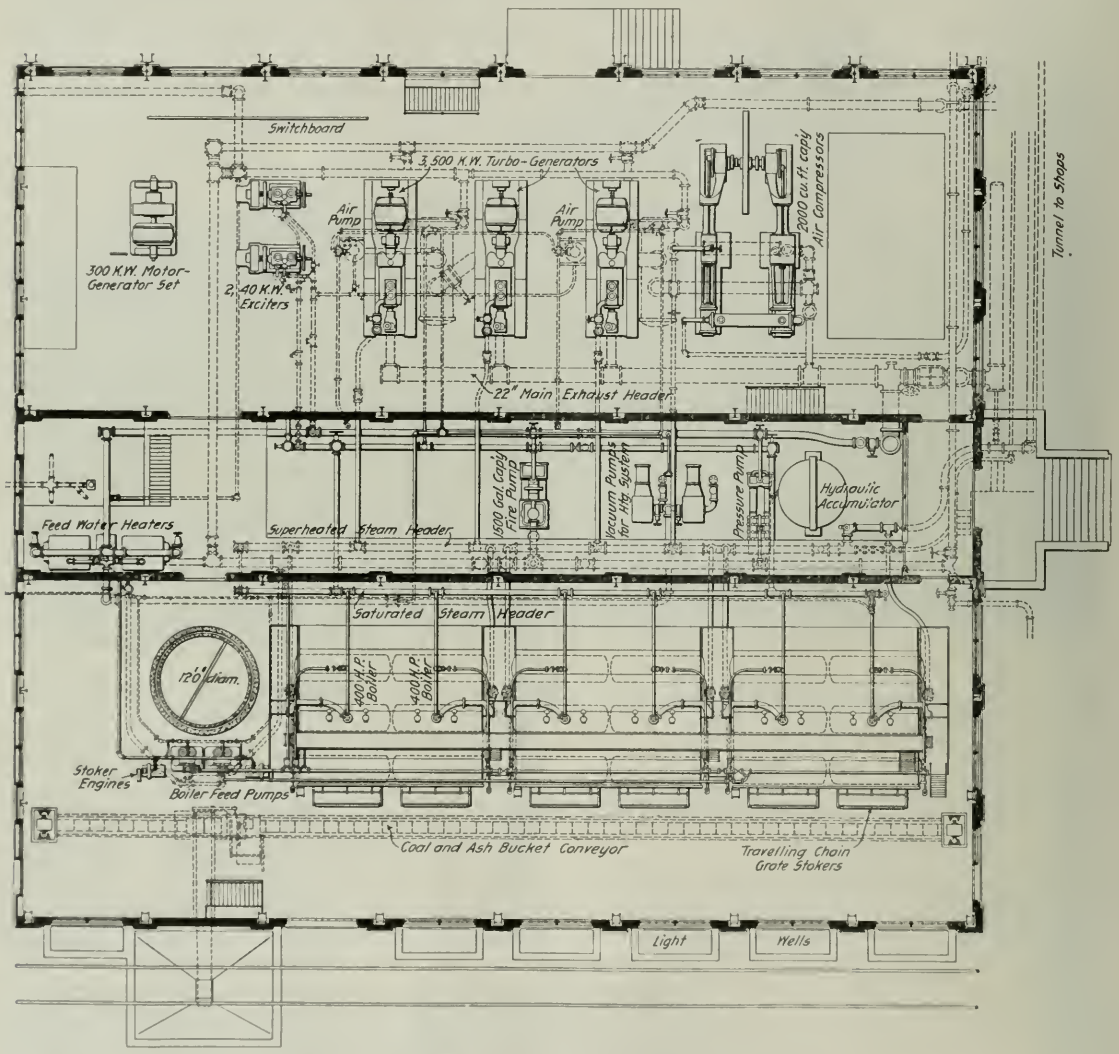
The liberal use of large windows in the side walls, and monitors and skylights in the roof, give a well-lighted interior. The building at present is closed at the east end by a wooden bulkhead to allow for future extension, which is contemplated at an early date. The power station will ultimately be twice its present size.

The boiler room is 46 ft. x 128 ft. It contains three batteries of two 415 h.p. Stirling water-tube boilers, each equipped with Foster superheaters and Greene chain-grate stokers. The boilers are connected to the stack by an underground reinforced concrete flue. The chimney is a Weber concrete-steel design, 12 ft. in diameter and 200 ft. high, equipped with lightning conductors.

Coal is stored in overhead reinforced concrete bunkers, and is fed direct to the stoker hoppers by steel spouts. The coal and ash handling machinery is the Link-Belt design. The coal is dumped from cars into a track hopper outside the building, and is carried to a crusher inside the building by a small apron conveyor. It falls from the crusher onto an endless bucket conveyor in the basement which passes up over the storage bunkers, automatically dumping into same. The ashes are fed to this same conveyor by spouts from the doors in the ash bins of the boilers. They are dumped into overhead ash pockets, located in front of the stack, from which they may be loaded through spouts into cars outside the building. The boiler feed pumps are of the Dean duplex, upright, Admiralty type. The boiler room contains a number of structural steel runways, making all piping and apparatus easily accessible for repairs.

The turbine room is 46 ft. wide and 128 ft. long, with a 12 ft. basement underneath. The main generating units comprise three Westinghouse-Parsons steam turbines, direct-connected to 500 k.w., 60 cycle, three phase, 3,600 r.p.m., 480 volt generators. There are two steam-driven, direct-connected 40 k.w. exciter units, and adjacent to same is a 300 k.w. Westinghouse motor-generator set for supplying 250 volt direct-current to variable speed tools. There is room for another exciter unit and a motor generator set.

It is the intention to run the compressor, which is a Laidlaw-Dunn-Gordon 2,000 cu. ft. cross-compound type, and the turbines



Plan of Power House; Beech Grove Shops of the C. C. C. & St. L.

condensing, and there are two wet vacuum system condensing outfits, consisting of two Wheeler Admiralty-type surface condensers and two steam-driven air pumps. The condensers each take care of two units, so that each unit may be run condensing or thrown on to the heating system at will. The exhaust steam from the auxiliary units is carried to the feed water heater by a separate system of auxiliary piping.

The generators connect to the switchboard by lead-covered, paper-insulated cables laid in the ducts in the concrete floor. The switchboard has 15 panels, 12 of which are for present use. It is equipped with Westinghouse instruments and I. T. E. circuit breakers, and is built by the Walker Company. In the floor back of the switchboard and running its entire length is a slate covered trench 14 in. wide and 8 in. deep. All ducts to the switch-

board lead to this trench and tubes turn up through openings in the slate cover to the circuit breakers. Feeders go out at right angles to the switchboard in clay ducts in the floor to the south basement wall, where they drop 6 ft. in split tile ducts laid in chases in the wall to the underground conduit system. Thus all power house cables are separately encased in tile duct embedded in the floor or basement wall.

Between the boiler room and turbine room is the pump room, 22 ft. wide and running the length of the building. It is open to the basement floor with the exception of a gallery along one side and the connection between the boiler and turbine rooms. This gallery supports two 2,500 h.p. Webster feed water heaters, equipped with purifying, filtering and oil separator accessories, and working automatically. Other apparatus in the pump room includes a 1,500 gal. Blake underwriters' fire pump, two Marsh vacuum pumps for the heating system, and a hydraulic pump and accumulator to furnish water at a pressure of 1,500 lbs. per square inch to the hydraulic riveter in the boiler shop. The turbine room has a 15-ton, hand-operated crane, and the pump room a 5-ton hand crane.

The main source of water supply for the plant is three deep wells worked by Blake motor-driven, deep-well pumps having a capacity of 250,000 gals. each per 24 hours.

The superheated steam piping and the saturated steam piping form separate and distinct systems; the saturated steam being used for auxiliaries and the superheated steam for the turbines and compressors only. There is, however, a cross connection between the two headers for use in case of emergency. All steam leads from the boilers contain automatic stop and check valves and all steam leads to units, except those to pumps, contain receiver-type steam separators.

The sanitary question has been given careful attention. There will be two separate sewer systems, one sanitary in which the sewage will be purified in septic tanks and sand filters. The other system will care for the storm water which is to be discharged into large storage reservoirs. Each building will be equipped with full toilet facilities. The machine and erecting shop, for example, will have 56 water closets, 12 shower baths, 190 lavatories and 24 urinals in two toilet rooms on the balcony. There will also be eight urinals on the main floor located about 100 ft. apart on the columns between erecting and machine bays. Another feature of importance is 12 drinking fountains on the main floor, direct-connected to the deep wells already mentioned, which will supply pure cold water of even temperature the year through.

The five buildings here described are all of the locomotive department that will be built at present. They are estimated to be able to care for 1,900 locomotives a year—25 per cent. more than the present equipment of the road. The general plan of the shops indicates a 50 per cent. extension for all buildings and for most of them there is room to double their length, so that the needs of the Big Four at Indianapolis are amply provided for for a long time to come.

The work has been under the constant supervision of W. Garstang, Superintendent of Motive Power of the Big Four, and H. D. Lockwood, Mechanical Engineer, and has the approval of J. F. Deems, General Superintendent of Motive Power of the New York Central Lines. The tool layout and equipment is directly in the hands of the motive power department, and will be treated in a subsequent article, after complete installation has been made.

The Münster-Schlucht Electric Railway.

BY E. OMMEGANCK.

The Münster-Schlucht electric railway, in Alsace, has been opened for traffic this year, and is interesting on account of the heavy grades encountered. The object of the railway is to establish communication between Stossmeier, Ampfersbach, Schmelzwasen and the town of Münster, and also in summer to convey tourists to the Schlucht, a locality also accessible from the French side by the existing Schlucht-Gérardmer railway. Schemes for building this railway have been long on foot, as two alternative projects were under consideration. One was entirely an adhesion railway, some nine miles long, with a maximum gradient of 8 per cent., while the other scheme contained a section with a gradient of 22 per cent. on which a rack rail was required, but the maximum gradient was 5.5 per cent. on the adhesion portion. The route in this case was shorter by more than two miles.

Car on Münster-Schlucht Electric Railway near Beginning of Rack.

Various local conditions and other considerations were in favor of the combined rack and adhesion scheme, which was accordingly decided upon.

The first one and three-quarter miles of the route out of Münster lies along the main road. The line then leaves the road, but rejoins it in about half a mile at the transforming station. From this point the road has been widened to accommodate the line, which continues in this fashion until the commencement of the rack section, nearly four miles from Münster. This portion has a maximum gradient of 22 per cent., and terminates at Altenberg, about one and a quarter miles further on. The final section, rather over a

mile long, follows the picturesque road to the Schlucht, in the direction of the French frontier. The total length of the line is about six and a half miles, of which about one and three-quarter miles is equipped with a rack. The station at Münster is at an altitude of 1,250 ft., and the line rises to 3,740 ft. at the Schlucht. Grooved tramway rails are used in the streets of Münster, and ordinary bullheaded rail for the rest of the line. The sleepers are partly of impregnated oak. The gage is one meter.

The rack is of what is known as the Strub construction, similar to that in use on the Jungfrau, Vesuvius, Brunnen-Morschach and Monthey-Champéry railways.

Like the running rail, it is mounted on iron chairs. The top of the rack is about 2 in. above the head of the running rails. The maximum pressure on the teeth of the rack is 3.5 tons, from each of the two wheels which engage with it. Tangential pressure on the rack is taken in the usual way by concrete blocks. The rails were laid in lengths of 34.5 ft., and the rack in lengths of 11.5 ft. There are in all seven stations on the railway. The generating station is at the end of the line at Münster. Two belt-driven, three-phase alternators capable of an output of 200 k.w., at 7,000 volts, 50 cycles, are provided, driven by horizontal steam engines.

Power is taken to the sub-station referred to above, by an overhead line, partly on the same poles as the trolley wire. Here there are two 160 k.w. motor generator sets, which supply continuous current at 750 volts to the trolley wire. A buffer battery of 390 cells of a capacity of 296 ampere-hours is used in parallel with these machines.

The overhead construction is partly of the span wire and partly of the bracket arm type. Two conductors are used, each 9 mm. in diameter. Owing to the position of the sub-station a feeder has not been thought necessary. The return is by the rails, which are bonded in the usual manner. The collectors on the cars are of the bow type. Two of these are carried on each car, both of which, of course, make contact with the two overhead wires.

The normal traffic in summer is nine trains per day, but a service every quarter of an hour both ways can be maintained on special occasions. In winter four or five trains per day suffice. Each train consists of a four-axled motor car, with usually one trailer. The motor car is provided with four motors of 85 h.p. each, two of which are for driving the running wheels in the usual manner, while the remaining two are permanently connected to the gearing which engages in the rack. All four motors are used on the rack section, so that the full 320 h.p. is available. This arrangement of two motors for the rack and two for the adhesion wheels has been developed by the Alioth Company, of Basle, under the Strub patents, and permits of the same rolling stock being used on the rack and adhesive portions of the line. On the adhesion section only the two motors are in use, and these drive the wheels through a single reduction gear in the ordinary way. The other two motors are not then in use. On the rack sections, however, all four motors are employed as just said. The rack motors work with a double reduction gear, and the adhesion motors are connected in series to run with a high torque at a low speed. All four motors are controlled by a single controller, which is interlocked, to prevent any wrong combination of connections being used. Series parallel control is employed, and reversing and braking positions are provided. The driver cabs are provided with ammeters for both motor circuit voltmeters, and the necessary fuses and circuit breakers, and a lightning arrestor equipment is installed on the roof. The carriages are heated and lighted electrically.

The motor car is provided with the following independent systems of brakes: (1) A mechanical hand-brake, acting through eight brake-shoes; (2) a band brake on the shaft of the motors driving on to the rack; (3) a rheostatic brake, and (4) an automatic brake which grips the sides of the rack when the speed exceeds six miles per hour down the steep grade. This form of brake is fitted to both trucks. The brakes can at any time be worked from either end of the car. In addition to these four brakes, the following safety devices should be noted. In order to prevent all possibility of derailment a pair of jaws are fitted under each truck surrounding the head of the rack rail, and a disc clutch is provided between the rack motors and their gearing, which permits of a certain amount of slip in the event of a sudden stoppage of the motor in a serious short circuit, so the enormous strain of a sudden jerk upon the rack is avoided and only a normal braking effect given.

Rack Construction; Munster-Schlucht Electric Railway.

The carriages are all of one class, and, as may be seen from the illustrations, are of the compartment type, with ordinary side doors. In the case of the motor cars one compartment is fitted with removable seats, so that it can be used for luggage if required. Each motor car weighs 25.5 tons, including passengers, and the fully loaded trailer weighs 6.5 tons, giving a total weight for the train of 32 tons. Each train contains accommodation for 72 passengers. The maximum speed on the level is 10.6 miles per hour, and on the steep portion 4.7 miles per hour. The total journey occupies about an hour. The main contractors were the Société d'Electricité Alioth, of Basle.

GENERAL NEWS SECTION

NOTES.

The Chicago, Milwaukee & St. Paul has made a reduction of 25 cents a day in the pay of the thousands of laborers working on the construction of its Pacific coast extension.

Following the imposition by a Canadian court of a fine of $25,000 for negligence causing an explosion in a freight car, the Michigan Central has canceled all rates on explosives destined to or from Canadian territory.

The Chicago & Alton, which some years ago turned all news agents off its trains, has now made a rule allowing rear brakemen to sell newspapers. They must ask not more than 1 cent above the regular price for a paper.

The Trunk Line Association has issued a new freight tariff on westbound merchandise imported from Europe, which goes into effect December 2. Many articles have been increased from 2 cents to 10 cents per 100 lbs. (New York to Chicago).

The Indiana State Railroad Commission has issued an order under which railroads will have to treat the crossings of interurban electric lines on the same basis as other crossings, at crossings not properly signaled and protected trains must come to a stop.

The second section of double steel tubes for the Detroit river tunnel was sunk on November 25, in a trench 40 ft. deep in the bed of the river, near the American shore. The sections are 262 ft. long. It is understood that no more sections will be sunk until spring.

The employees of the Nashville, Chattanooga & St. Louis have erected a monument to the late Major John W. Thomas, former President of the road, who died on February 12, 1906. The monument, a statue of Major Thomas, stands in Centennial park, Nashville, and it was dedicated on Sunday last.

A press despatch from Winnipeg says that the Canadian Pacific on November 25 put in effect a new freight tariff, making important increases in rates. The government had ordered the suspension of the tariff because of complaints which had been made against it, but on the 24th the suspending order was rescinded.

The Seaboard Air Line has issued an order forbidding the sale of liquor in its dining cars while in the state of North Carolina, except to passengers. Since the prohibitory laws of that state have become so strict there has been, it is said, a large demand for drinks from "crowds" at the stations where the through trains stop.

The Willamette valley, Ore., has marketed a prune crop valued at $1,500,000 this year. The packers shipped 7,000 tons, beginning about September 15, and 5,000 tons more were to go to market this month. The bulk of this crop went to the Atlantic seaboard, but heavy shipments were also sent to the Middle West, Canada, Europe and several carloads to London.

The Interstate Commerce Commission rules that where a passenger on a railroad is sick sufficiently to make travel dangerous to his health, a stop-over (including extension of time on limited ticket) may be granted; and not only to the sick person, but to one or more members of his family, if traveling with him. The same privilege may be granted to persons who are detained by an established quarantine.

Beginning December 1, the Detroit, Toledo & Ironton will run its through trains both freight and passenger, via Toledo, Ohio, instead of via Adrian, Mich., Tecumseh and Wauseon, Ohio. The three towns last named will be served by a branch from Napoleon, Ohio. The new route will be from Detroit, Mich., to Dundee, then over the Ann Arbor tracks to Toledo, and Wabash tracks to the D., T. & I. tracks again at Napoleon.

The new railroad commission of the state of Oklahoma has begun business with steam at full pressure. A number of complaints have already been received, and an order has been issued to the Fort Smith & Western to reduce passenger fares to 2 cents a mile. This road did not make the reduction on the establishment of the new state, as did most or all of the other lines. The names of the members of the new commission are given in the Elections column.

Governor Comer of Alabama has signed all the railroad regulation rate bills, and they become effective December 1. The Louisville & Nashville had declared that nothing would keep it from testing the laws in the Federal courts, but the reporters now think that the legislature in passing the penalty bills has caused the railroad to reconsider. The bills now signed include all the maximum rate bills, known as Group 8, and all the penalty measures. Some other bills signed prescribe procedure for taking appeals from the orders of the Railroad Commissioners; provide for litigation in the state courts on causes of action arising in other states; forbid common carriers charging more than the rates fixed by law, and give the Railroad Commission new authority and power.

In the Federal court at Salt Lake City November 20, indictments were returned against the Union Pacific, the Oregon Short Line, the Union Pacific Coal Co. and officers of the several companies, charged with violation of the anti-trust law by combining to force out of business D. J. Sharp, a coal dealer of Salt Lake City. The complaint alleges that Sharp was "punished" because he reduced the price of coal. The indictments are said to have been made in place of some which were returned several months ago but which were found defective.

Press despatches from Chicago say that the Erie Railroad, on the first day of its $10 passenger rate from Chicago to New York, took 2,400 passengers out of that city, all carried on four trains. The rate is made only in connection with steamship tickets to Europe, and these hundreds of passengers consisted almost wholly of foreigners who are going to Europe to spend the winter at their old homes. The same despatch says that the Grand Trunk and the Wabash will make a $10 rate to meet that of the Erie.

The number of emigrants going from New York to Europe is now far greater than in any former autumn, most of the steamships having all their low-class accommodations engaged weeks before sailing.

The Appellate Division of the Supreme Court of New York, third department, by a vote of three to two has sustained the constitutionality of the law of 1905, empowering a state commission to fix the rates at which gas shall be sold. The decision is looked upon as sustaining the Public Service Commission law of 1907 as regards the fixing of rates by a body to which authority has been delegated by the legislature. The decision is by Judge Smith, concurred in by Judges Chester and Cochrane. Judges Kellogg and Sewall dissent. The law in question authorizes the gas commission, after hearing and investigation, to fix the price of gas "within the limits prescribed by law." The court holds that, having thus fixed limits, the legislature has delegated only an administrative power. The only "limit" named in the press despatches reporting this decision is that of reasonableness—on the one hand, to the public, and on the other hand, to the producer; but this, according to the court, is sufficient. These limits are fixed, not by statute, but by the common law; but this makes no difference.

Coal Companies Sell Cars.

The Fairmont Coal Company has sold 2,223 and the Somerset Coal Company 1,000 coal cars. The Baltimore & Ohio has bought 1,700 of the Fairmont cars, and the Cumberland & Pennsylvania takes the rest and all the cars sold by the Somerset Company. These coal companies are now on the same footing as other coal shippers in the Fairmont and Somerset regions.

Railroad Disaster at Barcelona, Spain.

A press despatch of November 25 reports the derailment of a train on a bridge at Barcelona, Spain, on that day, in which 12 persons were killed and 22 injured, the train falling into the river.

Brown's (?) Discipline.

Several notices of dismissal have been posted at Sayre by the superintendent of the Pennsylvania division of the Lehigh Valley, as follows:

A brakeman failed to properly secure cars on a grade and an accident resulted.

An engineman permitted water to get low in a boiler with the result that considerable damage was done to the engine.

A yard brakeman was intoxicated when he reported for duty.

A brakeman failed to carry out instructions received from conductor, and a derailment resulted.

A conductor failed to carry out instructions received from a yardmaster, resulting in damage to cars.

A yard conductor was intoxicated while on duty and refused to work.—*Exchange.*

Law for Little Malefactors.

Passenger Traffic Manager C. S. Fee, of the Southern Pacific, has issued a circular of instructions giving interpretations of the revised Interstate Commerce law. This circular deals with extensions of tickets, stop-overs, charges for excess baggage, charges for

children, redemption of tickets and many other subjects. Any parent or guardian who endeavors to take a child of 12 or over across a state line on a half-fare ticket is subject to both fine and imprisonment. The man who induces a station agent to check a few pounds in excess of the 150 lbs. allowed free of charge across a state line is apt to get himself and the baggageman in jail. The man who beats his way on the cars across a state line breaks enough laws to keep him in prison for the rest of his life. A lineman in the service of a telegraph company, if making an interstate trip to repair some line which carries railroad business, can ride free, but if he rides across a state border on private business, then he violates the law and is liable to be sent to jail.

Need of More Track in Alabama.

The following extracts are from a letter from General Manager H. E. McCormack, of the Pratt Consolidated Coal Co., Birmingham, Ala., to Milton H. Smith, President of the Louisville & Nashville.

The company with which I am connected has shipped to the general markets in the South, for several years, about one and three-quarter millions tons of coal a year. This tonnage is equal to something more than half the tonnage of the entire cotton crop of the country, and the coal is sold and delivered in eight states. Rates that enable us to compete with the mines in Kentucky, east Tennessee, Virginia, as well as the output of Pittsburgh, which comes down the Mississippi river, and that of West Virginia and Virginia which comes down the Atlantic coast out of Norfolk, Va., are so carefully adjusted that for the several years that I have personally seen to the marketing of our product, I have not asked the railroad people for a reduction in the rate of freight to a single point. On the contrary the present rates would admit several million tons of coal to be marketed in excess of that now being produced in Alabama. In other words, if we could produce the coal, and the railroads were in position to handle it, we could enlarge our market very greatly by pushing back the coal from the North and West in the sections where we now meet them.

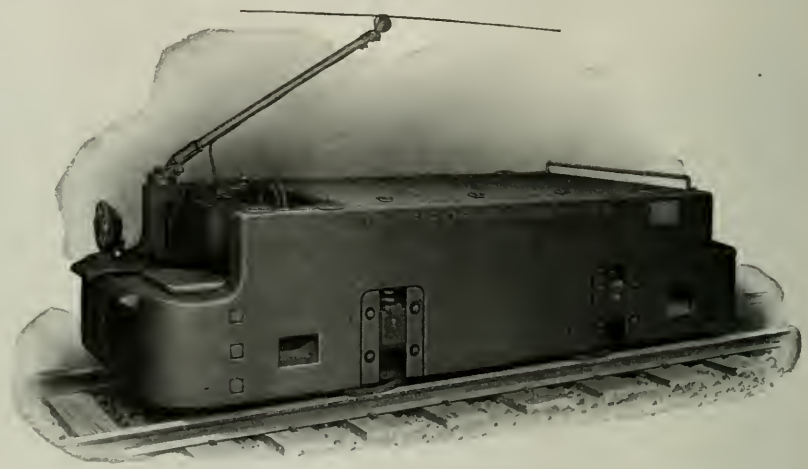
The Louisville & Nashville has always shown a friendly feeling to the Alabama coal field. Had it not been for you the rate to New Orleans would have been put, three years ago, to a point that would have virtually prohibited shipment of Alabama coal to that market, and thus deprived the mines of Alabama of a market for 2,000 tons daily, or 600,000 tons a year. I have been told that you informed the man who suggested it to you, that this advance in the rate of freight would shut down, or seriously injure, the mines along the line of the Louisville & Nashville in Alabama, and that you would, under no conditions, agree to the advance suggested.

I am unable to recall a single instance where a serious complaint has been made by our customers as to the rate of freight. I have come to the conclusion that practically all of the shortcomings of the Southern transportation lines are to be charged to two causes. Lack of funds is the principal one, lack of time is the other. At the beginning of the period of prosperity some of the Southern roads did not have the additional capital required to add to their equipment as fast as their necessities demanded it. My observation is that the railroad is just getting in shape to need money when it is graded, rails laid and operation commenced.

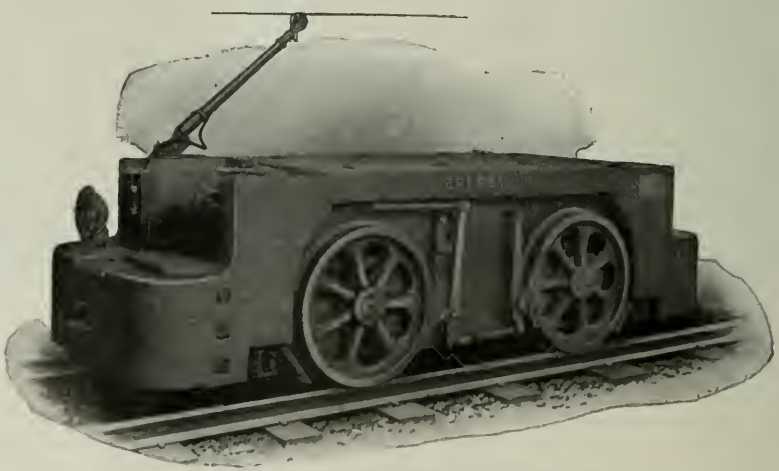
I have read that the Pennsylvania and the New York Central have spent for many years more money yearly in double-tracking, reductions of grades and curvatures than it cost to build their main lines originally. All the main lines in the Birmingham district move such a large tonnage that they will have to provide double tracks on which to move it. These cannot be built in a half century if it has to be paid out of earnings, and railroads cannot, of course, sell securities to the investing public unless they are able to show ability to earn interest on their bonded indebtedness, and a reasonable dividend above fixed charges. All of the main lines of the principal roads of Alabama were built hurriedly and by men whose capital was limited, and for that reason the double-tracking of our roads is a very much greater undertaking than is thought by most people. But if double-tracking is not done speedily, Birmingham and the mineral districts of Alabama will be brought to a standstill in so far as increased production is concerned.

Recent Types of Mine Locomotives.

The accompanying illustrations show recent types of electric mine locomotives built by The Jeffrey Manufacturing Co., Columbus, Ohio. The designs embody the latest ideas in mine locomotives and street railway construction. Every part has been made amply strong and is simplified as far as possible without losing any of the desirable features. The design is made to secure the smallest overall dimensions and at the same time allow access to all of the parts. The motors include the latest ideas in street railway practice, such as drum armatures with form-wound coils, laminated pole pieces, ribbon-wound field coils impregnated with solid compound, oil lubrication with auxiliary grease boxes and liberal wearing surfaces. The magnet frames are arranged so that the complete motor may be removed from the locomotive by taking off the axle caps, or the frame can be taken apart and the armature removed with very little trouble. The inside-wheel type is to be preferred where the mine entrance is wide enough to accommodate the increased width, as the wider locomotive allows more space for the electrical equipment and consequently easier access to the motors, rheostat, controller and other parts.



Inside-Wheel Type of Jeffrey Mine Locomotive.



Outside-Wheel Type of Jeffrey Mine Locomotive.

An Electric Switch Lock.

An electric device for locking and controlling outlying switches is shown in Figs. 1 and 2. This lock is connected to the switch point

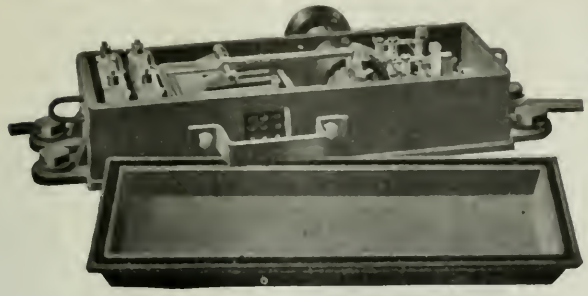


Fig. 1.

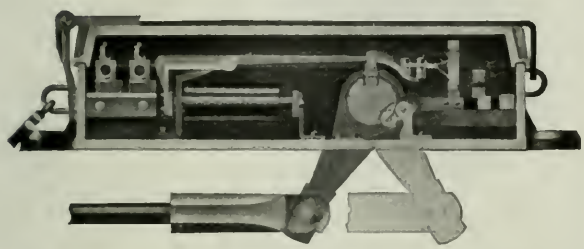


Fig. 2.

to make it impossible to throw the switch except with the co-operation of the nearest telegraph operator or towerman. The lock may be controlled at any reasonable distance from the switch. It is not necessary that the switch be in sight of the operator, as the lock is arranged with contact points so controlled as to indicate to the operator the exact position of the switch and the condition of the lock.

Fig. 1 shows the lock with the cover removed, and Fig. 2 is a sectional view. The locks are equipped with lightning arresters and two sets of contacts, one set being controlled by the movement of the switch point and the other by the lock mechanism. Visible or audible indications are given to the operator by these contacts and other circuits for electric signals may be opened or closed if need be. The contacts are either graphite or platinum. The use of these locks will save valuable time in train movements. A train may pull into a long siding and go to the far end, perhaps two or three miles distant, and there await permission from the tower operator to proceed to the main line. Trainmen cannot throw the switch and get on the main line without the towerman's co-operation.

A siding bell is placed at outlying switches for communication between same and interlocking towers or telegraph offices. Fig. 3 shows the signal bell box in combination with an indicator. The bell box contains the signal bell and keys for communicating between operator and trainmen. The indicator gives the trainmen the necessary stop or proceed signal. This is the device used in towers to give the switch lock operator indications of the switch movements. The siding bell is furthed either with or without the indicator.

These devices are made by the Railroad Supply Co., Chicago. Diagrams and circuits for electric lock applications will be furnished on request.

Fig. 3.

Muirhead's Station Indicator.

The Grand Central Station, New York City, has lately been equipped with new indicators, used to show the time and destination of departing trains, and one of the new pattern is shown in the illustration given herewith. Outwardly these indicators differ from the style formerly used chiefly in the use of white letters on a black ground instead of black letters on a white ground, but the mechanism by which the slats are turned has been simplified also. The slats bearing the station names are four-sided and three of the four sides are available for lettering, so that any one indicator will carry enough names to accommodate almost any train on any one of the three roads leading out of this station—the New York Central, main line, the Harlem division of the same road, and the New York, New Haven & Hartford. Thus any train may be started from any track. Each slat is moved by a vertical rod reaching down to the bottom of the case and it is turned so as to show the proper name for a given train by pushing the rod upward. A portion of the rod is notched so that a rack-and-pinion movement is accomplished, with the minimum of friction. The selection of the proper rods to be pushed is made by means of a card, perforated with holes opposite those rods which are not to be lifted.

Muirhead's Station Indicator.

The necessary supply of cards for use in connection with the trains usually departing from a given track are kept in the bottom of the case for that track, and the closing of the bottom door, after the card has been adjusted, lifts all the desired rods at a single stroke. On some of the indicators as many as 70 stations may be shown at one time. The cylinder bearing the name of the road and the figures showing the time are put in position by the same movement which turns the slats, and at the end of the stroke the slats are locked and kept in perpendicular position. The opening of the door releases every part and shows blanks throughout. The names and descriptions of the different trains are on a cloth curtain operated with a small crank from the side of the indicator near the bottom. The indicators are from 3 ft. to 3½ ft. wide; from 8½ ft. to 9½ ft. high and 7 in. thick. They are made by W. R. Muirhead, Bridgeport, Conn.

Boston & Albany Improvements.

Four-tracking is now under way on the Boston & Albany from Lake Crossing, Mass., to South Framingham, five miles, and it is expected that it will be finished by the middle of next month. The

road will then have four tracks from Boston to South Framingham, 21 miles; traffic is particularly heavy on this section of the main line because of the connections at South Framingham with the Milford branch of the B. & A. and with the New York, New Haven & Hartford. Five miles of third track from the South Spencer yard to the Charlton yard are in use, but there is more work to be done on it. Repairs are under way in the Worcester yard. Enlarged repair shops are being built at West Springfield, and part of the shops are to be in use within a few days. When finished they will have capacity for 38 to 40 engines a week; the old shops handle only 12 to 14 locomotives a week. These improvements consist of extensions to the old shops, new buildings and a new coal trestle. Long passing sidings are being built near Huntington, Chester and Middlefield. A siding has been put in at South Framingham, and another will be built west of East Brookfield. Several miles of third track near North Adams Junction and also east of the New York-Massachusetts state line are being laid. An eight-stall engine house is being built at Pittsfield, to be finished by the end of next month. Work is also under way for the 40-stall Beacon Park engine house at Boston. Plans are being made for new signals, to cost about $900,000. Three-quarters of the road will have new signals, and the installation, which is to be started next spring, is to be finished in two or three years. Other improvements include: a coaling plant and water station at East Brookfield, a water station at Rochdale, remodeling of the water supply system at Chester and new stations at Brookview and Payn's Mills.

Mileage Books in New York.

At Albany, N. Y., November 25, the State Public Service Commission held a hearing on its proposal to regulate and extend the sale of its interchangeable mileage tickets. Most of the railroads of the state were represented, and some of them protested strongly against the use of mileage tickets. Mr. Fort, of the New York Central, said that the use of interchangeable books would necessitate a large increase in the clerical forces of the railroads. Mr. Wallace, of the Erie, said that to make mileage tickets interchangeable would unjustly reduce the revenue of his road, and there would be a general traffic in the books by storekeepers. Chairman Stevens of the commission said that the Erie had encouraged the sale of books to ticket scalpers, knowing that coupons would be sold to users at less than the regular rate.

Mr. Carr, of the Delaware & Hudson, said that as the mileage book was a discrimination, the universal enforcement of its use by law would compel the roads to sell all tickets at the mileage book rate, 2 cents a mile. Mr. Carr doubted the legality of the present practice of selling mileage books at less than the regular one-way fare. Mr. Lee, of the Lehigh Valley, declared that the railroads had gone far enough in the use of mileage books; he would like to see them wholly abolished.

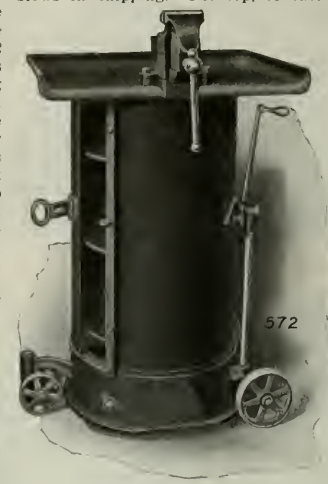
Vice-President Kerr, of the New York, Ontario & Western, told how his road had adopted a general 2-cent rate in 1898 in order to be able to abolish mileage books, because their use was a source of a great loss of revenue to the road. He considered mileage books the most vicious system of handling passenger transportation which has been introduced in railroad laws. Vice-President Caldwell, of the Lackawanna, agreed with Mr. Kerr that the mileage book was an abomination. Mr. Wood, of the Pennsylvania, said that the mileage book now in use on his road reduced the revenues $1,500,000 a year, as compared with the fares formerly paid by the users of the mileage books. The Commercial Travelers' Association was represented by Daniel Gray and George W. Driscoll. They did not ask for discrimination, but wanted a low mileage ticket rate for all. Mr. Driscoll said that he should come later and ask for a general 2-cent rate for everybody.

Profitable Electric Railway in Korea.

The American-Korean Electric Company operates at Seoul the only street railway in Korea. The average number of passengers carried daily in 1904 was 11,442; in 1905, 12,963; and in 1906, 13,714. The car mileage was 145,110 miles in 1904 (five months), 326,793 in 1905, and 398,616 in 1906. The equipment included 37 passenger and 18 freight cars. The company operates 12 miles of tracks with overhead electrical equipment. The gross receipts in 1906 were $98,221 and the net earnings $25,321, the increase in net earnings in 1906 over 1905 being 48 per cent. The company announces that the operating expenses have been reduced from 80 per cent. of the receipts in 1905 to 74 per cent. in 1906, but with the decrease in the cost of coal and with an increased service without addition to the expense of management it is hoped that a further material reduction will occur in 1907. With the exception of an injury to a boy, who fell under the car while stealing a ride, no accidents occurred during 1906, and the efficiency of the Korean motormen and conductors is becoming more and more apparent. A reward, in the nature of a bonus, is paid by the company at the end of each month in which no accidents occur.—*Consular Report.*

A Portable Vise Stand.

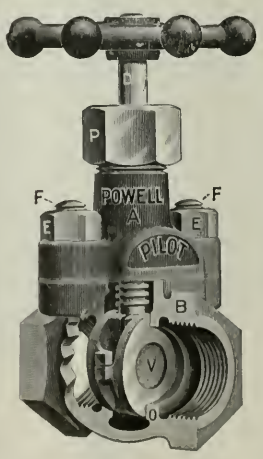
The accompanying illustration shows a portable vise stand made by the New Britain Machine Co., New Britain, Conn. The circular column of rolled boiler plate, firmly held between the base and the top, makes a rigid support for the vise, and withstands hammer blows in chipping. The top, of cast-iron, is so shaped that tools or work may be laid upon it, and in moving from place to place they will not jar off. The interior of the column is provided with three beaded edge shelves, two of which are adjustable, for holding or storing tools, and the sliding door with hasp closes the column. This door sets into jambs, travels in slides top and bottom, and can be padlocked. The position of the door is such that it is easy to open it without moving from working position; also, the column is not weakened under the vise. The base, of cast-iron, gives ample spread for floor support, and on the vise side is far enough back from the working line so that in standing at the vise nothing is in the way of the workman's feet. To move the bench from one palce to another, is is necessary only to raise the self-locking handle to the position shown in the cut which lifts the stand from the floor and throws the weight on the three wheels, two of which are dead and one swiveled. The stand can then be easily pushed over rough or smooth floors, the swiveled wheel trailing. The stand is built in two sizes, one in which the top tray is 20 in. x 26 in., carrying a 3½-in. vise, and another in which the top tray is 24 in. x 32 in., carrying a 5-in. vise. In each case, the vise is the right height for filing 41 in. They are usually equipped with a standard make of vise, but special vises can be provided or the stands can be furnished without vise, where it is to be used as an inspector's cabinet.



A Portable Vise Stand.

The "Pilot" Gate Valve.

The William Powell Co., Cincinnati, Ohio, has added the "Pilot" iron-body gate valve to its steam specialties. This valve is strongly and compactly built. The iron body, as shown in the illustration, has heavy lugs on each side of the neck, carrying stud bolts, F, and the bonnet cap, A, has corresponding lugs drilled to template to insure a perfect joint and constant alinement; this also allows the bonnet to be replaced without unusual care after taking apart for inspection or repairs. Two semi-finished hexagonal nuts, E, large enough to allow wrenching down hard, with a joint of good packing material between the faces of bonnet and body, make a tight joint for all pressures up to 100 lbs. The large brass packing nut, P, affords plenty of room for packing around the stem. The brass stem and bonnet are chased and cut to a true "Acme" thread of unusual length. This length of thread keeps the stem in a true axial position at all times whether open or closed. The hand wheel gives a firm grip, even with oily hands.



The "Pilot" Gate Valve.

The discs are double with ball and socket back, making them adjustable. They are hung in recesses to the collar on the bottom of the stem. The discs, working in a tapering seat, expand or collapse in opening or closing, so that the valve can be closed down tight without straining, or opened easily under all conditions. This valve is also made of all iron, that is, discs, stem and packing nut are iron, no brass being used at all. This iron valve is intended for use with ammonia, cyanide solutions, acids and other liquids or gases that attack brass.

The Battery Tunnel.

The second railroad tunnel under the East river New York City, between Manhattan and Brooklyn is now completed sufficiently to permit the running of cars, and a train carrying a party of guests was run on November 27 from Wall Street station in Manhattan to the Borough Hall in Brooklyn This tunnel forms an eastward extension from the south end of the present subway in Manhattan.

MANUFACTURING AND BUSINESS.

The Rail Joint Company, New York, has equipped the Panama Railroad with base supporting rail-joints.

The Railway Board, Calcutta, India, is asking bids until January 6, 1908, for 60,000 wooden ties for the Oudh and Rohilkhand Railway, delivery to begin April 15 and to be finished by June 30, 1908.

The Central Inspection Bureau, New York, have a contract with the American Railways Co. for the inspection of a number of single-truck cars to be built at the Kuhlman plant, Cleveland, Ohio, of the J. G. Brill Co., Philadelphia, Pa

The American Creosoting Co. has just begun operating its new plant lately built at Springfield, Mo., at a cost of $200,000. About 75 men are employed. The company will treat ties for the St. Louis & San Francisco. More than 500,000 ties are already on the ground.

W. A. Cornelius, Superintendent of the Monongahela furnaces of the National Tube Co., at McKeesport, Pa., has been appointed General Manager of the National Tube Co., succeeding George G. Crawford, who was recently made President of the Tennessee Coal, Iron & Railroad Co.

The Ball & Wood Co., Elizabethport, N. J., makers of engines, has added to its business a line of air compressors. Features of the design are: Large bearings and wearing surfaces, rigid frames, effective lubrication, ample valve areas and intercooling capacities, and high efficiency due to compactness of the engine.

The Expanded Metal & Corrugated Bar Co., St. Louis, Mo., has been awarded the gold medal by the jury of awards of the Jamestown Exposition for the Johnson corrugated steel bar. This is the fourth gold medal awarded to the corrugated bar, the last previous one having been given at the International Exhibition of New Zealand.

James H. Baker has resigned as President and General Manager of the Solid Steel Tool & Forge Co., Brackenridge, Pa., to establish an independent office in Pittsburgh. Mr. Baker has had a wide experience in the manufacture of drop forgings and will devote himself in future to the development of forging machinery and forgings, including car wheels.

The contract for the concrete pile foundations of the new conduit in the North Shore yard of the Long Island at Long Island City, N. Y., has been awarded to the Raymond Concrete Pile Co., of Chicago and New York. The conduit, which will be of concrete, will be 1,100 ft. long and will carry electric feed wires. The Abbott-Gamble Company, New York, has the contract for the conduit.

The National Foundry Co., Erie, Pa., recently made 275 molds from an 18-ton heat. Although some of these castings weighed only about two pounds, the average was about 60 lbs., there being 583 pieces in the heat. It took 1 hr. 35 min. to pour this heat, and most of the castings in it were about $\frac{1}{2}$ in. thick. It is the usual practice of the company to pour 200 molds or more from each heat. It was a 25-ton acid open-hearth furnace.

The American Blower Co., Detroit, Mich., has received the following orders: Heating apparatus for the Oswego and Rensselaer roundhouses and Depew boiler shop, New York Central & Hudson River, and for the Washington, Baltimore & Annapolis Electric at Odenton, Md.; large pressure blowers for the Grand Trunk at Stratford, Ont., and for the Duluth & Iron Range at Two Harbors, Minn.; a special blower for the Dominion Car & Foundry Co. at Montreal, Que., and a three-compartment lumber dry kiln for the General Electric Co. at Schenectady, N. Y.

The Technical Publicity Association held its November meeting on the evening of the 21st in New York and listened to an address on "The Evolution of Fine Printing and its Influence on Advertising Literature," by Paul Pfizenmayer. Among the companies represented by those present were: A. Allen & Son, New York; Yale & Towne Manufacturing Co., New York; Ridgerwood Manufacturing Co., New York; Sprague Electric Company, New York; General Electric Company, Schenectady, N. Y.; R. R. Almond Manufacturing Co., Brooklyn, N. Y.; Crocker-Wheeler Co., Ampere, N. J.; American Locomotive Co., New York; Goldschmidt Thermit Company, New York; A. S. Cameron Steam Pump Works, New York; Crane Co., Chicago, Ill.; International Silver Co., Meriden, Conn.; Traylor Iron & Steel Co., High Bridge, N. J.; Standard Roller Bearing Co., Philadelphia, Pa., and J. G. Brill Co., Philadelphia, Pa.

Iron and Steel.

The 6,500 tons of rails ordered from the Russo-Belge rail mill at Odessa for the Canadian Yazoo River & Pacific, the Mexican line of the Southern Pacific are now afloat, to be landed at Tampico, Mexico. The route is through the Black sea the Dardanelles, the Mediterranean and across the Atlantic and the Gulf of Mexico to Tampico some 6,700 miles

OBITUARY NOTICES.

Storm Bull, Mem. Am. Soc. Mech. Engrs., Professor of Steam Engineering at the University of Wisconsin died on November 19 at his home in Madison, Wis

Corwin V. Howell General Claim Agent and Attorney at Chicago for the Pennsylvania Lines West of Pittsburgh, died on November 20 of Bright's disease. He was 59 years old and had been with the Pennsylvania Lines since 1889. Before coming to the Pennsylvania, he was with the Canadian Pacific as claim agent of the Western division. He was buried at Chicago.

Michael Gilleas, formerly Third Vice-President of the Yazoo & Mississippi Valley, died last Monday at Los Angeles, Cal. Mr. Gilleas was 63 years old and all his railroad work was done on Illinois Central lines. He was born in Ireland and when he was 15 years old began work as a porter in the Superintendent's office at Amboy, Ill. He spent two years in a freight office and then, until 1877, was in the office of different Division Engineers. He was then appointed roadmaster of the Iowa division and in 1883 was made Superintendent of that division. Four years later he was appointed Superintendent of all lines in Iowa and in 1891 was made Superintendent of all lines west of Chicago. The next year he was appointed General Superintendent of the Yazoo & Mississippi Valley. In 1893 he was made Assistant General Superintendent of the Y. & M. and the southern lines of the Illinois Central, giving him authority over all lines south of the Ohio river. In 1902 he was elected Third Vice-President and General Superintendent of the Y. & M. V., and from November, 1905, until his retirement at the end of 1906, was Third Vice-President of the company.

Edward A. Handy, General Manager of the Lake Shore & Michigan Southern, died at Chicago on November 21 of pneumonia, after only three days' illness. Mr. Handy was born in Massachusetts in 1855 and educated at the Massachusetts Institute of Technology. His railroad work began in 1878, when he started as an assistant engineer of construction on the Atchison, Topeka & Santa Fe. After a year he was made Assistant Engineer of Bridges and Buildings and in 1880 went to the Mexican National, now the National of Mexico, as locating engineer. He was made Principal Assistant Engineer of the Northern division of that road in 1881 and two years later was appointed Chief Engineer. In 1888 he went to the Lake Shore as Engineer of the Lake Shore division. He was made Chief Engineer of the road in 1891. He held this office for 14 years and then, in 1905, was made Assistant General Manager, remaining in particular charge of engineering work. He was made General Manager when W. H. Marshall left the road last year to become President of the American Locomotive Company.

E. A. Handy.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Atlantic Coast Line.—W. W. Mackall, Savannah, Ga., has been elected a Director, succeeding Col. J. H. Estill, Richmond, Va., deceased.

Chicago & Alton.—S. M. Felton, President, has resigned. T. P. Shonts, Chairman of the Executive Committee of the C. & A. and President of the Toledo, St. Louis & Western, is to succeed Mr. Felton; a meeting of the Board of Directors is to be held in a few days. See Mexican Central.

Lehigh Valley.—J. W. Robbins, transfer clerk in the Secretary's office, has been appointed Assistant Secretary.

Mexican Central.—S. M. Felton, President of the Chicago & Alton, has been elected President of the Mexican Central, succeeding A. A. Robinson, who resigned a year ago. Eben Richards, who has been acting in Mr. Robinson's place, resumes his former office of Vice-President and General Counsel.

Missouri Pacific.—J. M. Johnson, Assistant to Vice-President C. S. Clarke, has been elected Vice-President in charge of traffic of this road and of the St. Louis, Iron Mountain & Southern. E. M. Boyd succeeds Mr. Johnson.

Pennsylvania Lines West.—C. G. Johnston has been appointed General Claim Agent and Attorney at Chicago, succeeding C. V. Howell, deceased. Mr. Johnston was assistant to Mr. Howell.

St. Louis, Iron Mountain & Southern.—See Missouri Pacific.

Operating Officers.

Boston & Albany.—J. H. Relyea, night chief train despatcher of the Albany division, has been appointed Trainmaster of that division, with office at Springfield, Mass., succeeding J. L. Truden, promoted. W. D. Anderson has been appointed Trainmaster, reporting to the Superintendents of the Boston division and of the Albany division. W. H. Brown has been appointed Trainmaster of the Boston division.

Canadian Pacific.—A. Price, General Superintendent at Winnipeg, Man., has been appointed General Superintendent at Calgary, Alb., succeeding R. R. Jamieson, who takes Mr. Price's place at Winnipeg.

Cincinnati, New Orleans & Texas Pacific.—W. E. Wheelock, Trainmaster at Somerset, Ky., has been appointed Superintendent of Terminals at Chattanooga, Tenn.

Mexican International.—W. F. Sheridan, Superintendent of Transportation, has resigned and the office has been abolished.

Mobile & Ohio.—H. W. Clarke, Superintendent of Transportation, has resigned, effective December 31.

St. Louis, Brownsville & Mexico.—E. L. Burke has been appointed Superintendent of the Second and Third divisions, with office at Kingsville, Tex., succeeding Oliver Rowe, effective December 1.

Southern.—E. H. Coapman, General Superintendent at Danville, Va., has been appointed Manager of the Northern and Eastern districts, with office at Washington, D. C., succeeding J. W. Seale, deceased. A. H. Westfall, Superintendent at Atlanta, Ga., succeeds Mr. Coapman. E. E. Norris, Superintendent at Knoxville, Tenn., succeeds Mr. Westfall. W. M. Deuel, Superintendent of Terminals at Atlanta, Ga., succeeds Mr. Norris.

Traffic Officers.

Chicago, Rock Island & Pacific.—See Missouri Pacific.

Missouri Pacific.—B. M. Flippin, Assistant Freight Traffic Manager, has been appointed Freight Traffic Manager of this road and of the St. Louis, Iron Mountain & Southern, succeeding W. C. Smith, resigned. The office of W. B. Knight, Assistant Freight Traffic Manager, has been moved from Kansas City, Mo., to St. Louis. He will be hereafter in charge of rates, divisions and publication of tariffs. K. M. Wharry, Assistant General Freight Agent of the Chicago, Rock Island & Pacific at Kansas City, has been appointed General Freight Agent of the Missouri Pacific, in charge of freight traffic in Kansas, Nebraska and Colorado, including Kansas City and St. Joseph, Mo. His office is in Kansas City. J. P. Burnett, Assistant General Freight Agent at St. Louis, has been appointed General Freight Agent in charge of the St. L., I. M. & S., with office at St. Louis. R. H. Eggsbrocht succeeds Mr. Burnett. J. N. Gibbens, General Agent at Chicago, Ill., has been appointed General Freight Agent of the Missouri Pacific in charge of solicitation at St Louis. See this company under executive, financial and legal officers. The office of D. R. Lincoln, Assistant General Freight Agent, has been moved from St. Louis to Kansas City.

Oklahoma Railroad Commission.—The Commissioners are as follows: John Love, Chairman, of Woodward; J. J. McAllester, of McAllester, and A. P. Watson, of Shawnee. W. L. Chapman, of Pawnee, Secretary of the Democratic State Committee and Editor of the *Shawnee Daily Herald*, is Secretary of the Commission. Mr. Love serves for six years, Mr. McAllester for four years and Mr. Watson for two years.

St. Louis, Iron Mountain & Southern.—See Missouri Pacific.

Wabash.—H. H. Taylor, traveling freight agent, with headquarters at Toledo, Ohio, has been appointed General Agent at Danville, Ill.

Engineering and Rolling Stock Officers.

Lake Erie, Alliance & Wheeling.—See Lake Shore & Michigan Southern.

Lake Erie & Western.—See Lake Shore & Michigan Southern.

Lake Shore & Michigan Southern.—J. W. Senger has been appointed Supervisor of Material, with office at Collinwood, Ohio, of this company and of the Lake Erie & Western and the Lake Erie, Alliance & Wheeling.

Purchasing Agents.

Chicago, Rock Island & Pacific.—J. M. McCarthy has been appointed Purchasing Agent. The office of General Purchasing Agent, formerly held by F. P. Jeffries, who has resigned, has been abolished.

CAR BUILDING.

The Baltimore & Ohio is in the market for one postal car.

The Baltimore & Ohio is said to be in the market for cars.

The Atlanta & West Point is in the market for one passenger car.

The Agar Packing Company, Des Moines, Iowa, is figuring on about 25 refrigerator cars.

The Pere Marquette denies having asked bids on 1,000 box cars, as reported in the *Railroad Gazette* of November 22.

Virginian Railway denies that it is in the market for eight special cars as reported in the *Railroad Gazette* of Nov. 22.

The Boston & Maine is said to have ordered 25 passenger cars from either the Pullman Company or the Laconia Car Company.

The Detroit, Toledo & Ironton denies having asked bids for box and flat cars as reported in our advance sheet of November 16.

The Chicago, Indianapolis & Louisville denies that it has asked bids on several hundred box and gondola cars, as reported in our advance sheet of November 16.

The Tonopah & Goldfield denies having ordered four chair cars, one smoking car and one baggage car from the Pullman Company, as reported in the *Railroad Gazette* of November 8.

The Duluth, Missabe & Northern, as reported in the *Railroad Gazette* of November 8, is about to order 19 passenger cars. Contracts for specialties for these cars are now being closed.

The Duluth, South Shore & Atlantic is in the market for three second class passenger coaches, 67 ft. 6 in. long; one first class passenger coach, 52 ft. 5 in. long, and one baggage car 52 ft. 5 in. long.

The Philippine Railways, as reported in the *Railroad Gazette* of November 8, have bought, through J. G. White & Co., four combination parlor and first class passenger cars. The special equipment, in addition to that formerly reported, includes: Congdon or Diamond S brake-shoes, natural varnish finish inside and out, Walkover chairs in the parlor compartment and triple elliptic springs.

The San Antonio & Aransas Pass, as reported in the *Railroad Gazette* of October 25, is asking prices on 200 ventilated cars and 275 plain box cars of 60,000 lbs. capacity. These cars will measure 36 ft. long, 8 ft. 6 in. wide and 12 ft. 9¼ in. high, over all measurements. The special equipment includes:

Brakes	Westinghouse
Brake-shoes	Christy
Brasses	More-Jones
Couplers	Janney
Door fastenings	Security
Draft rigging	Farlow
Journal boxes	McCord, Symington or Franklin
Paint	Sherwin-Williams
Roofs	Murphy
Springs	Standard Steel Works

The Intercolonial has ordered 130 hopper cars of 30,000 lbs. capacity from Rhodes, Curry & Co., and 70 Hart convertible cars of 80,000 lbs. capacity from Rhodes, Curry & Co., to be built by the Dominion Dump Car Co., at Montreal. The hopper cars will weigh 20,000 lbs. and will measure 15 ft. 10½ in. long and 8 ft. 3 in. wide, inside measurements, and 16 ft. 10 in. long, 8 ft. 8 in. wide and 9 ft. 5 in. high, over all. The Hart convertible cars will weigh 37,000 lbs., and will measure 32 ft. 2 in. long, 8 ft. 8 in. wide and 5 ft. ¼ in. high, inside measurements, and 34 ft. long, 9 ft. 10 in. wide and 9 ft. 3½ in. high, over all. The bodies and underframes of all cars will be of wood. The special equipment for all cars includes:

Bolsters (for Hart convertible cars)	Simplex
Brake-beams	Simplex
Brake-shoes (for hopper cars)	Christy
Brakes	Westinghouse
Draft rigging	Miner Tandem
Dust guards (for hopper cars)	Harrison
Paint	Red oxide
Springs	Coil
Trucks (for Hart convertible cars)	Simplex
Wheels	Cast Iron

RAILROAD STRUCTURES.

Coburg, Ore.—The Southern Pacific, it is said, has resumed work on the new steel bridge over the McKenzie river, near this place, on the Woodburn-Natron branch.

DENVER, COLO.—The Chicago, Burlington & Quincy, the Chicago, Rock Island & Pacific, and the Atchison, Topeka & Santa Fe, according to local report, are jointly planning to build a union passenger station here.

EDMONTON, ALB.—The Canadian Northern, it is said, will put up shops here next spring, to employ 200 men.

EVANSVILLE, IND.—The East Princeton & Vincennes Construction Co. will establish its power plant and headquarters here.

FORT SMITH, ARK.—The Kansas City Southern has recently bought ground for freight terminals within a block of the business center of this city. The present freight station is too far out to enable this company to obtain its share of business. Plans for a brick freight house, 40 ft. x 250 ft. have been recently revised, and bids for the work will soon be asked for.

KANSAS CITY, KAN.—It has been announced that at a recent meeting of the directors of the Kansas City Terminal Railway Co. in Chicago, it was decided to build a union station and passenger tracks to serve same in Kansas City, Kan., in connection with the proposed union station which is to be erected in Kansas City, Mo. Actual work will be held in abeyance until a more favorable time for financing the project.

KANSAS CITY, MO.—The Kansas City Southern is making plans for a new inbound and outbound freight house soon to be built on the old Union Elevator property in the west bottoms. The building will consist of a two-story brick structure for office purposes, and a one-story freight warehouse. The dimensions over all will be 40 ft. x 500 ft.

MINNEAPOLIS, MINN.—The Minneapolis, St. Paul & Sault Ste. Marie has started work on additions to its shops here. The cost of the improvements will be about $200,000.

TAMPICO, MEX.—The Mexican Central has adopted plans for important harbor improvements at this place. The plans will have to be approved by the Federal Government before the work will be begun.

TOLEDO, OHIO.—The Board of Public Service has approved the plans of the Lake Shore & Michigan Southern for its proposed steel bridge over the mouth of Swan creek, from the foot of Monroe street to Goose Point. (Oct. 11, p. 434.)

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

ATLANTA, BIRMINGHAM & ATLANTIC.—Plans are being made by this company to begin running regular trains January 1 on the Atlanta branch from Chalybeate, Ala., north to Atlanta, 77 miles. (Oct. 18, p. 472.)

BALTIMORE & OHIO.—This company, it is said, will lay additional sidings along its Pittsburgh & Western division to the Ohio state line, in addition to the work now under way straightening the line.

CHICAGO, MILWAUKEE & ST. PAUL.—It is reported that this company has opened its Pacific extension from Mobridge, S. Dak., west to Bowman, N. Dak., 200 miles from the Missouri river. (Oct. 25, p. 509.)

CINCINNATI, BLUFFTON & CHICAGO.—This company is pushing work on the remaining 15 miles of the line it is building from Bluffton, Ind., northwest to Huntington. A bonus of $98,000, it is said, is to be given by residents of Huntington if the line is in operation to that place by January 1, 1908. The road is now in operation from Bluffton southeast to Portland, 30 miles, and is eventually to be extended south from Portland to Union City, thence east to Versailles, Ohio, 35 miles. The company has bought land in Huntington on which it will put up shops, to cost about $75,000. (March 15, p. 382.)

COLUMBUS, MAGNETIC SPRINGS & NORTHERN (ELECTRIC).—This company, operating an electric line from Delaware, Ohio, northwest to Richwood, 18 miles, is building an extension north to Larue, 13 miles.

DULUTH & THUNDER BAY.—See Minneapolis, St. Paul & Sault Ste. Marie.

EDMONTON, DUNVEGAN & BRITISH COLUMBIA.—Application will be made by this company for an extension of time to build its proposed line from Edmonton, Alb., to Fort George, B. C. Pringle & Guthrie, solicitors. (Mar. 15, p. 395.)

GRAND TRUNK PACIFIC.—Grading on the main line has been finished from Portage la Prairie, Man., west toward Saskatoon for 412 miles, and track has been laid for about three-fourths of this distance. Work is being pushed to finish the line to Saskatoon. About 60 per cent. of the 318 miles from Saskatoon to Edmonton is also graded.

Surveyors are active now on both sides of the Yellowhead Pass, as the company desires to ask for grading bids early next spring.

ILLINOIS CENTRAL.—This company expects to begin running regular trains on its Birmingham line about the first of January. (Oct. 4, p. 403.)

ILLINOIS ROADS (ELECTRIC).—Rights-of-way are being secured by President Patton, of Charleston, for the proposed Mattoon Hillsboro electric line. Application will be made for franchises through the towns along the proposed route from Mattoon west via Shelbyville, Tower Hill and Pana to Hillsboro, about 60 miles.

KANSAS CITY SOUTHERN.—Work is in progress on a three-mile cut-off on this road just south of Howe, Okla., where this line is crossed by the Rock Island. The new line is to have a maximum grade of five-tenths of 1 per cent., and is a part of the plan for the contemplated reduction of the grade on this road, extensive surveys for which were made during the past year.

KETTLE VALLEY LINES.—Rights-of-way have been secured and work, it is said, will be started about February 1, by this company on its proposed extension from Spokane, Wash., northwest to Republic, 145 miles. (Mar. 15, p. 396.)

LAKE ERIE, ALLIANCE & WHEELING.—See Lake Shore & Michigan Southern.

LAKE SHORE & MICHIGAN SOUTHERN.—It is officially announced that on December 1 the Lake Erie, Alliance & Wheeling will be opened to Dillonvale, Pa., five miles south of Piney Fork, its present southern terminus. The line may eventually be extended south to Wheeling, W. Va., 17 miles.

LIGONIER VALLEY.—Plans are being made for extending this road from the new coal town of Wilpen, Pa., in Ligonier township, northwest to New Florence on the Pennsylvania Railroad about 12 miles. Surveys made. A branch has been built from Ligonier to Wilpen.

MARIETTA-MACLAND.—Application will be made by a company under this name for incorporation in Georgia with a capital of $500,000. The company, it is said, has options on the right-of-way for a railroad from Marietta, Ga., southwest ten miles to Powder Springs. J. N. McEachern and other Atlanta capitalists; also E. P. Dolls, J. P. Cheney, W. J. Manning, J. M. McEbreth and R. R. Petrie are interested.

MEADVILLE & CONNEAUT LAKE TRACTION.—Superintendent Kellenbaugh is quoted as saying that this company will build an electric line from Linesville, Pa., south to Greenville, 21 miles, if the Mahoning & Shenango Railway & Light Company will extend its line from Sharpsville, north to Greenville, 11 miles, to complete a through line from Youngstown, Ohio, to Greenville.

MINNEAPOLIS, ST. PAUL & SAULT STE. MARIE.—This company, it is said, will build under the name of the Duluth & Thunder Bay, a new line from its proposed Duluth line northeast to a connection with the Canadian Pacific at Fort William, Ont., about 200 miles. About half the distance is now covered by logging roads which will be used as parts of the through line. The line to Duluth is to run from Brooten, Minn., northeast via Freeport, Royalton and Superior, Wis., to Duluth, 300 miles.

PENNSYLVANIA.—Plans, it is said, are being made by this company to begin double-track work next year on the Belvidere division from Trenton, N. J., north to Manunka Chunk.

RIO GRANDE, SIERRA MADRE & PACIFIC.—Work on the extension of this road toward the Pacific coast, it is said, has been suspended, on account of the financial stringency. Grading has been finished from Nueva Casas Grandes to a point about 25 miles south of that place and rails are on the ground. A bridge has also been built over the Guerrero river. It is understood that the Government will grant an extension of time in which to finish the line. The projected route is from Nueva Casas Grandes, Chihuahua, southwest via Santa Elena and Ocampo to a point on the Pacific coast either at Guaymas or at Topolobampo, 300 miles. (Oct. 4, p. 403.)

SOUTH & WESTERN.—President Carter, of this company, has announced that this line, which is under construction from Elkhorn, Ky., south to Bostic and south of that place, under the name of the Spartanburg & Northern to Spartanburg, S. C., a total of about 300 miles, is to be extended. Plans are being made to build from Spartanburg southeast to a point on the Atlantic sea coast early next year, 250 miles. (Nov. 8, p. 573.)

SOUTHERN PACIFIC.—This company, it is said, will shortly begin laying double track on its line from Tracy, Cal., north to Sacramento, 68 miles.

SOUTHERN PENNSYLVANIA.—Under this name a company has been organized to consolidate a number of small projected lines which have been granted charters to build. It is proposed to build a line

from Summerville, W. Va., north to the Pittsburgh district, 160 miles, with a branch from Waynesburg, Pa., northeast to Millsboro, 15 miles, and another branch west to Marietta, Ohio, 50 miles. T. F. Barrett, of New York, also Pittsburgh capitalists are said to be interested.

Spartanburg & Northern.—See South & Western.

Texas Roads.—Location surveys are being made for a line from San Antonio south to a point in Live Oak county, 70 miles. Dr. C. F. Simmons, San Antonio, is in the market for relaying rails to be used in building the line.

Tintic Railroad.—Work, it is said, will shortly be started on a 10-mile line to connect certain mines with a smelter which is to be built near Eureka, Cal. Jesse Knight is the principal promoter.

Tombigbee Valley.—This company, operating 52 miles of railroad from Calvert, Ala., where connection is made with the Southern Railway north to Healing Springs, has opened for operation an extension north to Silas, 11 miles. The line is being extended north from Silas to Butler, 24 miles. The railroad runs through a timber section and hauls large quantities of lumber to its water terminal at Nannahubba Bluffs on the Tombigbee river near Calvert. (March 15, p. 393.)

Union Pacific.—This company has suspended work on its Marysville cut-off. This cut off is to run from Onaga, Kans., to Marysville, 32½ miles. About 15 miles was ready for the track, and the grading and bridging were about three-fourths finished on the rest of the line when work was suspended.

Washington, Baltimore & Annapolis (Electric).—An officer writes that this company has finished its double track electric line from Washington, D. C., northeast to Baltimore, Md., 40 miles. (Oct. 18, p. 473.)

Washington-Oregon Traction.—Incorporated in Washington with $1,500,000 capital to build 75 miles of electric lines in the vicinity of Walla Walla. The incorporators include A. H. Reynolds, C. K. Holloway, N. Baumeister, S. Drumheller, J. Smith, E. S. Isaac, W. A. Ritz and J. L. Sharpstein, of Walla Walla.

Westchester & Wilmington (Electric).—Application has been made in Pennsylvania for a charter by this company with a capital of $54,000. The company proposes to build 17 miles of electric line through West Goshen, Westtown and Thornbury townships, Chester county, and Birmingham and Concord townships, Delaware county. T. E. O'Connel, President, Westchester; C. P. Faucett, Treasurer, Westtown; J. A. Kirkpatrick, Birmingham; C. Gleason, Brandywine Summit; N. O'Connell, Westchester; W. Passmore, Brandywine, Del., and F. H. Day, Tallyville, Del., are interested.

Western Pacific.—Freight, it is said, is now being carried over this road from New Hope, Cal., to Stockton, and regular trains will soon be running on the line from Stockton to Sacramento.

Wyoming Short Line.—Incorporated in Wyoming with $2,500,000 capital to build a line from Grey Bull at the junction of the Big Horn and Grey Bull rivers, west via Germania and Wiley to the eastern boundary of Yellowstone Park, 100 miles. Isaac M. Hamilton, President, Chicago; C. A. Guernsey, Vice-President, Cheyenne, and S. L. Wiley, Treasurer and General Manager, Wiley, Wyo.

RAILROAD CORPORATION NEWS

Atchison, Topeka & Santa Fe.—See Union Pacific.

Boston & Albany.—Gross earnings for the three months ended September 30, 1907, were $3,501,159, an increase of $363,226. Operating expenses increased from $1,932,519 to $2,642,831 and the surplus after charges was $95,787, a decrease of $336,949. These figures, which indicate uneconomical handling of increased traffic, show strikingly the road's pressing need of those improvements which, as mentioned on another page, it is now making.

Boston & Northern Street Railway.—See Massachusetts Electric.

Canada Southern.—The $11,000,000 first mortgage 5 per cent. bonds of this company, maturing January 1, 1908, are to be extended for five years with interest at 6 per cent. The Michigan Central, which leases the road, is to pay this interest. The bonds can be deposited for extension with J. P. Morgan & Co., New York, up to December 21, 1907, and the interest coupon payable January 1 will be paid at the time of deposit.

Central of Georgia.—The United States Supreme Court has reversed the decision of the Georgia Supreme Court, which held that the Central of Georgia and the Georgia Railroad & Banking Co. were liable for 10 years' taxes, 1895 to 1904, on their holdings of $1,500,000 each of Western of Alabama stock. The amount of taxes concerned is said to amount to $800,000.

Chicago, Indiana & Southern.—See New York Central & Hudson River.

Cincinnati, New Orleans & Texas Pacific.—This company has, it is said, sold to Cincinnati, Ohio, bankers, $500,000 three-year 6 per cent. notes dated December 2, 1907. The proceeds are to be used for new construction and improvements.

Cleveland, Cincinnati, Chicago & St. Louis.—See New York Central & Hudson River.

Denver & Rio Grande.—E. T. Jeffery, President, is quoted as saying that the 2½ per cent. regular semi-annual dividend on the $45,761,400 preferred stock was earned in the first three months of the present fiscal year. No dividend is paid on the company's common stock. The preferred dividend will be acted on at a directors' meeting on December 5.

Georgia Railroad & Banking.—See Central of Georgia.

Illinois Central.—The injunction restraining the voting of the 5,500 shares of Illinois Central stock held by the Mutual Life Insurance Co. has been dissolved, Stuyvesant Fish having asked that the suit be dismissed on the ground that the Illinois law concerning the control of Illinois railroads by outside corporations did not apply to insurance companies.

Lake Shore & Michigan Southern.—See New York Central & Hudson River.

Massachusetts Electric.—The Massachusetts Railroad Commission has given permission to the Boston & Northern Street Railway to issue $410,000 4 per cent. 50-year bonds, and to the Old Colony Street Railway, $200,000 4 per cent. 50-year bonds. The securities are to fund floating debt incurred for construction and new equipment. Both companies are subsidiaries of the Massachusetts Electric.

Michigan Central.—See New York Central & Hudson River; also Canada Southern.

New York Central & Hudson River.—An equipment trust agreement has been made with the Guarantee Trust Company, New York, securing an issue of $30,000,000 5 per cent. equipment trust notes. The equipment covered has been delivered or is about to be delivered to the New York Central & Hudson River, the Lake Shore & Michigan Southern, the Michigan Central, the Cleveland, Cincinnati, Chicago & St. Louis and the Chicago, Indiana & Southern, and these companies jointly subscribe to the agreement. Of the total issue, $20,387,000 is said to be wanted at once and it is said that this amount has been already underwritten. The notes mature in 15 equal annual instalments beginning November 1, 1908.

New York, New Haven & Hartford.—This company, under date of November 18, has announced the terms of the new issue of 6 per cent. 40-year debentures of which $39,029,600 are to be issued. These were described in this column November 15. They will be either coupon debentures for $1,000, or registered debentures for $100, $1,000, or $10,000. Besides being offered to stockholders at the rate of $100 in debentures for $200 in stock, they are offered to the holders of 3½ per cent. convertible debenture bonds, registered and coupon, at the rate of $100 in new debentures for each $450 of the 3½ per cent. issue. Holders of the new debentures will have the right to subscribe for any future stock issue on the same terms as stockholders; these debentures are to share pro rata in the security of any mortgage which may be created on the main line between Woodlawn, N. Y., and Springfield, Mass., or on the main line between New Haven, Conn., and Providence, R. I. Subscription warrants are to be issued in amounts of $100 and multiples. Fractional warrants are to be issued in terms of ninths. For instance, the holder of four shares of New Haven stock will receive a warrant to subscribe for one new debenture of $100 and a fractional warrant for three-ninths of a right to subscribe for such a debenture. The holder of a 3½ per cent. convertible debenture certificate for $100 will receive a fractional warrant for two-ninths of such a right. Fractional rights must be combined into subscriptions for $100 to be accepted. Holders of 3½ per cent. debentures must have their certificates stamped by the fiscal agent of the company to secure the right to subscribe. (November 15, p. 606, and November 8, p. 574.)

Old Colony Street Railway.—See Massachusetts Electric.

Union Pacific.—It is said that this company some time ago sold about $20,000,000 Atchison, Topeka & Santa Fe common stock, which it owned last winter. Mr. Harriman and associates are understood to still hold $10,000,000 Atchison common, and the Oregon Short Line holds $10,000,000 Atchison preferred stock.

Western of Alabama.—See Central of Georgia.

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS.

THE BRITISH AND EASTERN CONTINENTS edition of the Railroad Gazette is published each Friday at Queen Anne's Chambers, Westminster, London. It contains selected reading pages from the Railroad Gazette, together with additional British and foreign matter, and is issued under the name Railway Gazette.

CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.

ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

OFFICERS.—In accordance with the law of the state of New York, the following announcement is made of the office of publication, at 83 Fulton St., New York, N.Y., and the names of the officers and editors of The Railroad Gazette:

OFFICERS:

W. H. Boardman, *Pres't. and Editor.* — Ray Morris, *Secretary*
E. A. Simmons, *Vice-President.* — R. S. Chisolm, *Treas* / H. H. Rines, *Cashier* / L. B. Sherman, *Western Manager*

EDITORS:

Ray Morris, *Man'g Editor* — George L. Fowler
Braman B. Adams — Frank W. Krueger
Charles H. Fry — Hugh Rankin
Rodney Hitt — Bradford Boardman

CONTENTS

Vol. XLIII., No. 23. — Friday, December 6, 1907.

In another column we print a letter from A. W. Heinle, of Pittsburgh, on the recommended rail sections. Mr. Heinle objects that distortion, on the one hand, and imperfect granular structure, on the other, will not be prevented by the proposed sections, but says that he is ready to state, through the columns of the *Railroad Gazette*, how a large rail can be rolled successfully without distortion or curvature, and so that it will cool evenly and separately within its different parts. We hope that he will do so at his earliest opportunity, and we trust that his letter will bring out interesting information and stimulate discussion, especially with regard to the most desirable number of passes.

The official statement in another column of the Yale-Princeton football traffic on the New Haven Railroad has several striking features to which the earlier tabulations of receipts in other years give emphasis. Unfortunately one cannot in all the returns separate the football traffic from the regular business. But the New York excursion business alone on the day reached 13,418 one-way passengers, and the total for both ways, with some local trains added, rises to 21,711. This, however, does not nearly represent the total volume of football traffic. To it must be added the football business of the regular trains unknown but very large, and, besides that, the considerable increment of traffic on the day before and the day after a big game which does not appear in the returns. More impressive are the returns given in receipts for last year of the Harvard-Yale football traffic which shows more accurately the real dimension of a "big" football game at New Haven in which the New Haven road gets the "long haul" from Boston as well as the short haul from New York. The total of $62,001 of football money carries the single day's revenue in 1906 well towards the average day's passenger receipts on the whole system which may be roughly given as $70,000 from the whole passenger department. In any computation, too, must be reckoned in the second big game this year played at Cambridge. No direct returns are available for it but the single item of 15,000 admission tickets to the Harvard stadium sold through the Yale ticket agency gives a clue to the volume of the business. Most gratifying of all is the way in which this vast amount of condensed passenger travel was handled. Here upon the lines of a system with extreme passenger density was poured within a few hours a volume of additional passenger traffic represented on the last football day at New Haven by forty special trains besides the overload of the regular passenger service. The big trains ran on the shortest headway and the New Haven station is far from vast in dimension. Yet the huge traffic was handled back and forth without mishap or even delay worth the mention. Such a record is in the highest degree creditable even on a road used to great currents of the passenger traffic which was ardently extolled by one of the road's old directors as "the freight that handles itself."

That a large majority of railroad officers are opposed on principle to the use of mileage tickets, admits of little doubt. For reasons of policy most of them keep their opinion to themselves; but at Albany, before the Public Service Commission, last week (*Railroad Gazette*, page 666), two or three of them spoke out with refreshing frankness. It would be good if this Albany example should be followed elsewhere. The mileage ticket is simply a dam to hold back the flood of public opinion when public opinion ignorantly demands that fares shall be made lower than the railroads can afford to make them. Legislatures or "commercial travelers" demand a low rate and the mileage ticket, available only for persons who are ready to pay for a lot of rides some time in advance, is the most convenient means of satisfying this demand without at the same time reducing fares to everybody. The excuse is the "wholesale principle"; but this is a false argument, except as regards the clerical labor of selling the tickets, for the riding is at retail. Users of mileage tickets do not ride in bunches, any more than when they traveled on ordinary tickets. The clerical labor of collecting and auditing the coupons is far greater than that saved by the change, and the work of the conductors is much increased. A dishonest conductor, however, will comply willingly, for, as has been found by experience, the mileage ticket is a very convenient thing with which to juggle, in conspiracy with a dishonest passenger, to cheat the railroad company. From the average state commission one can hardly expect a scientific decision on this subject. For knowledge of the railroad side the commissioners have to depend on the testimony of officers with minds distracted by opposing opinions and in some cases unwilling to tell all they know. On the other side the most numerous class of passengers, those not traveling regularly or all the time, is far less conspicuous in demanding its rights and expressing its desires than the class which wants mileage tickets. The Albany Commission, however,

is far above the average, and we may expect a philosophical study of the situation. By the most rational theory the fare should be fixed at some figure, below the present single trip rate and above the mileage book rate, at which the railroads could afford to carry all passengers alike, except when they travel in parties or excursions large enough to justify a reduction on the true wholesale principle. Probably this figure could not be closely calculated, except arbitrarily. Mr. Wood, of the Pennsylvania, said at Albany that his road was giving the mileage-book riders $1,500,000 a year. Assuming that this represents a reduction of 20 per cent (from 2½ cents a mile to 2 cents) it means that the benefit went to passengers paying the company (after the reduction) $6,000,000 yearly. But the total passenger receipts of Mr. Wood's lines are about 44 millions a year, so that other passengers, paying the road 38 millions, enjoyed no reduction. Half of this sum, or 19 millions, probably came from passengers paying over 2 cents a mile. If the 1½ millions had been divided among all these, the average reduction would therefore have made the average fare of these passengers much nearer 2½ cents than 2 cents. If the Pennsylvania were to give the 2-cent rate to all passengers who have been paying more than that, it would reduce its passenger receipts probably about six millions.

CAR EFFICIENCY IN PROSPEROUS TIMES AND DULL.

We have several times taken occasion to comment on the excellence of the reports of the Car Efficiency Committee of the American Railway Association, with their fullness of detail constantly increasing as the shyness of some of the backward companies wears off, but the reports only partially reveal the work of the Committee. The address which Arthur Hale made before the New York Traffic Club, November 26, discussed rather fully some of the Committee's aims and the measure of its accomplishments, and it is quite without exaggeration to say that in the brief half-hour's talk, Mr. Hale gave to his audience more real information about car efficiency than was available from any source whatever, as recently as a year ago.

It seems that, at the outset, the Committee itself was scarcely able to explain why it sought so earnestly to obtain the detailed information from the railroads, except that it was convinced that this information ought to be in somebody's hands. People have assumed, for example, that the car congestion of the fall and winter of 1906 was the worst in the history of the country, but nobody knew or could possibly know whether this was so or not, because no comparative statistics were available. Moreover, although the Committee itself took great pains not to point comparisons between roads, it was obviously desirable that the roads should be able to make these comparisons for themselves. If the General Manager or the General Superintendent saw that his freight cars had an average record of 400 ton-miles per car per day, while his neighbors' cars had an average of 350, he would know that he was doing well. If, without the assistance of predominating coal traffic, he attained an average of 450 ton-miles per car per day, he would know he was doing extremely well, while if he averaged 250 ton-miles per car per day, he would not only know that he was doing badly, but he would know how badly he was doing, for the average for the whole country is around 350. A comparison of this kind is, of course, a very desirable and helpful stimulus, yet it has remained for the Car Efficiency Committee to introduce it at this late hour in our railroad development. Similarly, the General Manager can find out what relation the average daily earnings per car owned bears to the average daily earnings per car on line, and he may thus prove definitely that it is worth his while to build new cars rather than to continue borrowing.

Mr. Hale brought out the interesting point that at the 25-cent rate, in prosperous times, it did not pay anybody to build cars who could steal them, while at the 50-cent rate it did not pay anybody to borrow cars who could build them, the average cost of owning a car, including interest and depreciation, figuring at about 37 cents a day. Consequently, the introduction of 50 cents per diem, together with the full working information supplied by the Car Efficiency bulletins, may be assumed to have occasioned the building of a great many cars this year that would otherwise not have been built.

But a peculiar and interesting circumstance has an important bearing on the results reached by the Committee. The Committee has done all its work, so far, in a time of car shortage. Its values are calculated for times when traffic exceeds facilities, and the same thing is true of the 50 cents per diem. But, broadly speaking, at the present time cars are scarce only in the coal trade. Elsewhere there is a surplusage of equipment, which is becoming greater and greater every day. It remains for the next few months to disclose whether the 50 cents per diem rate is going to result in a scramble by the roads to get their own cars off their lines instead of the characteristic strenuous efforts of the last year to get their own and other people's cars on their lines. If so, the 50-cent rate is going to do harm, and may perhaps have to be amended temporarily. For example, the Baltimore & Ohio is now beginning to return cars to their owners at large cost at just the time when economy is urgent. Yet the manner of temporary amendment is so cumbersome that it seems to us likely that it will be effected through the individual initiative and agreement of a half dozen roads, rather than through action at the April meeting of the American Railway Association. The per diem rate bears a certain rough analogy to the price of gold; cars will flock towards the premium in dull times and nearly disregard it in busy ones, and a semi-annual conference to recommend practice is, of course, insufficiently flexible as a device to keep the rate constantly at the proper balance.

Of course the remedy for this situation is a really efficient method of pooling cars between companies, but this is a matter so beset with practical difficulties that although it was the original object of the Car Efficiency Committee, very little progress has been made. The shipper has a real grievance at points such as Cleveland and Pittsburgh when the railroads insist on western route and eastern route movements, and do not allow finished products to move out, eastbound, in the same car in which raw materials came in from the west. The car is at hand and the goods are at hand, but the car is not allowed to go in the same direction in which the goods must move. Yet, when pooling arrangements are proposed, originating roads, which have a large equipment supply of their own, want their cars back, and are not interested in pooling, while lines which are chiefly participators in through hauls are not at all anxious to compensate owners for the cars they use, but much prefer to take cars when they can get them, without pooling arrangements which place reciprocal burdens upon themselves. Consequently, the large car owner who wants to put a penalty on diversion is the only party at interest who has really been moving vigorously, and his efforts are not at all directed towards the establishment of a system of pooling. It was pointed out by Mr. Hale that all foreign countries except Russia use systems by which each railroad gets its own cars home again as soon as possible; a system expensive both to the carrier and to the shipper, which it is not advantageous to imitate in this country.

The Committee has had better success in another important branch of its work—although this particular task has been a self-imposed one—and that is in its effort to convince shippers that car movement is good and that car delay is bad, no matter from what cause it arises. Every day that a freight car stands idle it incurs for its owners a gross loss, in times of dense traffic, of about $2.50 a day, as an average for the entire country, and a loss of perhaps $1 net. The net loss to the coal shipper when a car stands idle is somewhat greater, perhaps $1.25 a day, because the coal trade probably operates upon a somewhat smaller margin, net to gross, than a railroad does, and when coal does not move for long periods it simply is not burned; other forms of fuel are temporarily substituted or plants are closed. At all events, there is a real loss which is never fully recovered. Mr. Hale admitted that demurrage was the hardest problem with which the Committee was confronted, particularly as the question is now a burning one on account of reciprocal demurrage legislation in the states, but he thought that a good many shippers had been persuaded to expedite movement at sidings and industries and that further progress will be made. The information about the position of a large group of roads as to surplus or shortage, has also enabled the committee to suggest home routings where they would do the most good and yield the most revenue to one party or the other; a form of assistance which should be greatly appreciated by railroads and shippers alike.

Mr. Hale made a closing suggestion which is of first-class importance and has appeared before in the *Railroad Gazette;* that the Interstate Commerce Commission and the American Railway Association should work together more closely. The Association is peculiarly well fitted to supply the Commission with an enormous amount of technical data which it needs, and use is already being made of this data, but the existing state of harmony is surely capable of very great extension, which must necessarily be of the highest benefit to all concerned.

A STUDY IN RAILROAD BAITING.

The economist of a generation or, perhaps, half a generation hence, who looks back upon our present epoch of anti-railroad state legislation, before he solves its problems or even measures its forces, will have to face some striking anomalies. Reasoning from the natural order of things he will be called upon to infer that in the old and highly populated states railroad baiting, so-called, would reach its highest intensities. Changing the tense from future to present, theoretically we should look for an anti-railroad movement soonest and strongest in a region of high and varied industries, many cities and large towns and thickly crossed by railroad lines. It would be New England and Massachusetts rather than the South and Alabama or North Carolina. In a region of the kind first named, the contacts with the railroad of the average community and average man are many and varied whether in his relation as freighter or passenger; in a region of the latter kind those contacts are relatively few—in theory—certainly so as regards passengers. It is in the thinly settled region, where railroad facilities are most craved, that one would expect public opinion and its expression in law-making to be most tolerant and merciful.

For the time being the reverse seems to be true. Radicalism in the public policy toward railroads is most rampant in the states of low rather than high population and in states where railroad lines are relatively far apart. It is true there are some apparent exceptions. The new and drastic railroad laws of Vermont, the Public Utilities statute of New York and the passenger rate mileage law of Pennsylvania are Eastern examples of the exception, though the Vermont instance falls in a thinly settled state, albeit in New England. But in all these states we have yet to wait and find out the teacher and spirit of enforcement, and the presumption is that the outworking of the new statutes will be along law-abiding and considerate lines. In such states we do not find the fierce and almost savage ardor of enforcement as at the South, where one governor holds up a railroad by executive threat; where another governor calls an extra legislative session and signs in a batch twenty-one anti-railroad bills rushed through both houses with scant discussion and most of them likely to be declared unconstitutional; where a conference of governors of three states is held to secure joint and severe anti-railroad legislation; and where one sees such an inequitable railroad hold-up as in North Carolina where, pending the decision of the United States Supreme Court, the railroad must adopt lower fares as against its own "recovery" ticket plan, and they be forced to lose money on fares during the period of litigation even if it wins the suit. Even the states newest made, like Oklahoma and the two Dakotas, where the railroad is the pledge of prosperity, have the anti-railroad ailment in pretty acute form.

One does not have to hunt far, however, to discover why the natural law seems reversed and commonwealths with apparently the fewest railroad contracts are first in the "baiting" order. Such states in this country are mainly agricultural; and agriculture seems to lend itself peculiarly to the railroad and anti-corporation motif, especially when a President of the United States sets the pace and fires the train. It is not merely because agriculture must often depend on railroad rates and "long hauls" to get its product to market. The farmers of Connecticut have thrice balked any modification of the four days car detention law although their railroad business is of the slightest. The cause rather seems to inhere in the nature of the farmer and the influences upon him of his vocation. He is apt to be isolated, not in touch with men in general, with affairs, with other vocations or with the fundamental principles of business. His life is apt to be narrowed down to the bucolic furrow and his special interest fills his whole mental horizon. Hence any agrarian movement encoils him easily. Such was the populist outbreak of the early nineties; such the western anti-railroad impulse of the early seventies; and such, saying nothing of recent anti-railroad legislation of the West, the extremes to which it has been in southern states but confined there somewhat strictly to the cotton-growing regions rather than to the larger towns and cities. As the anti-railroad fever thus seizes a homogeneous industrial group it is in that sense limited. But it becomes serious when the group is so large that it controls the electorates of whole states and their law-making bodies in which politics is apt to interpret with redoubled energy the sentiment of the constituency.

This political phrase of the subject challenges special attention. It is most marked at the south, less so at the west, least in our eastern states but strong in all three great divisions of the country. The South and its present legislative foray on the railroads culminating in the astonishing new statutes of Alabama may be used as the best illustration. Recent observers of events in the New South have noticed its great industrial development, particularly in manufacturing, but they have also noticed, partly as a request of its own momentum, the tendency of business to separate itself more and more from politics. Commercial business and politics do not mix with civics at the south so much as North and West where, indeed, they do not mix enough. It was even more so in the old slaveholding days but, commercially speaking, the situation was then modified by the aristocratic cult, now all but extinct, which, with all its faults, was at least highly educated, personally honest and versed in economic law. The change is showing itself in the personnel of southern legislatures and to a degree in Congress also. Would such men as Lamar or Wade Hampton be found to-day abetting legislation like that leveled against the railroads of Alabama, and in that state it is a federal Circuit Judge, an ex-Confederate and "old school" southerner, who has just enjoined the amazing new "injunction proof" railroad law—exactly such a statute as a legislature made up from the politics that veer to every popular and demagogical breeze might be expected to enact. To the purely political motive and influence at the south, no doubt, much of the recent rash legislation, sure to be crushed by the courts, must be charged. From the same shifting and erratic motive any southern legislation of the kind is also likely to be transitory.

In the deeper study of these southern legislative raids on the railroads the most cheerful view is their summing up as a power of popular economic education not unmixed with their sharp lesson against high finance and other corporate misdoing. Communities and legislatures learn, on the whole, more from mistakes than from the statutes that prove effective and wise. The process even with the court to aid it, is sometimes protracted and fraught with some calamity. But usually it is short and, whether short or long, its final teaching strikes deep.

Car Service Disturbances.

The New York, New Haven & Hartford has given notice to the Interstate Commerce Commission and to the interested roads that after December 17 it will refuse to participate in through rates on freight from the railroads terminating in Jersey City, except the Pennsylvania. The reason given is that the New York division of the New Haven road is overcrowded with trains, and that the company desires to have this western freight go over the Poughkeepsie bridge. It appears that the number of cars transferred by boat to the New Haven road from its Jersey City connections is 800 daily, of which 500 are from the Pennsylvania and the rest from the other roads. The transfer floats are overworked and there has been congestion at Jersey City. The Central of New Jersey and its western connections have complained of this action to the Interstate Commerce Commission. They declare that the Poughkeepsie bridge route is not in condition to handle any more freight than is now carried over it. The New Haven people say that the dispute between themselves and their western connections concerning the car service rate has nothing to do with the present action; but some of the officers of the other roads claim that, nevertheless, the difficulty about per diem is the real cause. For most of the freight starting from points on the Central of New Jersey the distance to Hartford or Boston by way of the Poughkeepsie bridge would be greater than by way of New York, so that, no doubt, the complaint of the Central of New Jersey is based largely on the reduction which it would suffer in revenue if it were to send freight by the more northern route.

The Boston & Maine and the Boston & Albany have given notice that they will back out of the per diem agreement after 90 days. No reasons are given; but as the New York Central, which operates the Boston & Albany has been very critical in its attitude toward the car service plans which have been adopted at Chicago it may be conjectured that the B. & A. and the New Haven are in sympathy, at least to some extent. As the New Haven owns a big block of B. & M. stock the action of the B. & M. is supposed to have been influenced by the wishes of the New Haven.

If freight traffic becomes dull, an event which, though unexpected two months ago, now seems possible, the position of the roads which claim that 50 cents a day is too high a price for freight cars will be somewhat stronger. It will not be stronger in reason, for the only reasonable basis for car interchange, under present general conditions, is for every road to furnish as many cars as it uses, thus making the rate unimportant, relatively; but the objectors can get more friends to support their arguments. Borrowers can get cars more easily, and roads with a surplus will be anxious to lend. It may be assumed from the present action that the New York Central is willing to lend to the B. & A.

at less than 50 cents a day; and if to the B. & A., perhaps to the New Haven also.

If and whenever a rate less than 50 cents is fair to the lender the New Haven road's claims ought, of course, to be listened to, not only by the New York Central but by the other trunk lines as well; but still it will be regrettable to have uniformity disturbed even a little. Uniformity is almost synonymous with arbitrariness, of course, and in car service exchanges it often means superficial or temporary injustice; but it is a great promotor of smooth and economical operation nevertheless. It would be easy, of course, for the New York Central to make a separate agreement with the three New England roads to lend N. Y. C. cars to them at the old rate of 25 cents a day or even less. To do so would be only the perpetuation of a method of strengthening its hold on New England traffic, which the New York Central began forty years ago. But the Pennsylvania would have to follow, or else lose some of its New England business, and so the uniform rate would be badly jostled throughout the country. If the Pennsylvania has use for all its cars west of New York it can ignore the reduction, of course.

Well, the New Haven has succeeded in keeping things stirring; who knows but that next May, when it has received its thousands of new cars, it will move for an *advance* in the per diem rate?

In a police court in New York City this week a magistrate ruled that the Grand Central Station was a public place, and that a public porter could go into the station and solicit trade. A porter had been arrested by a special policeman of the Grand Central Station, charged with loitering about and refusing to leave when ordered. The policeman cited a previous decision sustaining his action, but it was not recognized. These "public porters" are a nuisance. Licensed by the city at one dollar a year they hang around the main entrance of the station for the purpose of earning money in performing a service which the railroad company's porters will gladly do; that of carrying hand baggage into the station. But, by meeting people farther from the door, and grabbing their baggage, the self-appointed porters "secure the business," as a G. P. A. would say. A half dozen of them, more or less, seem to make a living at this one point. These porters are a nuisance because they are irresponsible. Wearing caps or badges that look like an official uniform they deceive green passengers into employing them; yet their qualifications are an unknown quantity. Recently one of them led a woman into danger—in front of a team of horses. Boys on the sidewalk a block away from a station asking to carry one's grip are perhaps an incurable nuisance; but grown men, occupying room around a crowded entrance and smoking in passengers' faces, ought to be suppressed by the police.

Chicago Great Western.

As on many other roads, operating expenses of the Chicago Great Western during the year ended June 30, 1907, increased faster than gross earnings. Therefore, although the road had the largest year's traffic in its history, its financial condition is weaker than it was a year ago, both in its income and capital accounts.

The decrease in net earnings was $253,000, or 10 per cent. The net income after charges was $1,460,000, against $1,740,000 in the previous year. The company has no bonds, but interest on its debenture stock though not an absolutely necessary payment amounts to a fixed charge. Net income after debenture interest therefore really represents the amount available for dividends on the three classes of the company's stock, of which a little more than $78,900,000 is outstanding. This net income was $414,000 last year against $695,000 in 1906, a decrease of 40 per cent. As two semi-annual dividends of 2½ per cent. on the preferred "A" stock were paid instead of one as in 1906, there was a deficit from the year's operations of $153,000, against a surplus of $412,000 the previous year.

The balance sheet showing is also not encouraging. On June 30, 1906, the company had total cash on hand amounting to $1,340,920. On June 30, 1907, the cash item was $224,000. On the same date, bills payable exceeded accounts receivable by $337,000 and current liabilities exceeded current assets (not including fuel and material on hand) by $612,000, making a total excess of items payable above corresponding items receivable of $989,000.

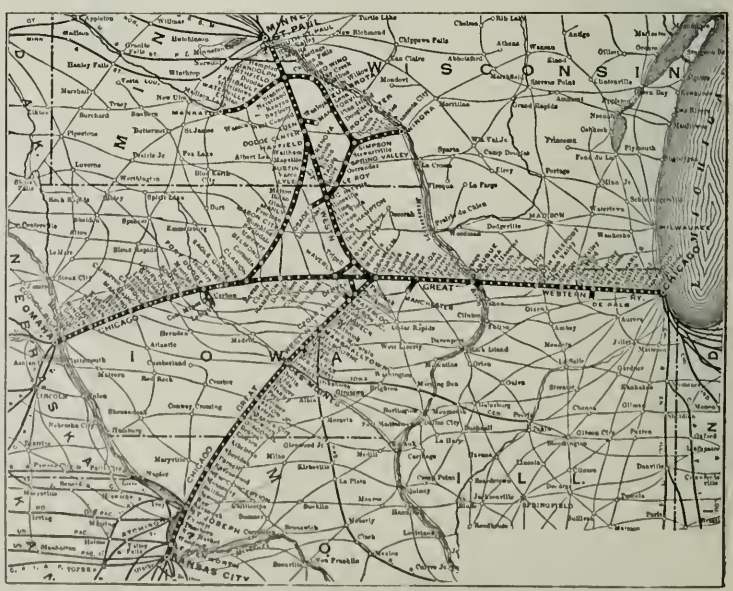
Freight earnings for the year increased 6 per cent., passenger earnings 8 per cent. and express earnings 25 per cent. Operation was more efficient than in the previous year. With an increase of 11 per cent. in revenue ton mileage there were only 6 per cent. more revenue freight train miles and 7 per cent. more miles run by helping locomotives in freight service. Loaded freight car mileage both east and westbound increased; at the same time there was a decrease of 14 per cent. in empty freight car milage eastbound and of 13 per cent. in empty freight car mileage westbound. The revenue trainload rose from 295 tons to 308 tons, or 4 per cent. In comparing this figure with trainloads on other roads it must be remembered that these traffic statistics cover only the 818 miles of the Chicago Great Western proper of which 787 miles are main line. This, therefore, is essentially a main line trainload.

Among the operating expenses, the largest increases were in the maintenance accounts. General expenses increased 4 per cent. and conducting transportation 10 per cent., while maintenance of way "and renewals" increased 15 per cent. and maintenance of equipment 29 per cent.

Maintenance of way cost $1,027 per mile of line, against $894 in 1906. This figure is for the largely main line mileage of the Chicago Great Western proper. On the 386 miles of the Mason City & Fort Dodge, including the line from Oelwein to Omaha and the connecting branch to the Minneapolis line, maintenance of way cost $438 per mile, against $372 in 1906. The Wisconsin, Minnesota & Pacific, operating most of the branch lines, spent an average of $470 per mile in 1907 and $415 in 1906 on each of its 271 miles. This makes a total maintenance of way expenditure for the 1,476 miles of the whole system of $770 a mile, against $669 in 1906. Of this 1,476 miles, 1,151 miles, or 78 per cent., is included in the main lines to Chicago, Minneapolis, Omaha and Kansas City. An average maintenance of way expenditure of $770 a mile is small, even for a prairie railroad, particularly when less than one-quarter of its mileage is branch line. As an extreme contrast, the Burlington with about 50 per cent. of its mileage branch line spent $1,584 per mile last year. The $1,027 spent on the Chicago Great Western proper might well have been the average for the whole system.

There was spent on capital account during the year $936,000 for new equipment, including 480 box cars of 70,000 lbs. capacity and 320 stock cars and 100 furniture cars of 60,000 lbs. capacity. On line improvements $1,400,000 was spent, of which the largest items were $252,000 for an extension of the freight house at Chicago and $365,000 for double track between Galena Junction and Stockton, 27 miles east. During the summer this work was continued from Galena Junction west to Dubuque, and this section is reported to be now finished. This, with five miles of double track directly east of Oelwein, makes a total of 46 miles of double track on the 240 miles of line between Oelwein and Chicago. This line connects all the rest of the system with Chicago and carries a traffic larger than it can economically handle as a single-track line. Double tracking of the remaining 200 miles is greatly needed.

President Stickney makes no comment whatever on the year's results or the prospects for the future. One incident which may be mentioned is the report of a committee of the Minnesota Senate



Chicago Great Western.

made last April to the effect that the road was worth only $28,000 a mile, but was capitalized at over $140,000 a mile. Of course, this latter figure represents the total of securities at their par value. Chicago Great Western preferred A stock is now selling at about 30, the preferred B at 10 and the common stock at 8. The committee also reported that the company was carrying at full cost on its balance sheet locomotives now in the scrap pile. This is a more vital criticism. If true, it means that the company has not been maintaining its equipment. The statement of locomotives owned seems to bear out this contention, for in 1907 there were only 259 locomotives as compared with 265 in each of the three previous years, while no deduction was made from the balance sheet item "equipment" to show this decrease. It is noticeable that since 1903 the company has had no new locomotives and that last year, the busiest year of its history, it had less locomotives than in any of the preceding three years.

The Chicago Great Western is capitalized on the English plan and derives most of its strength from the support of its English shareholders. Last summer President Stickney was able to secure a loan abroad on terms reported to be more favorable than stronger roads could get in this country. Its policy has always been not to accumulate a large surplus, but to pay out most of its net income to stockholders. An industrial depression may furnish an interesting test of the reserve power in hard times of a company which has followed this policy. Already it has begun to suffer. In the three months of July, August and September gross earnings decreased 4 per cent. and net earnings 36 per cent., while the operating ratio rose from 69 to 77 per cent.

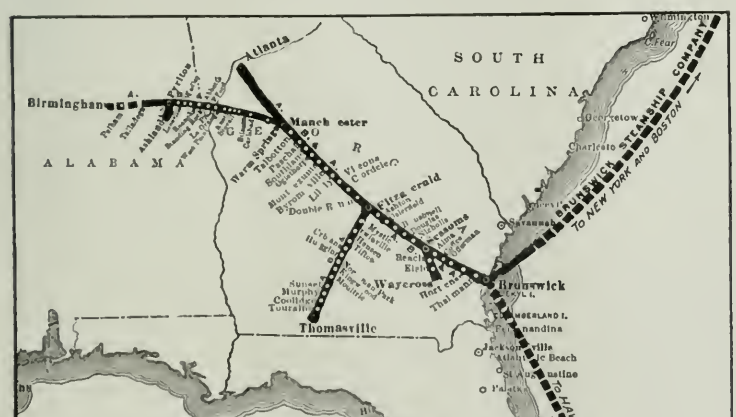
The following table gives for the Chicago Great Western proper the results of the last two years:

	1907.	1906.
Mileage worked	818	818
Passenger earnings	$2,148,219	$1,984,403
Freight earnings	6,333,699	5,993,374
Gross earnings	8,859,047	8,345,717
Maint. way and structures	840,101	730,961
Maint. of equipment	1,263,502	982,709
Conducting transportation	3,974,931	3,617,125
Operating expenses	6,583,808	5,817,655
Net earnings	2,275,239	2,528,062
Surplus earnings of prop. lines	280,040	227,431
Net income	1,459,010	1,740,504
Interest on debenture stock	1,044,978	1,044,978
Net income after debenture int.	414,032	695,326
Dividends	566,845	283,423
Year's surplus	152,813*	411,903

*Deficit.

Atlanta, Birmingham & Atlantic.

Two small railroads in southeastern Georgia were the nucleus of the Atlanta, Birmingham & Atlantic—the Atlantic & Birmingham and the Brunswick & Birmingham. Both of these together carried the line only as far as Montezuma, 194 miles northwest of Brunswick. From here the road has been extended westward until now track is laid as far as Talladega, which is about 75 miles from Birmingham, and track laying on the 76-mile branch to Atlanta is just being finished. It is expected that grading on the Birmingham line will be finished by March 1, 1908, and track laying somewhat later. Terminals are being built at Birmingham, Atlanta and Brunswick. The Brunswick Steamship Company is owned by the Atlanta, Birmingham & Atlantic and now has four steamships in operation between Brunswick and New York. A fifth steamer is to be completed this month. There is also a semi-monthly service between Brunswick and Havana. The new extensions, particularly the one to Birmingham, are likely to change the road from a local to a through carrier. Coal and iron companies affiliated with the railroad own mineral tracts in the district about Birmingham. The new road should also get traffic from the Illinois Central and the St. Louis & San Francisco, which it will reach at Birmingham. No doubt a through route will be developed from New York via Brunswick and Birmingham and over one or both of these roads to the Mississippi valley region and the Southwest.



Atlanta, Birmingham & Atlantic.

The new construction is being financed through the funds received from the sale in May, 1906, of $5,000,000 5 per cent. 4 year joint notes of the Atlanta, Birmingham & Atlantic and the Atlantic & Birmingham Construction Company, which is building the new extensions. These notes are secured by stocks and bonds of the Brunswick Steamship Company, stock of the allied coal and iron companies and common stock, preferred stock, equipment notes and first mortgage bonds of the railroad. The total advances on June 30, 1907, to the Atlantic & Birmingham Construction Company by the railroad company were $18,260,500.

With an increase of 70 miles, or 22 per cent., in the average mileage operated, gross earnings rose last year from $1,130,000 to $1,590,000, or 41 per cent. Operating expenses increased 48 per cent., leaving net earnings of $419,000, against $339,000 in 1906, a gain of $80,000, or 24 per cent. These results made an increase in the operating ratio from 70 to 74 per cent. Fixed charges increased from $271,000 in 1906 to $368,000, owing to the larger amount of bonds outstanding. As this increase was larger than the gain in net earnings, the net income of the year was less—$49,000 against $74,000 in 1906. This is a decrease per mile of road of 45 per cent. This result is due, according to President Atkinson, to the fact that construction work has been going on over nearly all the road from Brunswick to the end of the track. The road therefore was operated under disadvantages. In order to put the railroad as a whole in shape for carrying through traffic, it seemed wise to bend every effort to finishing this construction work, even though it interfered with the operation of the line already built. Increased cost of fuel, wages and taxes have also done their part in reducing the year's profits.

Freight earnings increased 40 per cent. as a whole, and 15 per cent. per mile of road; passenger earnings increased 29 per cent., and 7 per cent. per mile of road; while gross earnings increased 41 per cent., and 16 per cent. per mile of road.

Maintenance of way increased 56 per cent., maintenance of equipment 47 per cent. and conducting transportation 46 per cent. The unit maintenance charges are interesting because the road has been under construction or reconstruction. Maintenance of way cost $595 per mile, against $463 in 1906. The 1907 figure will be found inadequate if a large through traffic is developed.

Repairs and renewals of equipment cost $1,513 per locomotive, against $1,427 in 1906; $406 per passenger car, against $609 in 1906, and $22 per freight car, against $32 in 1906. All of these figures are low, and the freight car figure very low. This is largely due to the fact that the company has recently bought a large amount of new equipment of modern standard. Its old freight equipment is light and of small capacity, but it is not yet suffering from operation in heavy through trains. The old and lighter freight cars are probably held on the line for the local freight traffic.

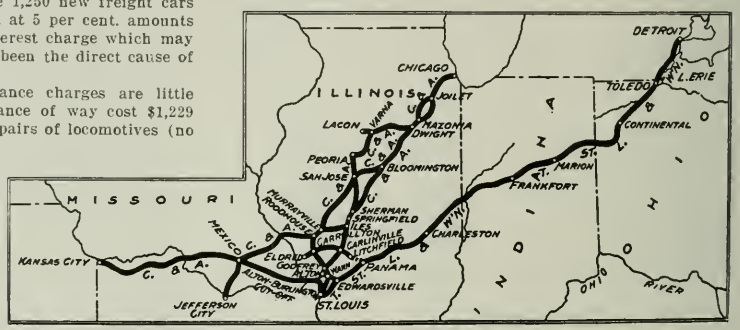
The Eastern Railway of Alabama and the Alabama Northern, two small roads connecting with each other at Pyriton, Ala., were bought during the year from the Louisville & Nashville. The 20-mile line of the former is to be used as part of the Birmingham extension. The Atlanta, Birmingham & Atlantic has had the misfortune to be carrying on its construction work at the time of a financial crisis. It is reported, however, that it has funds in hand to carry out its plans for the development of its system. With its extensions and terminals completed, its old roadbed reconstructed, its new lines built to modern standards and its steamship line, it should come to be an important outlet from Georgia and Western Alabama to New York and the East. The following table sums up the results of the last two years:

	1907.	1906.
Mileage worked	393	324
Passenger earnings	$360,593	$278,591
Freight earnings	1,083,129	771,939
Gross earnings	1,589,148	1,128,327
Maint. way and structures	233,722	149,977
Maint. of equipment	213,916	145,141
Conducting transportation	636,331	434,826
Operating expenses	1,169,935	788,984
Net earnings	419,213	339,342
Net income	49,077	73,858

Toledo, St. Louis & Western.

The Toledo, St. Louis & Western had in two respects a different experience during the past year from most railroads in this country. In the first place its gross earnings decreased; in the second place its operating expenses decreased still more, so that net earnings were the largest in the company's history. This second very favorable result can be traced directly to the fact that the road during the year received 500 new coal cars and 750 new box cars, all of 80,000 lbs. capacity. The two largest single savings among the individual operating expense accounts were in per diem payments, which were $84,000, against $202,000 in 1906, and in repairs of freight cars, which cost $133,000, against $206,000 in 1906. Furthermore, the new cars made possible a much heavier trainload. This was 471 tons, against 398 tons in 1906, an increase of 18 per cent. Correlative with this was a reduction of 6 per cent. in the loaded and of 26 per cent. in the empty freight car mileage, and a saving in the amounts paid for freight conductors, brakeman, engineers and firemen, engine despatchers, wipers and roundhouse laborers, and fuel for locomotives—this with 359,000 more tons of freight hauled during the year. The average haul, however, decreased from 221 miles to 197 miles, and earnings per ton and per ton-mile fell off, so that freight earnings and also gross earnings were less than in the previous year. Nevertheless, as a result of these various operating economies, there was an increase of 16 per cent. in net earnings. The 1,250 new freight cars cost $1,217,375, on which one year's interest at 5 per cent. amounts to $60,869. In this one year at least, an interest charge which may be estimated at this amount seems to have been the direct cause of an increase of $190,000 in net earnings.

With one exception the unit maintenance charges are little changed from the previous year. Maintenance of way cost $1,229 per mile of road, against $1,238 in 1906. Repairs of locomotives (no renewals appear to be included in any of the maintenance of equipment accounts) cost $2,588 per locomotive, against $2,501 in 1906; $851 per passenger car, against $831 in 1906, and $35 per freight car, against $76 in 1906. The fact that the 1907 freight car figure is less than half of the amount spent in the year previous is the direct result of the increase of 39 per cent. in the number of freight cars. The previous year's figure was high because the older freight cars, particularly since they were overburdened with traffic, needed heavier repairs than normal. Last year's figure is low, because 188 old cars had been disposed of and one-third of the freight equipment were new cars.



Toledo, St. Louis & Western and Chicago & Alton.

The road is a through line from the Mississippi river at St. Louis, Mo., and at Alton, Ill., northwest to Lake Erie at Toledo, and over the Detroit & Toledo Shore Line, which is controlled jointly with the Grand Trunk, to Detroit. It has no branch lines. Its traffic is highly competitive and moves at low rates. With 34 per cent. of its tonnage made up of manufactures, merchandise and miscellaneous, its average rate is little more than one-half a cent per ton mile. Last year there was a great development of bituminous coal tonnage, which rose from 20 per cent. of the total to 29 per cent. Mineral products, as a whole, make up 37 per cent. of the total tonnage; agricultural products, 16 per cent.; animal products, 5 per cent. against 10 per cent. in 1906, and forest products, 7 per cent. The most marked decrease during the year was in packing-house products other than dressed meats, the tonnage of which decreased from 113,000 tons to 34,000 tons.

Recently the road has assumed a new prominence through its purchase in August of a property much larger in mileage and in earning capacity—the Chicago & Alton. The process of combining the two properties is already under way. The executive, financial and accounting departments are now being combined, and it is probable that eventually the two roads will be operated very much as one property. This acquisition brings the "Clover Leaf," as the Toledo, St. Louis & Western is generally called by traffic officers and shippers, as far west as Kansas City. As soon as the short connecting line from Panama, Ill., west to Litchfield is built, new through traffic between Kansas City and Toledo and Detroit should be developed. The extent of the combined system is shown on the accompanying map.

Results for the years ended June 30, 1907 and 1906, are shown below:

	1907.	1906.
Mileage worked	451	451
Passenger earnings	$547,017	$549,967
Freight earnings	3,415,402	3,468,593
Gross earnings	4,181,966	4,205,051
Maint. way and structures	551,663	558,145
Maint. of equipment	488,768	558,287
Conducting transportation	1,454,842	1,615,474
Operating expenses	2,803,155	3,016,026
Net earnings	1,378,810	1,189,025
Net income	645,067	472,324
Dividends	200,000	.....
Year's surplus	445,067	472,324

NEW PUBLICATIONS.

A Text-Book on Roofs and Bridges. Part IV.—Higher Structures. By Mansfield Merriman and Henry S. Jacoby. Third edition; revised and enlarged. New York: John Wiley & Sons. 374 pages; 6 in. x 9 in.; 181 illustrations; cloth. $2.50.

As its name implies, this book is intended as a text-book for the student and not simply to be read by the engineer. It has apparently been prepared for the classes of the two professors who are the authors and who are at the Lehigh and Cornell universities respectively. It is a continuation of the previous parts I. to III. of the same work, and deals with those structures which have more than two supports, as continuous, draw and cantilever bridges, or which have two supports, whose reactions are not vertical, as suspension and arch bridges. The investigations given are those of the theory of stresses and their determination by analytic or graphic methods, with no attention whatever to the details of construction or erection beyond the bare description of the general types represented by those structures that are selected for purposes of illustration. With this limitation the book necessarily deals almost exclusively with bridges to the exclusion of roofs proper, though the latter are represented in the discussion of two and three-hinged arches as applied to train sheds. The discussion of this part of the subject is in great detail; the actual maximum and minimum stresses being computed for several cases. This for three-hinged structures, while, for arches with two hinges and with no hinges the reactions are determined analytically and the stresses by simple graphic constructions. In this especial emphasis is placed upon the importance of proper methods of erection in order to hold the subsequent stresses down to a minimum. For example, it is shown that, for a no-hinged arch it is well to erect and join as a three-hinged structure, changing then to a two-hinged and finally to a no-hinged in order to compensate for the dead load and temperature stress due to inequalities of conditions during erection.

The method of presentation of the subject is to state the proposition as the heading of an article, such as the "Deflection of a Swing Truss" or the "Anchor Span," and then, after a brief statement of the question involved to enter at once upon the mathematical or graphical solution of the case. Usually these articles, which are really sub-heads of the several chapters, conclude with the presentation of a problem that is left for the student to solve. Sometimes it is of a purely theoretic or hypothetical character, while again it is the determination of the stresses set up in some structure that has been erected and is in service. Incidental to this work the adaptability of various types of bridges to different classes of traffic is shown, and the reasons that should govern a choice, as in the case of the preference of a two-hinged to a three-hinged bridge for heavy railroad work for example.

The chapters on suspension, two-hinged and no-hinged arch bridges open with a brief historical sketch of the introduction and development of the types which is sufficient to give a clear idea of what has been done. And all through the book there are references to an elaborate series of illustrations accompanying the last chapter on modern bridges of all of the types discussed. In this chapter, instead of increasing the size of the volume by complete descriptions of the structures illustrated, there is simply an excellent half-tone engraving of a bridge with a caption stating its character and accompanied by a paragraph that merely refers to the engineering publications in which a description of that specific structure can be found. In this way the book becomes not only a text-book adapted to the needs of the student who is at work upon the theories and intricacies of bridge stresses, but a valuable book of reference for those who wish to examine in detail the methods of construction and design of modern examples of those types of bridges that fall within the general scope of the work.

CONTRIBUTIONS

The Recommended Rail Sections.

Grafton Station, Pittsburgh, Pa., Nov. 27, 1907.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Regarding the respective merits of the rail sections shown in your issue of November 22d and those proposed by the rail committee of the American Railway Association on Rail and Wheel Sections, prompts me to ask the following relative questions. Aside from the mathematical value of these sections, what real benefits do the proposed forms disclose, and where do the designers expect them to contribute to the betterment of the granular structure of large rail sections? Will they actually have any practical advantages in rolling, and enough to compensate for the additional metal which has been added at the flange points?

If the diametrical effects of certain roll surfaces cause a passing or sliding of the crystals where longitudinal tensions take place in the base of the rail now, what benefits can be expected by just increasing the thickness of the whole flange and permit the identical mechanical conditions of the rolls to remain unchanged? Further, will these sections, with a little more material in a uniform flange, prevent the chill of the metal traveling slower toward the rail head, resting there last, and forming a crystalline structure? Will not this condition in cooling be about the same as found with the 90 or 95-lb. standard section, with the exception that larger sections will cool slower, with the resultant crystallization coarser; it ought to be well known by this time that metal 1 in. x 4 in. cools about 50 per cent faster than the same area 2 in. x 2 in.

If these sections are increased in height, with the base remaining about the same width as in the old sections, what is to prevent the metal in the head from swinging in a curve at a more rapid rate over the flange in the rolling, and effectually setting up a greater disparity in elongation on opposite sides of the section? Quite enough trouble is already experienced from curvature in rolling a rail where the height equals the width, while if the height exceeds the width a corresponding increase of curvature can be expected. If more roll passes are demanded, together with less reduction per pass to reach low finishing temperatures, what will eventually happen? There is only one result, distortion, unless the form of the flange is changed in a manner to promote an equal elongation.

The mechanical actions of the rolls on the thicker flanges will have no more effective advantages than in the present practices, unless the thicker flange is expected to keep the metal in a more workable state, by reason of being slightly warmer. But in consideration of the fact that larger ingots will be contemplated and more roll passes will also be required to reduce to the desired sized bloom, then the metal in the flange points will become as nearly refractory as in the present practice. This being the case, what diametrical roll influences are going to elongate the metal uniformly on both sides of the section, or rather the flange and the head, and pass them at the same speed safely through more roll passes?

With the general shape of the rail flange unchanged, how are the parties responsible for these new designs going to clear up the fact that larger rails must be continuously rolled to gain toughness, stiffness, tenacity and granular superiority by reason of colder rolling? While if they are aware of this requisite, how is the present or proposed large rail shapes going to safely reach the final passes in the rolls without excessive curvature and distortion; which in turn necessitates gagging. On the other hand, are the proposed sections purposely designed to suit rolling in fewer passes, to assist rapid and economical manufacture at the expense of the final granular structure? Is not the elimination of roll passes an inevitable approach to a "cast-steel" rail?

So far as the rolling of these new sections is concerned, it would seem to be a digressive step, and that the inclination is towards a rail made in the laboratory. The sections as they now are, represent nothing more than an intentional disregard for the mechanical features that was so apparent and beneficial in former days, and where a good rail was produced from poorly regulated properties while other good factors were supplemented by the use of many more roll passes with less reduction per pass. More roll passes and colder rolling is the only compensation for chemical shortcomings in either the Bessemer or the open hearth process.

I am prepared to state through the columns of the *Railroad Gazette* how a large rail can be successfully rolled without distortion or curvature, and will cool evenly and separately within its different parts. If the railroad officials desire a strong and lasting rail, why not design one that is more in accord with the fundamental principles for rolling it and where the proper mechanical effects can be applied in the rolls and thus produce a rail of superior internal character something more than a mathematical figure which invites a return to molecular crudeness.

A. W. HEINLE,
Consulting Roll Turner.

Train Robbery in Russia.

Russia seems to have taken the lead in train robberies, in which heretofore we have had the first rank. The latest was in northwestern Russia, the train carrying collections from stations, under the guard of three policemen. Just after leaving a station, two men with pistols appeared in the car carrying the money. They opened fire on the cashier in charge and wounded him. A policeman fired on the robbers, who ran out of the car, shot down one of the policemen who got in their way and killed one passenger and wounded another by stray shots. One robber climbed to the roof of a car and there was shot dead and the other was killed as he was jumping from one car to another. Meanwhile the engineman knew nothing of it and kept on to the next station. One of the policemen had, at the first alarm, cut the bell rope, which probably prevented an accomplice from signalling the engineman to stop in the woods, where the main force of the robbers is supposed to have been stationed.

The Crops of 1907.

The following extracts are taken from the 1907 report of the Secretary of Agriculture to the President of the United States:

It has been a year of untoward conditions requiring all the industry and skill of the farmers to grow an average crop. They have struggled not only with an erratic season but with a scarcity of help in all the states and territories of the Union. Such a year as 1907 has been, with its hard winter, summer weather in March, and late cold spring, gives exceptional emphasis to the wisdom of this department's policy of diversifying farm products and of establishing new crops. A general crop failure in a field as large as the chief part of the temperate zone of a continent must be a rare occurrence.

No general crop failure afflicts the farmer this year, not even within small areas. The production of the farms, all things considered, is well up to the average of the previous five years in quantity, while its value to the farmer, as now appears at this annual day of reckoning, reaches a figure much above that of 1906, which by far exceeded any previous year's wealth production on farms.

Out of the farming operations of 1907, the railroads will get an average haul of freight, and foreign countries will take a heavy excess above home consumption. The farmer will have more to spend and more to invest than he ever before had out of his year's work.

DURUM WHEAT.

When the Department of Agriculture brought durum wheat to this country from Russia and Africa during 1899 to 1902 the seed was sown that formed practically the entire foundation of the present crop of durum wheat. At a cost of $10,000 in the beginning, a crop worth $30,000,000 now grows in regions of low rainfall, where in the day of stock ranges the steer roamed on 20 acres to find his cud. This crop has encroached on the home of the prairie dog and of the cactus. It has spread throughout a wide strip of country, extending from northern North Dakota to southeastern New Mexico and northwestern Texas. It is a common crop in Montana and Idaho and in parts of Washington, Oregon and Utah.

This variety of wheat has entered into home industries. To a considerable extent it is mixed with other wheat in making flour for bread. It is promoting the manufacture of macaroni and kindred paste products in this country and is prepared as a breakfast food. It is the grain through which the desert feeds the cities of the east at home and abroad.

As an export crop durum wheat has become prominent. In 1905 Europe took nearly 10,000,000 of the 20,000,000 bushels produced; in 1906 about 20,000,000 bushels of the crop of that year.

Last year two-thirds of the exports went to Mediterranean countries. The former sheep and cattle ranges sent macaroni material to Marseille, Naples and Venice; to Greece, Spain and the countries of western Europe; and even to the old homes of durum wheat—northern Africa and Russia. Shipments of this wheat were made to 43 ports in Europe and Africa named in trade reports of the collectors of customs, and to other ports unnamed.

With an average production of about 15 bushels per acre, durum wheat this year covered an area of over 3,000,000 acres, many of them valueless for agricultural purposes before the advent of this new crop. Its value to the farmer is over twice the entire cost of the Department of Agriculture during the current fiscal year, including the Weather Bureau, the costly meat inspection, and the Forest Service.

BEET SUGAR.

The beet-sugar industry in this country had not advanced beyond experiment and given promise of prominence until about 1888. Since that year it has rapidly grown, under aid and encouragement from the Department of Agriculture and the experiment sta-

tions and with favorable legislation by Congress and several state legislatures.

About 560 short tons of beet sugar were made yearly from 1879 to 1887; in 1891 the quantity was 6,000 short tons; in 1892, 13,460 short tons; in 1893, 22,344 short tons; in 1897, 45,246 short tons; in 1899, 81,729 short tons; in 1901, 184,606 short tons; in 1903, 240,604 short tons; in 1906, 483,000 short tons, and in 1907, 500,000 short tons.

Sugar factories occupy a belt across the continent in the sugar-beet zone and a belt from Washington to Arizona along the Pacific coast. From the easternmost factory in western New York they extend through Ohio, Michigan, Illinois, Wisconsin, Minnesota, Kansas, Nebraska, Montana, Colorado, Utah and Idaho; and from eastern Washington through Oregon and California to southern California and Arizona. In 16 states there were 64 factories in 1906, with a capacity of working 49,500 tons of beets daily. Factories with more than three-fifths of this capacity are situated in the western division of states, and in that region this new crop has so well established itself and the growing of sugar beets has proved to be so remunerative that sugar-beet farms of the medium sort increased in value $42.49 per acre from 1900 to 1905, as determined by special investigation by the Department of Agriculture, or from $99.47 per acre in 1900 to $141.96 in 1905.

To the fostering of this industry by nation and states, to the instruction provided by the Department of Agriculture, by experiment stations, and by agricultural colleges, it has responded by increasing the value of its production 543 per cent. in nine years. The factory value of the refined sugar made in 1899 was $7,000,000, and in 1907, $45,000,000. More than $60,000,000 is now the value of the beet-sugar farms and factories.

One-third of the value of the beet-sugar made this year would be enough to pay the cost of the Department of Agriculture during the current fiscal year and the National expense of the 60 experiment stations of contiguous United States when they shall have received the ultimate appropriation of the Adams Act.

ALFALFA.

Alfalfa, that extraordinary plant for producing wealth and doing wonders to farms, is occupying an important place in the plans of the Department of Agriculture, the experiment stations, and the agricultural colleges. Through their efforts largely it has rapidly gained success in cultivation throughout a vast area. The value of the crop as hay this year is supposed to be $100,000,000, and if the plans and efforts now under way to promote its extension receive a reasonable reward the value of the future crop will be several times the present amount.

This forage plant is a chemical laboratory in which nitrogen is taken from the air. It is a soil improver of the highest merit. As a flesh-forming feed for growing live stock, and as a milk and egg producer, it is unexcelled by any plant of large production.

It grows 2½ tons of hay to the acre as an average for the whole country where it is grown, or twice the average for all kinds of hay, and, besides this, is more nutritious than other hays.

The cultivation of alfalfa has been pressing eastward until now it has established itself as far as the longitude of eastern Kansas, except in southern Texas. It is established in some areas still farther to the eastward—in spots in Arkansas, in southern Wisconsin, northern Illinois and northern Indiana, in the limestone regions of Kentucky and Tennessee, and in the southeastern corner of Michigan.

This plant is semi-established in Minnesota, Iowa, Missouri, Ohio, and is making its way in Illinois and Indiana. Elsewhere the growing of this plant is mostly experimental, but with promise of success.

IRRIGATION.

Among the large efforts that have the effect of giving steadiness to the agricultural production of the nation at times of threatened adversity is irrigation. This is almost entirely confined to the arid and semiarid regions west of the 100th meridian and to the rice coast of the Gulf of Mexico in Texas and Louisiana, but will move eastward as its value is learned. The area now under irrigation is 11,000,000 acres, or a surface equal to the improved farm land of Georgia, or Virginia, or Michigan, or equal to one-third of the cotton area.

At the census average income per acre, with allowance for subsequent increase of price of products, the value of the crops raised on irrigated land this year would appear to be worth at least $175,000,000, an increase of 75 per cent. over the value of 1899. In 1908 an additional area of 5,000,000 acres will be under ditch and ready for settlement. When this additional area is settled, the total will be 16,000,000 acres. If the new area were at once productive, the irrigated crops of 1908, at the price of 1907, would be worth $250,000,000 or more, and would support a population of over 1,000,000 persons

CORN.

Four fifths of the world's production of corn, as nearly as can be determined, grows in the United States, and in the world's international trade in corn this country contributes one-third to one-half of the exports, not including the products of corn-fed animals. Fears of a failure or a large degree of failure of the corn crop this year diminished after mid-summer and at last the harvest secured 2,553,732,000 bushels, a production that is almost exactly the average of the crops of the preceding five years. There have been three larger corn crops—those of 1899, 1905 and 1906.

In value the corn crop of this year is much above the high-water mark of 1906. On the assumption that the crop will be sold by farmers at an average price not below the present one, its value is estimated to be $1,350,000,000, or 26 per cent. above the average value of the previous five crops. Four crops before had exceeded one billion dollars in value.

The farm value of the corn crop of eight such years as 1907 would pay for duplicating every mile of steam railroads in the United States and pay for their costly terminals, rolling stock, and all property. In 13 years it would replace the present banking power of this country in banking capital, surplus, deposits and circulation, and in 17 years it would replace the banking power of the world.

HAY.

Apparently the hay crop this year is more valuable than the cotton crop. On account of the varieties and qualities of hay its average price is difficult to determine without reports from crop correspondents. The computed value of the 61,420,000 tons of the crop is $660,000,000. The tonnage has been exceeded several times, but the value is $65,000,000 above the highest previous value, that of 1906. Compared with the average of the preceding five years, the quantity of the hay crop of this year is 2½ per cent. higher and the value is 20 per cent. higher.

COTTON.

If the cotton crop of this year does not eventually occupy second place in value instead of hay in the final estimates of the Department, if seed be included, it certainly has third place, even without seed.

The farm value of the 1907 crop of cotton and its seed is estimated to be from $650,000,000 to $675,000,000. The commercial expectations are that the crop will be found to be the third one in size ever raised, and perceptibly larger than the average crop of the previous five years. Its farm value is probably a little below that of last year's crop. Otherwise it will be the most valuable cotton crop ever raised in this country and 7 per cent. above the average farm value of the crops of the previous five years.

The year was a trying one to cotton from planting time to nearly the end of the summer, but even under adverse conditions a crop has been produced that will be sufficient, with the surplus of last year, to meet the requirements of spinners until the next harvest. The fears of a cotton famine that followed the low production of this country in 1901 have not been justified, and in the meantime efforts to make European spinners partly independent of the Upland cotton of the South by aiding the growing of "colonial" cotton have not made themselves felt. Outside of the British East Indies, the production of cotton in the British colonies, possessions and protectorates was 7,553 bales of 500 lbs. gross weight in 1904 and 10,016 bales in 1905. In the French colonies, except French India and Indo-China, 400 bales were produced in 1904; in the German colonies, 1,500 bales in 1905.

Among the strong points of advantage possessed by this country's cotton is the low cost of transportation to market. Recent investigations by this Department indicate that the average cost of transporting cotton per 100 lbs. from farm to local shipping point is about 16 cents; from local shipping point to seaport, about 40 cents; and from seaport to the United Kingdom, about 32 cents; the total being only 88 cents per 100 lbs., or less than a cent a pound.

WHEAT.

Wheat, the fourth crop of the year in value, is deficient in quantity by 5 per cent. when compared with the average crop of the preceding five years. The 625,576,000 bushels produced will be enough for a large per capita consumption, with a remnant of many millions of bushels for export, although not as many as usual. During the last five years the wheat exports, including flour, have averaged 122,411,110 bushels, and during that period 18.6 per cent. of the crops was exported.

Although wheat is 5 per cent. in quantity below the average crop of five years preceding, it is 5½ per cent. above the average value of these crops, or a little over $500,000,000. The crops of three years, 1901, 1902 and 1905, had a slightly higher value than this one.

OATS.

The only large crop to which a great degree of failure attaches this year is oats. Only 741,521,000 bushels were harvested and these were of low quality. In number of bushels this is the tenth oats crop ever grown in this country, and it is 19 per cent. below the average crop of the previous five years.

In value the story is different. Contrasted with the loss of 19 per cent. in quantity is a gain of 26 per cent. in value in comparison with the five-year average; so that this year's crop is worth $360,000,000, or much more than the most valuable oats crop heretofore produced.

POTATOES.

The sixth crop in value is potatoes—292,427,000 bushels, worth $190,000,000. Three potato crops have exceeded this one in size—those of 1895, 1904 and 1906—but it is 2 per cent. above the average of the previous five years. Its value is 26 per cent. above the five-year average.

BARLEY.

Barley has pushed its way upward in production until it is now the seventh crop in value. The 147,192,000 bushels of this year are estimated to be worth $115,000,000. Only the crop of 1906 was larger, and the crop of 1907 is 2 per cent. above the average of the previous five years. The value of barley this year indicates an extraordinary situation, the price per bushel being about double what it was last year, hence the value of the crop is about 85 per cent. above the average of the previous five years.

TOBACCO.

The tobacco crop has declined to 645,213,000 lbs. this year and is smaller than the crops of many years. It is 11 per cent. under the average of the preceding five years, yet the value is the highest ever reached, except in 1906, and is estimated to be $67,000,000, or 16 per cent. above the five-year average.

SUGAR, MOLASSES AND SIRUP.

As farm crops, sugar beets and sugar cane are valued herein as such, except that the cane products are taken into account if the cane is crushed on the farm. The large cane-sugar mill is classed with manufacturing instead of with agriculture; this is to preserve the census basis for comparison.

The farm value of the sugar beets in 1907 and of the sugar cane and sorghum cane and such molasses and sirup as were made on the farm is estimated to be $64,000,000. The sugar-beets value is slightly above the figure for 1906, and is 50 per cent. above that for 1905, and twice the amount for either 1903 or 1904. The farm value of sugar cane, molasses and sirup is estimated to be $33,500,000, which was exceeded only in 1904.

The popular interest in this subject is so large that it is worth mentioning as a manufacturing industry. The raw cane-sugar mill production of 1907 is estimated at 389,000 short tons, with a factory value of $28,000,000, the year 1904 alone exceeding this amount. The estimate for refined beet sugar is 500,000 short tons, worth $45,000,000.

Both kinds of sugar add to 889,000 short tons, worth $73,000,000. When mill molasses and sirup and sorghum and maple products and beet pulp are added, the total value of the ultimate products of the sugar, molasses and sirup industry (the refining of cane sugar not included) in 1907 is $95,000,000.

FLAXSEED.

The 25,420,000 bushels of flaxseed of this year's crop are worth about $26,000,000, the quantity being 5 per cent. under and the value 3 per cent. over the average of the previous five years. The crop of 1902 is the only one that exceeded this one in value.

RYE.

With a production of 31,566,000 bushels, or 4 per cent. above the average of the five previous years, the rye crop has a value of $23,000,000, or 29 per cent. above the five-year average. In three years, going back to 1891, the production has been greater, and the value has been higher in two years, 1867 and 1901.

RICE.

Rice is the twelfth crop in point of value this year and in both quantity and value is the record rice crop. The preliminary estimate is a production of 21,412,000 bushels of rough rice, or 963,540,000 lbs., an amount a little above the great crop of 1904 and 98 per cent. above the average crop of the previous three years. This year's crop is worth $19,500,000 to the farmers, or 36 per cent. above the three-year average.

The exports of domestic rice in the fiscal year following the crop year 1904 were 75,000,000 lbs. of cleaned rice, 4,000,000 lbs. in 1906, and 2,443,000 lbs. in 1907. The imports of rice, less the foreign and domestic exports, were about 64,000,000 lbs. yearly from 1900 to 1903, and about 62,000,000 lbs. in 1904. After the crop of 1904 the tide turned and in 1905 there were net exports amounting to 41,000,000 lbs., followed the next year by net imports of 43,000,000 lbs., and in 1907 of 61,000,000 lbs. The only year before 1907 when the production was greater than the consumption was 1904, and the production in 1907 is greater than in that year. The Department of Agriculture has been helping the rice grower to get better varieties from the Orient, which has changed imports into exports.

BUCKWHEAT.

Buckwheat was a crop of larger production before 1860 than it has been in subsequent years, but it has revived during the last half dozen years. The production in 1907 is 13,911,000 bushels, or 4.7 per cent. below the average of the previous five years, and its value is $10,000,000, or 14 per cent. above the five-year average.

HOPS.

The hop crop has lapsed somewhat from its position in 1905 and 1906. The production of 1907 is estimated at 48,330,000 lbs., or 4.6 per cent. below the five-year average, while the value of the 1907 crop is placed at a little less than $5,000,000, or 29 per cent. below the five-year average.

TOTAL OF CEREALS.

Upon consolidating the seven cereal crops and comparing the production of 1907 with the average of the preceding five years, a loss of 214,000,000 bushels is observed, or 5 per cent. That is, the average of the five years was 4,349,000,000 bushels, and the production in 1907 was 4,135,000,000 bushels. The oats crop was 175,000,000 bushels under the average, and wheat 32,000,000 bushels, while rice was 11,000,000 bushels above, and rye and barley a little above.

Regarding corn as at the average of production and excepting oats, the other cereals show a net reduction below the five-year average of only 18,000,000 bushels, and this in a total production, omitting oats, of 3,393,000,000 bushels, so that the percentage of the net reduction is only one-half of 1 per cent.

In total value the seven cereal crops make a new high record that is above that of 1906 by $296,000,000. The farm value of the cereals of this year is estimated to be $2,378,000,000, or 23 per cent. above the average of the previous five years.

SUMMARY OF CROPS.

In the production of crops the year 1907 has been a good one to all of the people as well as to the farmers. It has averaged with the previous five years after a general balancing of gains and losses. A great fall in oats below the average and much smaller declines in wheat, tobacco, hops, flaxseed and buckwheat have been counterbalanced, and more than that, by increases above the average in cotton, hay, barley, rye, rice and potatoes. This means material commodities and not the value placed upon them.

No such high aggregate of crop values has ever before been reached by farmers as for the crops of 1907. In estimating these, little if any use is made of the high prices before the break in the latter part of October. The present indication is that every crop except hops will considerably, if not very much, exceed in value the average of the previous five years. Extremely large rates of gain are observed for corn, oats, barley, rye, hay, tobacco, potatoes, rice and cotton seed, and the rates of gain would be notable in any ordinary year in the case of wheat, cotton lint and buckwheat.

In the grand total income from his crops of this year the farmer finds himself in better financial condition than before. He reckons his income in ten figures and he is still improving his farm, buying bonds, lending to his neighbors, and putting his money into the vaults of banks.

Wealth production on farms in 1907, as expressed in value, transcended the high record of 1906, which was itself much above the highest amount before reached. In arriving at the total the farm products of the year are estimated in value for every detail presented by the census and at that point in production at which they acquire commercial value.

The grand total for 1907 is $7,412,000,000. This is $657,000,000 above the value of 1906, $1,103,600,000 above that of 1905, $1,253,000,000 above that of 1904, $1,495,000,000 above that of 1903, and $2,695,000,000 above the census amount for 1899.

The value of the farm products of 1907 was 10 per cent. greater than that of 1906, 17 pr cent. over 1905, 20 per cent. over 1904, 25 per cent. over 1903, and 57 per cent. over 1899.

A simple series of index numbers shows the progressive movement of wealth production by the farmer. The value of the products in 1899 being taken at 100, the value for 1903 stands at 125, for 1904 at 131, for 1905 at 134, for 1906 at 143, and for 1907 at 157.

During the last nine years wealth estimated as above explained was created on farms to the fabulous amount of $53,000,000,000.

EXPORTS.

Food and fiber were provided in such enormous quantities in 1906 that a great national surplus went abroad to feed and clothe many millions in foreign countries. High prices helped to swell these exports as expressed in money, and for the first time in the history of the world a country exported agricultural commodities of home production to a value greater than $1,000,000,000.

In the year ending June 30, 1907, the domestic exports of farm products were valued at $1,055,000,000, or $79,000,000 above the high record of the previous year. Four-fifths of these were plant products, and chief among these was cotton, with a port value of $182,000,000, an amount much above the highest value of any former year.

The exported grain and grain products were valued at $184,000,000, the unmanufactured tobacco at $33,000,000, the oil cake and oil-cake meal at $26,000,000, the vegetable oils at $20,000,000, and the fruits at $17,000,000. All were gains over 1906, except the item of grain and grain products.

Animals and animal products were exported to the value of $255,000,000, mostly composed of packing-house products, worth $203,000,000, or only $4,000,000 under the high-water mark of 1906. Exported live animals were valued at $41,000,000 and dairy products at $6,600,000.

IMPORTS.

Agricultural products valued at $627,000,000 were imported in the fiscal year 1907, of which the plant products were $403,000,000, chief among these being sugar and molasses, valued at $94,000,000; coffee, $78,000,000; vegetable fibers, $62,000,000; fruits and tobacco,

each valued at $26,000,000, and vegetable oils, with a value of $15,000,000.

Animals and their products were imported to the value of $224,000,000, with packing-house products, mostly hides and skins, valued at $96,000,000; silk valued at $71,000,000, wool at $42,000,000, and dairy products at $6,000,000.

FOREST PRODUCTS.

Never before 1907 were the year's exports of forest products so valuable as in this year. With an increase of $16,000,000 over 1906, the total of these exports ran up to $93,000,000, of which $52,000,000 was the value of lumber, $22,000,000 naval stores, and $18,000,000 timber.

On the other hand, the imported forest products were valued at $123,000,000, mostly composed of india rubber, valued at $59,000,000; lumber, valued at $21,000,000; gums, not including rubber, valued at $15,000,000; wood pulp at $6,000,000, and unsawed cabinet woods at $5,000,000. The total imports of forest products were valued at $26,000,000 above the total of 1906, which was the highest amount hitherto reached.

The Fort Dodge, Des Moines & Southern Railway.

During November a new electric road operated by overhead trolley was put in operation from Fort Dodge, Iowa, south to Des Moines, 92 miles. This is the Fort Dodge, Des Moines & Southern, which includes part of the Newton & Northwestern, a steam road from Rockwell City, Iowa, south through Boone to Newton, 101 miles; and two new pieces of road, one south from Fort Dodge, the other north from Des Moines. Forty-two miles of the Newton & Northwestern lying almost in a direct line between Fort Dodge and Des Moines were electrified, and two extensions of 25 miles each were built, one from Lanyon, at the northern end of the electrified section of the steam road, the other from Huxley, at the southern end, thus establishing the through line between the two cities.

Local Freight Train; Ft. Dodge, Des Moines & Southern.

Wood Trestle and Bridge at Crossing of Des Moines River near Fraser, Iowa.

This section of Iowa is well supplied with railroads, but they are mostly east and west lines. The new road is crossed by the Chicago Great Western and the Illinois Central at Fort Dodge, the Chicago & North Western at Boone, and the Chicago, Rock Island & Pacific at Des Moines. These three cities are active business and railroad centers, and there has been need of direct railroad connection between them. There has been no direct railroad connection between either Fort Dodge and Boone, or Des Moines and Boone, while other important points such as Ames have not been easily accessible. The Fort Dodge, Des Moines & Southern now makes a through line connecting all these points. Besides the direct local traffic between these three cities, it should get considerable traffic as a distributor of the through traffic of the trunk lines which it crosses. Already joint passenger traffic arrangements have been made with the Illinois Central and the Chicago Great Western at Fort Dodge. The Fort Dodge, Des Moines & Southern will also carry express and freight.

The passenger train service now established between Fort Dodge and Des Moines is based on an average speed of 27½ miles an hour, including 15 regular stops. A maximum speed of 55 miles an hour is frequently made between stations. From terminal to terminal the total running time is 3 hours and 50 minutes, but 6½ miles within city limits consumes 43 minutes of the total running time. The 42 miles between Huxley and Lanyon, the electrified section of the Newton & Northwestern, is covered by all the electric trains in 1 hour and 36 minutes, including seven regular stops. This stretch was generally covered by the steam trains in about two hours.

The electrified section of the steam road was improved for this service, and the extensions are gravel ballasted and equipped with 70 lb. rails. The country is fairly level except near Boone, where the road crosses the Des Moines river. Here the country is rugged. Deep ravines lying at right angles to the river abound. On this part of the line is the maximum grade, 2½ per cent. To get over this grade it was necessary to build a succession of trestles over the ravines along the edge of the plateau above the river. One of these trestles, shown herewith, is one of the longest and highest in the country.

Car Barns at Boone; Fort Dodge, Des Moines & Southern.

High Trestle near Des Moines River West of Boone; Fort Dodge, Des Moines & Southern.

In traffic and operating methods the road uses steam railroad practice wherever possible. There are ticket, baggage, express and freight offices at all regular stations. One-way passenger fares are sold at about 2 cents a mile, while a rate of about 1¾ cents a mile is made for round-trip tickets. Five-hundred-mile mileage books cost $7.50.

The cars are shown in the photographs. They are of the best

interurban standard. Passenger and express cars are similar, each having four 75-h.p. Westinghouse motors and equipments. They are 53 ft. long over buffers and 9 ft. 6 in. wide over sills, which is nearly as wide as a standard steam railroad coach. They are single ended and have locomotive pilots, standard radial drawbars and also M. C. B. couplers. Westinghouse multiple unit control apparatus is used on all cars for operation in trains. Passenger cars are finished inside in mahogany with semi-Empire ceilings and plate glass windows. The seats are upholstered in leather. At one end of each passenger car is a smoking compartment containing eight seats and also a baggage compartment fitted with movable seats. When the seats are filled, the passenger cars weigh about 76,000 lbs.

A turbo-electric plant at Frazer, which is midway between the terminals and on the Des Moines river, supplies the power. Near Frazer slack coal in mined and is a cheap fuel. The power is generated as alternating current and transmitted at 20,000 volts to five sub-stations which are an average distance of about 15 miles apart. At the sub-stations the alternating current is transformed to direct current at 600 volts, which is supplied directly to the trolley wire. All the principal electrical apparatus is of Westinghouse manufacture.

The engineering and electrical construction and equipment of the system were carried out by J. G. White & Co., of New York City. The grading and track work was done by the Northwestern Construction Company. J. L. Blake, General Manager of the Fort Dodge, Des Moines & Southern, representing the owners, had general supervision of the undertaking.

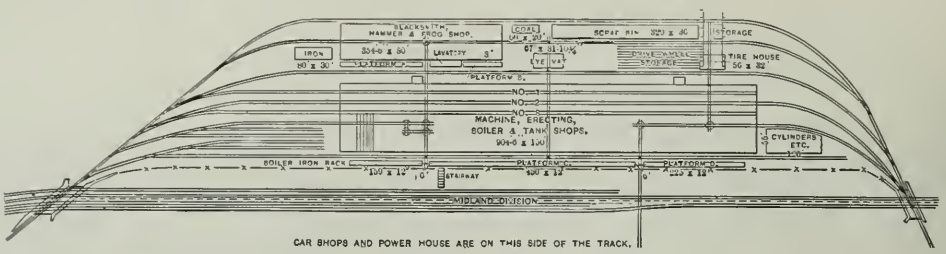
Foreign Railroad Notes.

The Prussian State Railroads have concluded a contract with the German steel combine for their supply of rails and steel ties for the next three years at 120 marks for rails and 111 marks for ties per kilometric ton = $29.02 and $26.84 per ton of 2,240 lbs.

In an address before the German Society of Mechanical Engineers recently, Herr Wichert, an eminent electrical expert, who, with others, had recently returned from a mission to America, to study the application of electricity to transportation, declared that a satisfactory solution of the question of the use of electricity on ordinary railroads has been found only by the invention of the single-phase, alternating-current collector motor.

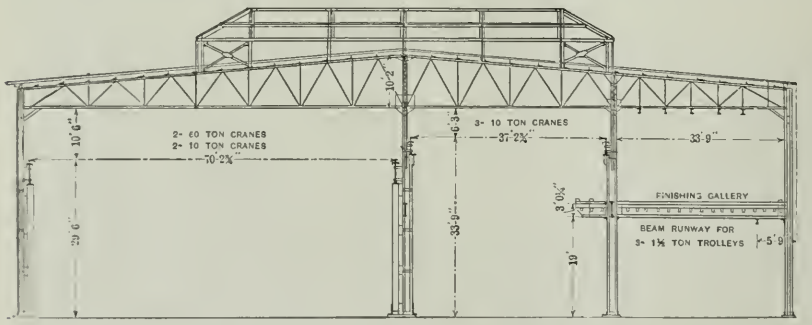
Readville Locomotive Shops; New York, New Haven & Hartford.

When it became necessary for the New York, New Haven & Hartford Railroad to increase its locomotive shop facilities, it was decided that the most suitable location for new shops would be at Readville, Mass., where the main car repair shops of the company were. Such an arrangement would concentrate the repair work, and Readville was in other ways a good location by reason of its being at the junction of two main divisions of the road. Additional property was bought south of the tracks of the Midland division, and the locomotive and car departments united by subways at the east and west ends of the grounds where main line trains pass under the Midland division; also by a subway about the middle of the grounds for pushcar service and foot passengers, and by conveniently located stairways over the Midland division fill. One main entrance serves both departments and the yard tracks of each are connected. One shop superintendent has charge of both departments with a general foreman for each department; the plants are therefore substantially a unit.



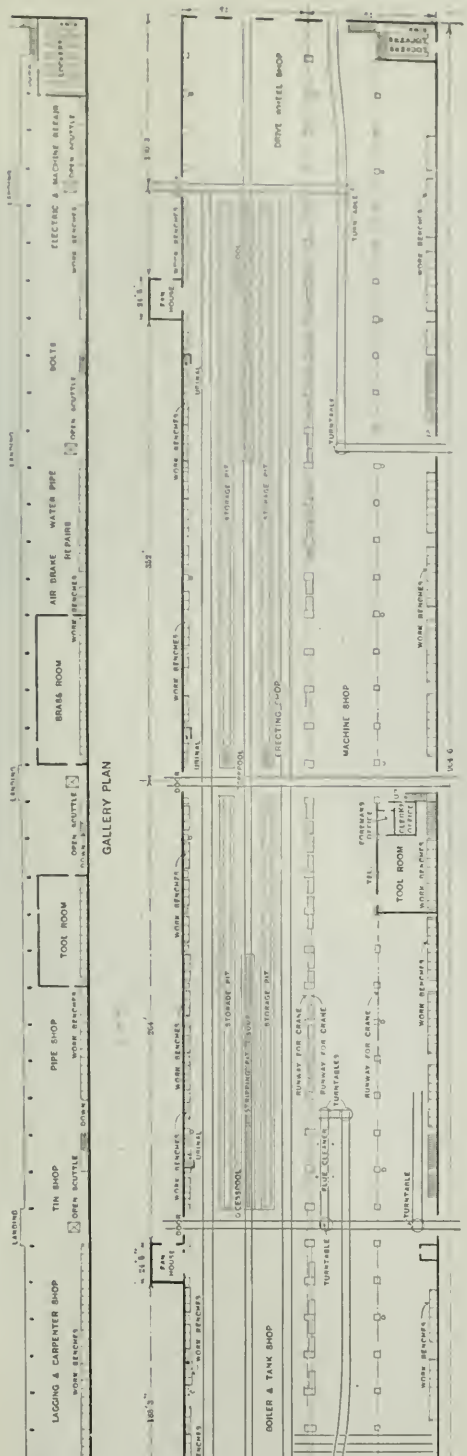
General Plan of Locomotive Repair Shops at Readville, Mass.; N. Y., N. H. & H.

The car shops have been in operation for several years; the locomotive shops have only recently been put in operation. The principal building of the new shop plan is 904 ft. 6 in. x 150 ft., which includes the machine and erecting, boiler and tank shops. The long axis of this building is parallel to the tracks of the Midland division and the building and yard tracks are connected with the main line of the Providence division at the eastern end. By means of a crossover from the Providence division to the Midland division access to the shops from either division is obtained. Other buildings are a blacksmith and frog shop 354 ft. 6 in. x 80 ft., an iron shed 80 ft. x 39 ft. adjoining, a tire house 56 ft. x 32 ft., a lye house 67 ft. x 31 ft. 10 in., and a coal house 60 ft. x 20 ft. In the yard are numerous storage platforms; one 12 ft. wide extending the length of the main building and terminating at the boiler shop end of the building in a boiler iron rack 159 ft. x 12 ft.;



Cross-Section Through Erecting and Machine Shop.

Interior of Erecting Shop; Readville Shops.



Plan of Machine, Erecting and Boiler Shop; Readville Shops.

a platform for cylinders at the opposite end of the building 120 ft. x 55 ft. at its greatest width; a scrap platform 320 ft. x 36 ft. provided with bins for assorted material. Three tracks entering from the east pass entirely through the main building, three others are carried through and along each side of the blacksmith shop and alongside the scrap bins, while another passes between the long platform previously mentioned and the north side of the main building. Adjacent to the tire house is a yard for driving wheel storage.

Locomotive Shop.—A number of features in the design, construction and equipment of the main building are of interest and particular attention has been given to details. The materials are steel, brick and concrete with mill construction and roof covered with five-ply asphalt and gravel. The concrete foundations are carried to a height of 5 ft. from grade, and the sills of the first floor windows are formed directly in this material, no stone sills being used. The concrete floors in the machine shop are laid in squares, although the method of laying is not apparent in the finished floor, the outline of the blocks being formed of a strip of tar paper rising to within ½ in. of the surface and folded underneath the lower edge of the block. All the steel work was fabricated and

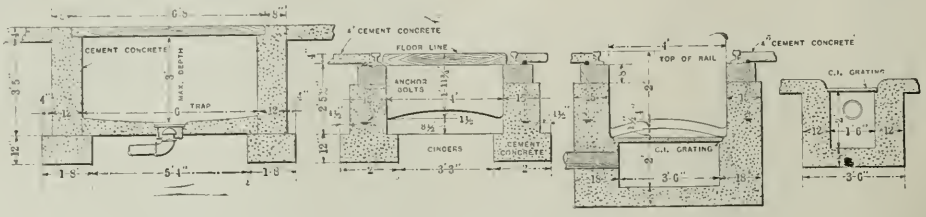
Part Exterior of Main Building.

erected by the New England Structural Steel Company, Boston and Everett, Mass.

The shop was designed to afford facilities for repairing 45 locomotives a month. The erecting shop floor occupies half of the width of the building for about two-thirds of its length, a space approximately 200 ft. long at one end being used for a boiler shop and 100 ft. at the other being used for a driving wheel shop. Stripping pits each 150 ft. long are located at each end of the stripping track, which is the center track of the erecting floor. The stripping pits are flanked on each side by storage pits which extend the whole length of the erecting floor, or about 600 ft., with the exception of a 20-ft. passageway in the middle of the length of the buildings are a blacksmith and frog shop 354 ft. 6 in. x 80 ft., in the engravings. The storage pits are 6 ft. wide, built entirely of concrete with walls 12 in. thick supported on foundations 18 in. wide and 12 in. deep of the same material. At the ends these pits are 2 ft. 10 in. deep and the floors drain longitudinally on a slope 2 in. in 30 ft. to the maximum depth of 3 ft. in the center. The pits are covered with loose 4-in. x 12-in. yellow pine plank and every tenth plank is provided with a pair of heavy malleable iron handles set flush with the surface.

The walls of the stripping pits are of concrete 15 in. thick on foundations 12 in. x 14 in. The walls are capped by 8-in. x 12-in. yellow pine stringers secured by ¾-in. anchor bolts spaced every

6 ft. The space under the floor of the pit, which is raised in the center to a height of 1½ in. in the width of 4 ft. is filled in with gravel and the floors slope longitudinally 4 in. in 50 ft. to sumps covered with cast-iron gratings. The rails resting on stringers extend ¼ in. above the floor level, and the concrete floor is carried against the outside of the rail and under the head, the space between the rails being made concave and sloping longitudinally to bell traps.



Cross-Sections Through Locomotive Pits.

Work benches line the entire outer wall for the length of the erecting and machine floors, and are also conveniently located in bays between center lines of columns. The erecting floor is served by two 10-ton and two 60-ton cranes, each of the latter having

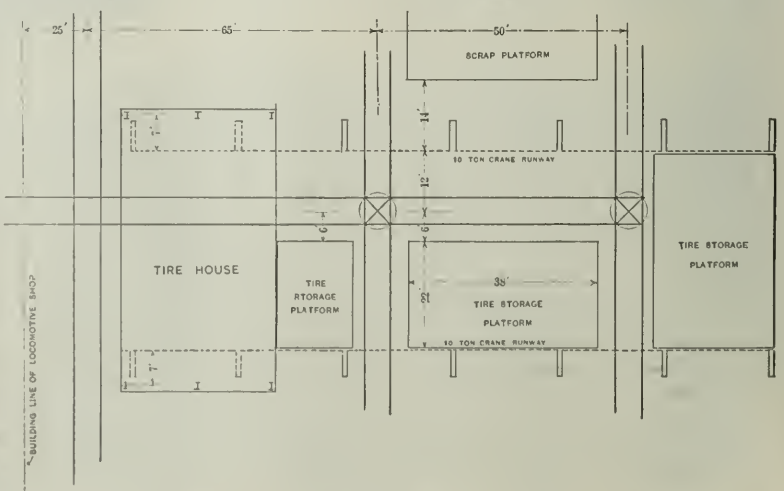
10-Ton Crane and Runway over Tire Storage Yard.

10-ton auxiliary hoists. The 60-ton cranes are located in the middle and those of 10 tons capacity at each end. All cranes throughout the shop were built by the Shaw Manufacturing Company, Muskegon, Mich., and are equipped with G. E. Type M induction motors.

Machine Shop and Gallery.—The machine shop space is divided longitudinally by a row of columns supporting a gallery used for the lighter classes of work. The tool room and brass room are separated from the remaining open space by partitions 12 ft. high, consisting of a wainscot 4 ft. high with crimped wire netting above. Other space is devoted to electric and machine repair, finished bolt department, air-brake and water pump repairs, tin shop, pipe shop, lagging and carpenter shop, etc. Four landings projecting beyond the edge of the gallery are convenient for crane service from the erecting floor cranes. The gallery is also served by the three 10-ton cranes which serve the machine shop floor, and in addition by two 1½-ton electric trolley hoists, built by Maris Brothers, Philadelphia. Three of the same kind of hoists travel under the gallery and run the full length of the machine shop. At convenient distances are located four open hatchways by means of which the upper hoists can drop material through the gallery floor to be taken up by the hoists below and distributed to the benches which line the outer wall. All hoists are electrically operated by induction motors and runways are of single I-beam section. Both the edges of the gallery and the hatchways are protected by a 1¼-in. pipe railing carried on 2-in. pipe supports, the posts at the landings being removable. The hatchways are 8 ft. x 7 ft. 4 in. The gallery floors are of 2-in. x 6-in. spruce laid diagonally on 8-in. x 16-in. Oregon fir joists and covered with 1-in. x 4-in. square-edge maple.

Each end of the gallery floor is provided with a locker room containing 110 lockers with suitable lavatory accommodations, and on the first floor immediately below are rooms similarly equipped with 63 lockers each, while on mezzanine floors are located closets and urinals. The space under the gallery is devoted to department grouping of machine tools, the heavier motor-driven tools being located in the space covered by electric cranes. All motors, both on the gallery and on the floor below, are mounted on steel brackets on the nearest row of columns and not against the side walls, thereby leaving light and space near the benches unobstructed in any manner by belting. The neat and substantial appearance of these brackets, as well as freedom from obstruction afforded by their location, is shown in the illustrations. The brackets differ slightly according to the columns on which they are located, but consist generally of a frame built of channel sections, fastened together by angles and attached to the columns with a plate floor 28 in. x 50 in. and ½-in. thick. Where crane girders interfere, the brackets are braced to the bottom flange of the girder.

A complete scheme of line shafting was worked out by the engineering department before any of it was put in place. The main line shaft is erected in one continuous straight line throughout the whole length of the shop, motor or group sections being on an average 44 ft. long, and provided with flange couplings at the ends, a space of ½ in. being left between the faces of the flanges. In the event of the failure of any motor, it is possible to throw off its belt and by slipping a ½-in. filler between its shaft coupling and the next one, and bolting the two together, the group load can be carried by the motor in the next group. While the group sections are 44 ft. long, each piece of shaft is 22 ft. long;



Plan of Tire House and Storage Yard; Readville Shops.

this feature introduces further flexibility as the section may be divided in the center and half the load distributed to each motor on either side of the one in trouble.

The Sturtevant hot-air system is installed for heating and ventilating the main building. Two fans are located in lean-to extensions on the ground and two more are located on the gallery. The fans are spaced so as to divide the periphery of the building into four equal parts. The main artery of the system is a concrete duct built entirely around the building under the floor in the shop near the outer walls, varying in width from 1 ft. to 2 ft. 6 in. and ordinarily 3 ft. high except where some obstruction made necessary a change in section. Ten manholes afford access to the interior. The underground duct obviates the use of unsightly overhead pipes, and the only parts of the system that appear are the galvanized iron risers next to the outside wall. A novel plan was adopted for making the connections between the duct and the risers. Space was too limited to use the ordinary vitrified elbow, and as a substitute an elbow of No. 20 galvanized iron was used as a form and around this was built a shell of concrete of not less than 2 in. thickness. This elbow was made to project 2 in. above the floor level and on this projection the riser was fitted, the joint then being sealed with a collar of cement. At points where the duct is crossed by the tracks entering the erecting shop the rails are secured to an I beam reinforcement embedded in the concrete cover of the duct. A gravity return from the heating system drains to a receiving tank under the floor of the machine shop and the water of condensation is forced back by a pump to the boiler room. In the boiler shop end of the building is a high-pressure pump capable of pumping up to 300 lbs. pressure and connected with this is a line of extra heavy piping along the center and side columns for use in testing boilers.

The tool room on the gallery is a manufacturing tool room only, and the corresponding room on the ground floor is for issue, dressing and grinding tools. A central station for a complete shop telephone system of 51 extensions is located in the distributing tool room. The installation of the telephone system with switchboard in the tool room and stations at numerous points saves the time required for mechanics to go to the tool room for tools. When any special tool is required the mechanic calls for it by telephone and the tool is sent by messenger, who takes a check for it.

Interior of Blacksmith Shop at Night, Showing Illumination.

All tool-dressing is done in the tool room and not in the blacksmith shop, a suitable forge and power hammer being provided for the purpose. Cast-iron boxes in the floor between the tracks of the erecting shop are provided for the attachment of hose to the air-pipe system and a large number of portable lathes, forges and rivet furnaces as well as electric drills are in daily use on the erecting floor and in the boiler and tank shops. Twenty portable forges were recently supplied by the W. N. Best American Calorific Company, New York, to these shops.

Good provision has been made for natural lighting in the new shop building. The windows are large and set close together, especially along the sides. Each bay of 22 ft. between pilasters contains two sets of triple sash, the second floor windows being 15 ft. 8 in. x 13 ft. $1\frac{1}{2}$ in. (three sections of 50 10-in. x 14-in. panes). The lower windows are 15 ft. 8 in. x 17 ft. 8 in. and consist of three pairs of sash each containing 60 10-in. x 14-in. panes. Over each alternate bay in the roof is a skylight of ribbed glass and the lighting is further improved by the white paint of the interior.

Artificial lighting in high bays, over erecting floor and in the yard is by series arc lamps with Nernst four and six blower lamps for general illumination over and under the gallery and along the central row of columns. On the outside walls over the benches Faries articulated fixtures with incandescent lamps are used and each machine tool is provided with an incandescent lamp. A plentiful supply of Chapman light sockets is provided, along the center line of columns, outer walls and in the pits.

Tire House.—A useful adjunct to the locomotive shop is the

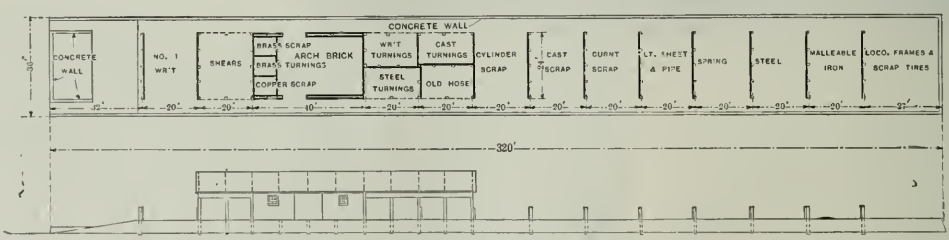
Motor Bracket on Intermediate Column.

Riser from Heating Duct.

tire house with its adjacent yard for the storage of mounted driving wheels. This is located next to the section of the main building in which the driving wheel work is done and is a fireproof building of corrugated steel. It is equipped with a 10-ton traveling crane which operates within and outside of the building over the tracks in the yard. It contains also a Ferguson oil furnace supplied by the Railway Materials Company, Chicago, and of a sufficient capacity to heat a nest of eight tires at one time. For the removing tires on a pair of mounted wheels the crane supports them in the ordinary fire on the floor until sufficiently heated.

The lye cleaning house is a separate structure. There are two lye vats and two draining platforms. The vats are 18 ft. 8 in. by 10 ft., inside dimensions, and the least depth is 7 ft., the bottom sloping 4 in. in 20 ft. Each pit has a concrete platform having a similar slope and covered with a grating of 3-in. x 6-in. yellow pine strips spaced 2 in. apart on a frame of 4-in. x 4-in. spruce joists. The floor not occupied by pits and platform is of macadam. The walls of the pits are 18 in. thick and the floor is 9 in. thick, of concrete. The walls of the pits were waterproofed with soft soap and alum solution. It has been found, however, that the oil from the greasy parts which were dipped into the lye has been absorbed by the walls to such an extent as to increase the waterproofing. The usual steel tank inside of the lye pits has therefore been omitted. The space afforded by the tanks, cleaning and draining floors is ample and the usual litter around this department is not in evidence. The service track passes through the middle of the house between the two sets of pits and platforms.

Blacksmith and Frog Shop.—The blacksmith shop, one end of which is fitted up as a frog shop, is unusually light and fully equipped with ventilating apparatus. The tool equipment includes McCaslin forges, Ferguson furnaces, etc., and an extension, 68 ft. 6 in. long x 15 ft. 4 in. wide, is devoted to locker and toilet rooms.



Plan and Elevation of Scrap Storehouse and Platform; Readville Shops.

The monitor roof is provided with swinging sash and louvres. All sash is p voted and arranged to operate from the floor. Service tracks extend through the middle of the building longitudinally and transversely.

Platforms.—Reference has been made to the platform space in the yard and the dimensions of the principal ones have been given. These are all built with concrete walls and floors with a gravel filling. The arrangement and construction of the scrap platform is shown in the illustrations. The covered scrap bins occupy 100 ft. of the length. The roof of this part is three-ply Paroid roofing and the doors are hung on Coburn trolley hangers. The open space is divided into spaces 20 ft. wide for the various classes of scrap.

The yard also contains a fuel oil storage tank in the form of a depressed covered pit containing steel tanks into which the oil is taken by gravity. Oil is drawn from the tank by means of a pump provided with a pressure regulator and the oil is distributed at a fixed pressure to all parts of the shops and is shut off automatically at a fixed pressure. The system is so arranged that at night or when the furnaces are not in operation all oil in the pipes returns by gravity to the tank.

Adjacent to the blacksmith shop is the iron shed provided with the usual rack space and room for weighing and cutting at the ends. The coal shed has a concrete floor throughout and is divided into spaces for coke, charcoal and coking coal.

Power House.—The power house is on the car shop side of the plant, and originally was a sub-station taking current from a power station belonging to the railroad company at Hyde Park, one mile away. The boiler plant which was added consists of five 400 h.p. Babcock & Wilcox boilers, four of which are equipped with Roney stokers, one being reserved for burning shavings, etc. They are provided with Sturtevant economizers and operate under induced draft. The original chimney still remains, however, and provision has been made by which the economizers can be bypassed and induced draft used or both by-passed and natural draft used. The equipment includes Hancock injectors and Warren-Webster feed water heaters, open type. There are two Worthington duplex outside center-packed plunger feed-water pumps, each having a sufficient capacity to supply water for the entire plant. In process of installation is a coal handling system with a clam-shell bucket working on a single I-beam trolley. This is supplied by the Whiting Foundry & Equipment Company, Harvey, Ill. This will handle coal from the storage to the stokers and will also be used for the removal of ashes, the apparatus being electrically operated.

In the engine room are three 400 k.w. G. E. a.c. generators, 25 cycles, 600 volts, direct-connected to three 600 h.p. cross-compound non-condensing Hamilton-Corliss engines equipped with Locke safety stops; two G. E. exciters direct-connected to 90-h.p. Watertown engines; one Franklin cross-compound air compressor having a capacity of 1,700 cu. ft. of free air per minute, supplied by the Chicago Pneumatic Tool Company; two Franklin compressors of 1,100 cu. ft. capacity each; three Brush dynamos for series arc lighting

The switchboard is equipped with a Tirrell voltage regulator, station watt-meter and separate lighting watt-meter together with a full complement of volt-meters, ammeters, switches, etc. The car-shop transfer table was formerly operated with a direct-current motor, but this and the motor generator set have been removed and an induction motor installed. In the process of remodelling the power-house equipment for present purposes all 60-cycle transformers for lighting were removed and 25-cycle transformers installed. As a result of these changes all electric apparatus on both the locomotive and car-shop side now operates on three-phase, 25-cycle alternating-current, power voltage being 550; Nernst lamps 220 volts, incandescent lamps 110 volts.

All steam pipes between buildings are encased in Wyckoff sectional covering and are carried underground. As an interesting detail may be mentioned the color scheme in the various piping systems in the locomotive shop. The colors and their significance are as follows: White, high-pressure steam; yellow, exhaust and low-pressure steam heat; black, water, including boiler feed and feed water heater; green, air; blue, drip and return, including the Holley system; red, fire service.

All wiring, switchboard and pipe work and the installation of the Holley system were done by Westinghouse, Church, Kerr & Co., H. C. Pond, engineer in charge, under the direction of the railroad company. All wiring is overhead and is carried across the Midland division in tile conduits built into the concrete arch, affording access from one side to the other.

E. H. McHenry, Vice-President, has had general supervision of the design and erection, and F. K. Irwin, Constructing Engineer, was in charge under Mr. McHenry. S. Higgins, General Manager, and the mechanical superintendent assisted in the consultation with reference to the general scheme and in the selection and arrangement of machinery. C. A. Dodge & Co., Boston, were general contractors, and Babcock & Wilcox had the contract for the boiler room, including all apparatus except the coal-handling plant.

The Japanese Railroad Commission reports that there were in the country March 31, 1907, 4,783 miles of railroad, of which 1,532 miles belonged to the state. During the year previous 89 miles were added to the system, and at the end of the year work was progressing on 821 miles more. The average cost per mile of the completed roads has been $43,056. The train service was at the average rate of 10.4 each way daily, and the average number of cars per train was 15.8. The traffic amounted to 2,505 millions of passenger miles and 1,352 millions of ton-miles, which is at the rate of 717 passengers and 387 tons each way daily. (In this country 154 passengers and 1,318 tons.) Thus there is 4⅔ times as much passenger traffic per mile in Japan, but not one-third as much freight traffic as here. The gross earnings per mile in Japan were $7,309; the working expenses, $3,404, and the net earnings, $3,905. Here the contrast with the results in this country are striking. Our railroads earned per mile $3,151 *more* gross, but $357 *less* net, owing to the fact that working expenses were $6,912 per mile here against $3,404 in Japan. The Japanese net earnings were 9 per cent. on the cost of the roads. The number of employees was 73,754, which is nearly 15½ per mile against 6.9 here.

Retirement of James F. Jackson.

On Nov. 30, James F. Jackson retired from the chairmanship of the Massachusetts Railroad Commission in order to be able to devote more time to his private business. In these days of radical and half-baked action by the state commissions it is pleasant to turn to the intelligent and efficient work which has been done in Massachusetts, and the retiring chairman of the board of commissioners has been a worthy successor to Charles Francis Adams, Jr., in his own policies as well as in his efforts to carry out the long established principles of the commission since its earliest days. The Massachusetts commission is endowed with full police powers; in other matters it works with publicity and suggestion as its tools, and its opinions and decisions, carefully made, carry with them such weight of public opinion that they have nearly the force of statute, and can usually command new legislation.

We take the following comment on Mr. Jackson's administration from a careful review published in the *Springfield Republican*:

Those who have watched the administration of Chairman Jackson realize what his decision to resume the practice of law means to the state. It has been evident in watching his conduct of hearings and in reading the orders and other decisions of the board, that he has aimed to be absolutely impartial between the corporations and the public. He has laid down certain principles and tried to supervise the roads—both steam and electric—in accord with them. During his administration many new deliverances have been made and these few years have been of large value to the people. Quite a development of railroad and railway law has occurred. Not only has the commission laid down principles of action, but it has had a share in the passage of legislation. It has continued to keep Massachusetts at the head of the development in the relation of the public to their transportation servants and its reports are in wide demand all over the country, and in foreign countries on the part of governments and of individuals.

James F. Jackson.

Chairman Jackson has been particularly careful and painstaking in the drafting of the orders and other decisions of the board. His writings have struck out new lines of practice and they have been followed with precision. He has the remarkable fact to his credit that not a single decision which he has made, not a single principle of administration which he has formulated, during his whole eight years in the chairmanship, has been set aside by any court. Not only that, but each party in the transportation field, the corporations and the public, has accepted his decisions as good law and good sense and have lived up to them as embodying substantial justice for both parties. Many new questions have arisen where new precedents had to be set. He has been very thorough in his study of separate subjects, in order that the body of principles he was building up should not only be the best for their special cases, but should be consistent with each other throughout and make a harmonious whole upon which future action could be taken with assurance that the principle was sound in both theory and practice.

Chief Justice Knowlton of the Supreme Court once said to a legal friend that Chairman Jackson's decisions were remarkable for their inclusion of the essentials and their omission of the non-essentials. Plenty of evidence of this trait will be found running through the decisions printed in the annual reports of the board. It has been the aim to be guided only a little by technicalities, but largely by the general principles at issue. This element, too, will be found abundantly in the decisions in the annual reports.

A further principle of general policy has been co-operation with local authorities, and not antagonism to them in the settlement of local issues, with clearly marked distinction between state policies and matters of purely local concern. This grows out of the supremacy given by recent law to the board over the local authorities, in order that there might be uniform application of the same principles all over the state. Subject to these general principles the board has regarded the local authorities as largely as possible, and the consequence has been harmonious working together of the board with city governments and selectmen. In numberless cases the board has acted as advisor rather than supervisor in adjusting questions between selectmen and street railway management.

The Massachusetts anti-stock watering laws have been carefully guarded in spirit and letter. Western Massachusetts will remember the defeat of the proposed legislation to permit the western Massachusetts street railway company to secure special privileges that would have overthrown fundamental principles of an anti-stock-watering nature. Another illustration is where the board was instrumental in the defeat of the proposition of the Boston & Maine Railroad in trying to get authority to capitalize the purchase price of street railways, where such price might include value of franchise and of earning capacity. Besides these conspicuous instances, the board is giving illustrations constantly on a smaller scale in its decisions regarding the issue of stock and bonds by railroad and street railway companies. The spirit of the law has never been violated.

Massachusetts leads in the use of block signals. An illustration of the force emanating from the board is seen in the case of the disaster two years ago at Baker's bridge, near Concord, resulting in a thorough overhauling of the system on the Boston & Maine, involving the expenditure of a large amount of money. The board has urged similar action upon other railroads.

In regard to the service the companies must render the public and which the public can demand from the companies, the writer has heard it stated over and over again at hearings—and the same principle is embodied in repeated decisions—that capital has a right to a reasonable return; that private persons cannot reasonably be expected to put their money into a means of serving the public and be expected to perform the service at constant loss. A company is justified in charges sufficient to yield a reasonable dividend upon the investment. On the other hand, the franchise is given by the public in order that the public may be served. Therefore a company is not justified in cutting off a particular train or car because it is unprofitable taken by itself. But if it serves a public need, and the company, considering all its income, can perform the service, it must do so. Necessities of transportation must be provided as far as possible. But when it comes to giving the public luxuries, then it is a question how far the income justifies it.

During this administration the powers of the board have been increased in respect to the elimination of grade crossings, and have been extended over street railway locations and over methods of constructing and operating street railways. Recent laws also give authority over steamships and express companies. In practice but little has been done under this law, but it is a fair presumption that the same principles will be applied as hitherto in the regulation of transportation companies. Special duties have been imposed upon the board from time to time, showing the confidence of the Legislature and its readiness to use the board as a sort of public utility commission. It was put in charge of the construction of the new bridge between Fall River and Somerset. It has supervisory powers over the construction of the Cape Cod canal, and at the last session of the Legislature it was given the determination of questions affecting important public improvements in Springfield. The board, further than this, has been many times consulted by the committees on railroads and street railways, officially, as well as by members of the Legislature individually, in regard to pending

legislation. Some particular measures of high importance are as follows: In 1901 the board recommended the 500-mile mileage book. This was adopted and put in force by all the railroads. The next annual report said: "This was a step toward bringing about a rate of two cents a mile for long distance travel. Under continued conditions of prosperity such standard charge is to be expected at an early day." Under the lead of President Mellen, of the New Haven road, the board's suggestion of a standard rate of two cents a mile has been carried out. Discussing a reduction of rates the board said: "It is at times necessary to make demands upon companies which involve a possible loss of revenue in order to secure what is due to the public. This should be done, however, only after careful inquiry and study of consequences. Any policy which jeopardizes the prosperity of a company through reckless interference with earning power is as unfortunate for the public-at-large as for the stockholders."

As to workingmen's fares, the board after an investigation in England and in this country, established the state policy that such fares rest not upon class distinction, but upon business principles, saying: "This question is a business problem to be solved upon business principles and not one of enforced contributions to a public charity, either from the railroads or from the more prosperous to the less prosperous part of the community. The true ground for a cheap morning and evening service is the fact that daily travel between home and place of business at fixed hours affords the carrier the most favorable condition for economical operation, and therefore entitles those who so travel to the lowest fares which are consistent with a reasonable return upon capital."

The board has consistently favored a monopoly in the street railway service of a large municipality. It applied that principle in Boston and later in Springfield. As stated in the decision in the Springfield case: "A monopoly in local street railway service under proper supervision should give the public a better service than the efforts of contending companies in infrequently struggling to keep alive enterprises which ought never to have been undertaken. Under our laws such a monopoly is founded upon statutes which protect the public interests by making street railway locations not only subject to supervision, but to revocation for cause, practically, therefore, dependent upon good behavior of the company."

Malay Railroad Projects.

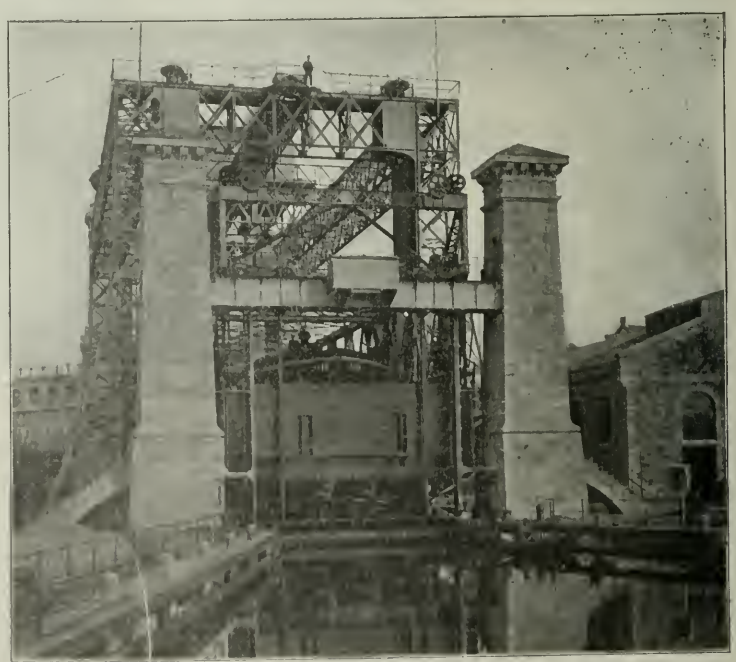
The Federated Malay States Railways are about to build a line from Gemas, Negri Sembilan, to Kuala Semantan, Pahang. The permanent survey has been made, construction authorized, and work is to be started almost immediately. It is difficult to over-estimate the importance of having railroad communication in a state like Pahang, which is still almost entirely undeveloped, where distances are great, and where the mineral and agricultural possibilities are admittedly promising. This road, together with the 150 miles of trunk line now under construction between Benta and Kuantan, will pass through and throw open a large area of hitherto practically unknown and inaccessible country, valuable for mining and plantations. The line is about 70 miles long, and up to December 31, 1906, $44,482 had been spent on its survey. At that time over $7,560 had been spent on railroad surveys in Pahang. These included a trial survey from Kuala Semantan, the terminus of the Gemas line, to Kuantan. This line will be a little over 76 miles long, and is estimated to cost $4,635,368. Another trial survey was made from Kuala Semantan to Lipis, via Kuala Tembeling, 47 miles. This line, if built, will tap the Tembeling Valley midway between Lipis and Temerloh, and will open up a large area of agricultural land. A survey was also finished last year, at a cost of $10,000, from Kuala Semantan to Lipis via Bentong, on the Pahang trunk line, to Kuala, 58 miles. This line will not go nearer than eight miles to Bentong, which will have to be reached by a branch from Kuala Semantan.

The Ship Lift on the Dortmund-Ems Canal.

At the present moment when so much interest is being taken in large canal construction schemes in several countries, it is of interest to show views of an important piece of work that was carried out a few years ago on the Dortmund-Ems canal—the ship lift, situated near Henrichenburg.

The highest level of the canal between Munster and Herne is situate about 192 ft. above the mean level of the North sea, and this difference of elevation is met by a series of locks. The section from Munster to Herne is about 42 miles long, and it crosses the Stever and Lippe rivers by strongly built aqueducts. The industrial town of Dortmund is connected with the canal, and therefore with the North sea ports, by means of a 10-mile branch canal to the highest level. There is a difference of elevation at the junction of this branch with the main canal of from 45 to 52 ft., according to conditions, and instead of employing a series of locks this difference is overcome by means of the ship lift near Henrichenburg. In this way delays are avoided, and several additional locks would also have involved the consumption of great quantities of water.

View in the Trough During Construction of Ship Lift.



Transfer of a Vessel from Upper to Lower Level.

The apparatus, as built by Haniel & Lueg, of Dusseldorf, con-

sists of a vertical floating lift with several submerging floats, by means of vertical cylinders standing in single wells, with parallel guidance on the Jebens' system for the trough, by vertical and revolving screw spindles.

The movable tank is filled with water, and in it the vessel can be lifted or lowered. There are five floats which entirely submerge in five shafts which are completely filled with water. These floats are connected to the water tank by built up columns. The floating

Shafts for Ship Lift While Being Built.

capacity of the five floats, which is always constant, is exactly equal to the weight of the water tank. The result is that the weight of the tank moves up and down at any height without the expenditure of power.

A screw gear is connected with the "trough" to regulate the movements as required. Four screw nuts are secured to the trough and move over four strong screw spindles, which are connected to a common gear, whereby the trough is moved up or down. The screw spindles and their neck bearings are of such dimensions that the whole weight of the trough, or even the whole lifting power of the floats, can if necessary be borne by them.

The trough is closed at each end by a vertical lifting gate, having at its periphery a ledge of rubber jointing which rests against a ledge projecting inside the trough. Similar gates separate the canal levels from the lift. In order to open the gates, when the trough is in the correct position against the level, the corresponding gates of the level and the trough are coupled and lifted together. The gates can only be lifted if the trough is in the exact position; otherwise the gear is locked. The trough cannot be moved unless the gates are closed.

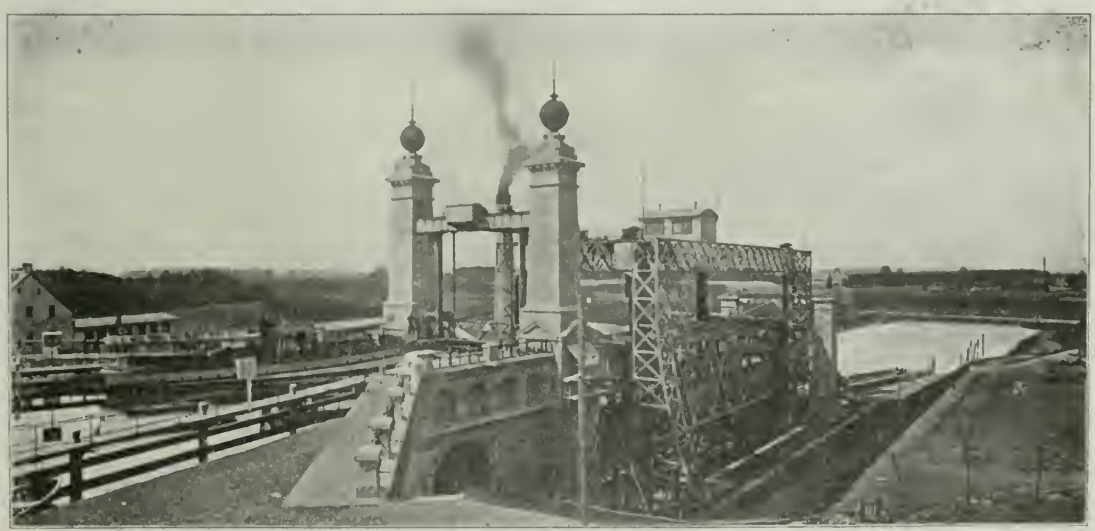
As to the capacity of the lift, the vessels to be transferred have the normal burden of 600 tons. The length of the largest regular vessel is 223 ft., breadth of hull 25 ft., with a draft of 5 ft. 7 in. The vessels are transferred over the lift afloat. The depth of water in the trough under ordinary conditions is 8 ft. 2 in., so that with the greatest immersion there is still ample water beneath the vessel. Therefore when necessary a burden of 1,000 tons can be borne. The speed of the trough in the vertical ascent and descent is about 4 ft. per second. The weight of the filled trough, its supports and five floats is 3,100 tons.

The large screw spindles of the gear for regulating the ascent and descent of the trough are driven by an electric motor, and all other movements of the lift are done electrically, such as the lifting devices for the lift gates at the divisions of the trough and levels, also the capstan for handling the vessels in and out of the trough. There is a special generating station from which the necessary electric power is obtained. In the case of self-propelled steamers, such as passenger vessels, one can be transferred from one level to the other in from four to five minutes, during which it has gone some 100 to 150 meters of its journey. Heavy vessels which have to be hauled in and out by capstan occupy 12 minutes.

We understand that it has been found possible in 21 working days of eight to ten hours each, to effect 600 single transfers.

The working expenses for a single transfer amount to two to three shillings (average), reckoning that the full use of the lift is required. The cost of the undertaking was approximately $625,000.

The Shantung Railroad, which is 271 miles long, on the average ran 2.5 trains each way daily in 1906, the regular service being two mixed trains daily, and the remainder consisting of special,



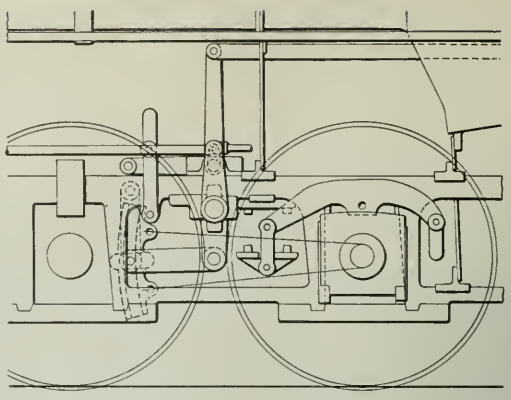
Henrichenburg Ship Lift, from Upper Level.

extra and work trains. The average train had 34½ axles, and more than two-thirds were under freight cars. The average passenger movement was 786 each way daily, and the average freight movement 237 tons each way daily. Of the total 419,814 tons of freight shipped, 54 per cent. was coal, 9½ per cent. beans, and 6⅔ per cent. cotton. The road passes through a densely peopled district, and

the small amount of freight, aside from coal, indicates that the Chinese have not yet learned to use the line. The gross earnings were $1,084,448 in our money, or $4,002 per mile. Of this amount 42 per cent. went for working expenses, leaving net $2,321 per mile, which is moderate interest on the cost. The road has 481 employees, all but 57 of whom are Chinese. There is a considerable number of railroads in China, and there will certainly be a great many more; but it is not often that we have definite reports of their traffic and earnings.

Locomotives for South Manchurian Railroads.

The Baldwin Locomotive Works have recently built for the South Manchurian Railroads 20 consolidation locomotives for freight service and two steam inspection cars. These engines are of the standard 4-ft. 8½-in. gage and were built to American designs throughout. The consolidation locomotives will be used on a section of the line, where the grades are 1 per cent. and where the curves are of 990 ft. radius, or of about 5 deg. 45 min. The cylinders are single-expansion with slide valves, which are driven by the Stephenson link motion. As will be seen by the engraving the link itself is set well ahead and up close to the second driving axle, in order to secure as great a length of eccentric rod as possible, and then a short transmission bar is used to deliver the motion back to the rocker, which is set between the main and second drivers where there is a space to receive it.



Link Motion of Consolidation Locomotive; South Manchurian Railroads.

The boiler is straight topped with a wide firebox which is supported by buckle plates at each end. The equipment includes automatic air-brakes, the Le Chatelier water brake and steam heating appliances. The engine truck and tender wheels are of rolled steel.

The inspection cars are each carried on a four-wheeled passenger car truck at the back end, and on a single pair of driving wheels and a two-wheeled leading truck at the front end. The leading truck is of the Rushton type, and is equalized with the driving wheels. The frames which support the boiler and machinery are of the usual bar form and are held in rigid alinement with the car body. The boiler is reversed in position, having its firebox over the truck, while the steam pipe passes out through the back head. On emerging it curves out and passes down on the left-hand side of the fire-door, returning again to the center line below it and ending in a tee from which branch pipes lead out on either side, to cast elbow connections bolted to the saddle just inside the frames, from which there is a passage of the ordinary type to the steam chests. This arrangement of placing the cylinders at the firebox end of the boiler requires the use of a rather long exhaust pipe; one that extends the whole length of the firebox and shell to the smokebox. It is, however, comparatively free from bends.

The operating mechanism is conveniently located at the forward end of the car, and the enginemen have an unobstructed view through the front and side windows. The coal box is placed on the left-hand side. It is 17 in. wide by 2 ft. high and 8 ft. long, and has a hinged cover extending its whole length. The capacity is about 22¾ cu. ft., or a storage for a little more than a half ton of coal. The water tank is suspended from the body back of the engine frame, and extends the full width of the car, having a capacity of 875 gallons. It is filled by a funnel extending up through the roof.

Air sanding devices are applied to the driving wheels and air-brakes to both the driving wheels and those of the rear truck.

The car bodies were built by the Pennsylvania Railroad. They have a timber frame measuring 36 ft. long over the end sills and 9 ft. 9 in. wide over the side sills. The rear truck is of the usual construction, having a wheel base of 7 ft., with chilled wheels 33 in. in diameter. The passenger compartment is handsomely fitted up, and is furnished with eight arm chairs. The lighting throughout is by electricity and steam heating equipment is provided. The

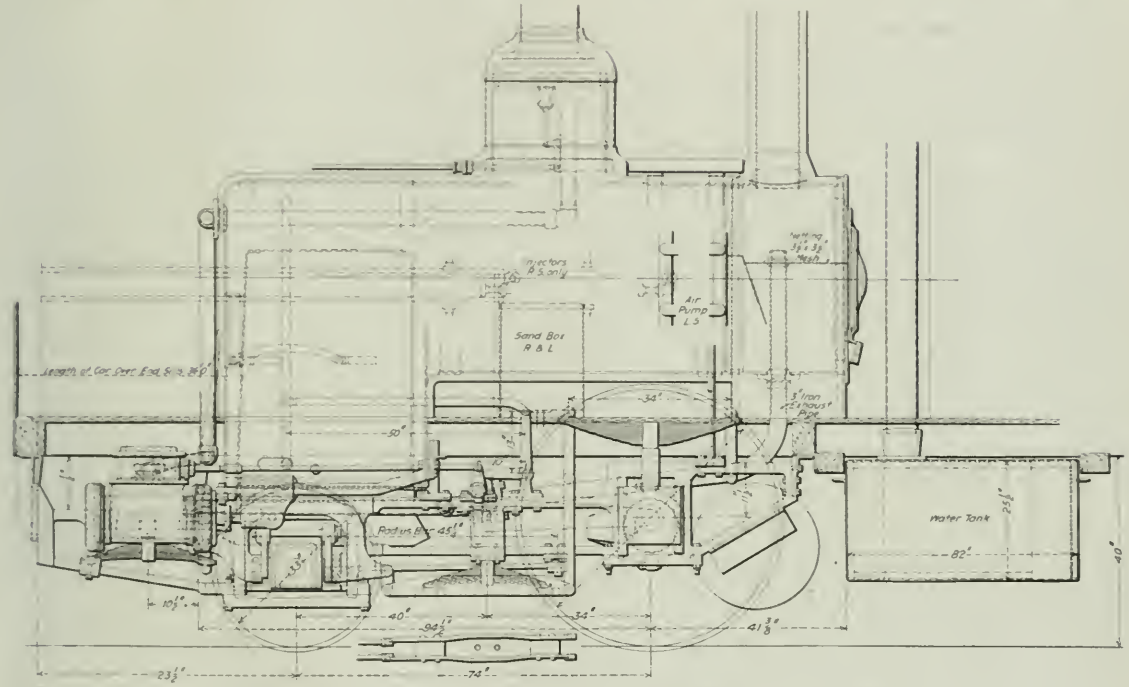
Consolidation Locomotive for the South Manchurian Railroads, Built at the Baldwin Works.

Inspection Engine for South Manchurian Railroads, Built at the Baldwin Works.

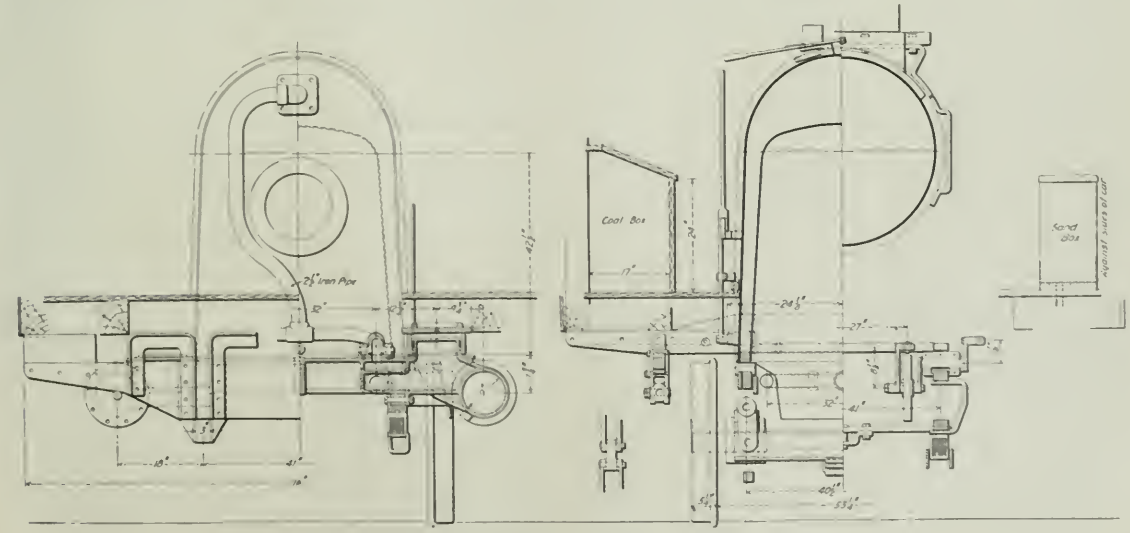
equipment includes automatic couplers and iron pilots at each end

The following are some of the principal dimensions of these engines.

	Consolidation	Inspection
Cylinder diameter	21 in.	9 in.
Piston stroke	28 "	10 "
Boiler diameter	74 "	40 "
Boiler, thickness of sheets	5/8 "	1/4 "
Working steam pressure	180 lbs.	160 lbs.
Fuel	Soft coal.	Soft coal.
Firebox, material	Steel.	Steel.
" length	101 1/16 in.	30 1/16 in.
" width	65 7/8 in.	38 1/4 in.
" depth, front	73 1/8 "	49 1/2 "
" depth, back	64 3/8 "	49 "
" thickness, sides and back	5/16 "	1/4 "
" " crown	5/8 "	5/16 "
" " tube	1/2 "	1/2 "
" water spaces	4 "	2 "
" water spaces, throat	"	2 1/2 "
Tubes, material	Iron	Iron
" number	340	144
" diameter	2 in.	1 1/2 in.
" length	14 ft. 6 in.	5 ft. 6 1/2 in.
Heating surface, firebox	173 sq. ft.	51.6 sq. ft.
" tubes	2,610 "	308.4 "
" total	2,783 "	360.0 "
Grate area	46.6 "	9.6 "
Wheels, diameter, driving	54 in.	54 in.
" truck	33 "	33 "
" tender	33 "	33 "
Journals, main driving	9 1/2 x 10 in.	5 1/2 x 8 in.
" trailing, driving	9 x 10 "	"
" engine truck	5 1/2 x 10 "	4 x 8 in.
" tender	5 x 9 "	4 1/2 x 8 "
Wheel base, rigid	15 ft. 4 in.	6 ft. 2 in.
" engine	23 " 8 "	28 " 3 "
" engine and tender	55 " 9 1/2 "	
Weight on driving wheels	148,800 lbs.	25,400 lbs.
" front truck	20,200 "	23,200 "
" total engine	169,100 "	48,600 "
" engine and tender	270,000 "	72,600 "
" back truck		24,000 "
Tank capacity, water	5,000 gals.	875 gals.
Tank capacity, coal	10 tons	
Tractive effort	32,700 lbs.	3,264 lbs.



Longitudinal Section of Inspection Engine; South Manchurian Railroads.



Cross Sections at Waist and Cylinder; Inspection Locomotive.

Weight on drivers / Total weight	=	4.55	7.78
Tractive effort / Total weight	=	5.17	21.63
Tractive effort / Tractive effort x diameter drivers	=	634.5	489.58
Heating surface / Heating surface	=	59.72	37.44
Grate area / Firebox heating surface	=	62.1*	14.33
Total heating surface / Weight on drivers	=	53.49	70.55
Total heating surface / Volume two cylinders in cu. ft.	=	11.22	1.18
Total heating surface / Volume of cylinders	=	248.04	305.08
Grate area / Volume of two cylinders	=	4.15	8.14
Tube heating surface + firebox heating surface (Vaughan formula), sq.ft.	=	686.84	127.0
Total equated firebox htg. surf. sq.ft.	=	859.84	178.6
Total heating surface / Total equated heating surface	=	3.24	2.02

*Per cent.

Football Travel on the New Haven Road.

The annexed tables give returns for passenger travel on the New Haven road on the day of the Yale-Princeton football game Nov. 16, 1907, as well as comparative tables of receipts for corresponding games and for the Yale-Harvard games of 1904 and 1906, some of which have never heretofore been printed. The figures are official.

YALE-HARVARD FOOTBALL GAME SERVICE NOV. 16, 1907.

Trains from New York.

Train.	Left New York.	Arrived New Haven.	Cars in train.	Passengers.
Special A	7:55 a. m.	9:51 a. m.	12	551
" B	10:01 "	10:58 " (Stmfrd)	10	263
" C	8:58 "	10:52 "	12	858
" D	9:15 "	11:01 "	12	920
" E	9:36 "	11:29 "	12	848
" F	10:50 "	11:55 " (Stmfrd)	12	726
" G	9:51 "	11:45 "	12	915
" H	10:05 "	11:52 "	12	989
" I	10:20 "	12:00 noon	10	287
" J	10:29 "	12:14 p. m.	10	290
" K	10:24 "	12:22 "	10	315
" M	10:31 "	12:25 "	12	966
" N	10:40 "	1:06 "	10	322
" O	10:45 "	12:55 "	10	440
" L	10:41 "	1:00 "	12	798
Emergency	10:58 "	1:16 "	12	730
Emergency	12:22 p. m.	(Bdgprt) 12:46 "	10	401
Princeton team	10:00 a. m.	(Norflk) 12:29 "	2	33
Special	10:30 "	(Wtrbry) 11:54 a. m.	8	441
" R	10:25 "	(Hrtfrd) 11:35 "	10	817
" S	10:55 "	(Hrtfrd) 11:55 "	10	419
" T	12:10 p. m.	(Hrtfrd) 1:09 p. m.	10	182
Total			230	12,491

Trains from New Haven.

Train.	Left New Haven.	Arrived New York.	Cars in train.	Passengers.
Special A	4:46 p. m.	6:34 p. m.	12	888½
" C	5:01 "	6:53 "	12	343
" D	5:10 "	7:03 "	12	387½
" I	5:21 "	7:13 "	10	283
" J	5:25 "	7:19 "	10	273
" E	5:27 "	7:26 "	12	1,203½
" F	5:35 "	7:56 "	12	881½
" K	5:35 "	8:00 "	10	332
" G	5:48 "	7:47 "	12	751½
" H	6:00 "	8:00 "	12	973
" M	6:15 "	8:22 "	12	779½
" N	6:18 "	8:12 "	10	294
" O	6:29 "	8:33 "	10	415
Extra 837	12:06 a. m.	2:03 a. m.	8	193
Special U	5:25 p. m.	6:36 p. m. (Hrtfrd)	10	326
" V	5:41 "	7:30 " (Spgfld)	8	664
Special	6:01 "	7:30 " (Wtrbry)	8	233
Total			182	9,221
Total both ways			412	21,711

Special "E" of the outgoing trains to New York with its 1,203½ passengers in 12 cars, or more than 100 passengers per car, suggests the elasticity of a train immediately after a big football match.

Some returns of the regular trains for the day, with four trains containing 33 cars excluded for which no figures for passengers are returned, are also of interest:

Going to New Haven

Train	Cars.	New Haven passengers.	Train.	Cars.	New Haven passengers.
No. 16	12	600	No. 809	7	411
" 276	5	172	" 45, 1st sec.	6	161
" 50	12	700	" 45, 2d sec.	12	626
" 10	6	154	" 49	10	160
" 12	12	510	" 9	6	43
" 278	8	140	" 61	10	106
" 52	12	225	" 635	8	260
" 54, 1st sec.	12	18	" 1107	8	450
" 54, 2d sec.	12	275½			
" 65	11	475	Total	169	5,116

Outgoing from New Haven.

Train.	Cars.	New Haven passengers.	Train.	Cars.	New Haven passengers.
No. 53	7	204	No. 59, 1st sec.	9	448
" 287	5	416	" 59, 2d sec.	12	293
" 17	12	389	" 23	9	96
" 289	10	108	" 25	12	359
" 55	12	386	" 293	7	170
" 21	11	383			
" 57	12	343	Total	118	3,595

The outgoing and incoming passengers at New Haven by the regular trains for which returns are given number 8,711, of whom a large but uncertain number were undoubtedly football passengers.

The official schedule shows that of the 22 special trains reaching New Haven 12 were from two to 23 minutes ahead of time, most of them ahead by double figures; five trains were from five to 26 minutes late from various causes; and five were on time. Of the 17 outgoing specials no returns are given. The schedule for the regular trains shows that, as was to be expected, it was deranged considerably by the football traffic. Out of 18 incoming trains all but two were late by from one to 54 minutes. No returns are given for the outgoing trains from New Haven.

The official tables annexed show graphically the great volume, the increase and the remunerative character of the New Haven's annual football traffic:

STATEMENT SHOWING APPROXIMATE AMOUNT OF BUSINESS ON ACCOUNT OF YALE-PRINCETON FOOTBALL GAME AT NEW HAVEN, NOV. 16, 1907, COMPARED WITH BUSINESS OF THE SAME OCCASION, NOV. 18, 1905.

	No. of one-way passengers— 1907.	1905.	Inc.	Revenue.— 1907.	1905.	Inc.
New York excursion	13,418	15,568	2,150*	$20,127	$23,370	$3,243*
New York regular	4,547	2,434	2,113	6,820	3,651	3,169
Other stations, excursion and regular	15,634	12,527	3,107	14,021	9,900	4,121
Total	33,599	30,529	3,070	$40,968	$36,921	$4,047
Parlor and sleeping† cars:						
Special				$2,031	$2,334	$303*
Regular				1,539	1,217	322
Total				$3,570	$3,551	$19
Total revenue				$44,539	$40,472	$4,067

*Decrease.
†Sleeping cars used as parlor cars.

STATEMENT SHOWING THE APPROXIMATE AMOUNT OF REVENUE ACCRUING TO THE N. Y., N. H. & H. R.R. ON ACCOUNT OF THE YALE-HARVARD FOOTBALL GAME AT NEW HAVEN, NOV. 24, 1906, AS COMPARED WITH BUSINESS ACCOUNT SIMILAR GAME AT SAME PLACE, NOV. 19, 1904.

Special ticket business.	—1906— No. passengers.*	Revenue.	—1904— No. passengers.*	Revenue.	—Increase— No. passengers.*	Revenue.
New York	11,086	$16,629	10,092	$15,345	994	$1,283
Boston,†	6,052	15,476	5,002	13,982	1,050	1,494
Boston,‡	1,876	2,103	846	956	1,030	1,146
Providence	292	413	282	753	d50	d340
Springfield	642	802	818	1,422	d176	d220
Hartford	1,142	856	1,766	2,324	d624	d468
Bridgeport	1,670	584	1,000	350	670	234
Other points	2,619	1,694	1,876	1,213	743	481
Total	25,219	$38,559	21,682	$34,947	3,537	$3,611
Excess of regular business	16,236	17,265	10,848	13,495	5,387	3,770
Total	41,454	$55,824	32,530	$48,443	8,924	$7,381
Parlor and sleeping cars:						
New York	.....	$2,008	.....	$1,318	.....	$690
Boston,†	.....	2,842	.....	2,008	.....	834
Other points	.....	2,227	.....	1,897	.....	330
Total	.....	$7,077	.....	$5,223	.....	$1,854
Grand total	41,454	$62,901	32,530	$53,666	8,924	$9,235

*One way.
†Via Shore, Air and Hartford lines.
‡Via Springfield.
d Decrease.

Wastes of Fuel, Power and Time in Railroad Operation.*

* * * The problem of fuel consumption or better combustion of fuel is a serious matter. On most roads there is no one man who is held accountable for the amount of fuel used. It would seem that there is room on a railroad to-day for a man whose title might be fuel superintendent, who would have charge of and direct the work now done by the fuel agent, including inspection of coal and the assignment of certain grades of coal to various coaling stations. He would be so closely in touch with the mechanical department that he would be able to advise what class of coal was to be furnished each division point, so that engines might be drafted for the class of fuel to be burned, and he would have on his staff a corps of traveling firemen to see that the men were properly instructed concerning the principles of combustion and were firing their engines according to correct principles, and that the engines were drafted so that they would burn the fuel in an economical manner when properly fired. Such a man should be able to effect a wonderfully large saving when it is considered that to-day the fuel agent in some cases is trying to make a record by buying cheap fuel and will not admit there is such a thing as poor coal. The mechanical department, to avoid steam failures, is drafting engines to handle the poorest fuel, and the men on account of poor coal, improperly drafted

*From a paper presented to the Traveling Engineers' Association Convention by D. C. Buell.

engines or lack of interest are burning from 10 to 20 per cent. more fuel than necessary.

Of other channels through which energy is wasted may be mentioned the following.

Coal Wasted.

Coal not properly inspected at the mines, allowing slack and dirt in considerable amounts to take up space in cars, tanks and fire boxes that the coal should occupy, to say nothing of the loss caused by dirty fires, clinkers, etc.

Coal spilled at coal chutes and not picked up.

Coal stolen all along the line.

Coal wasted on account of improper or wasteful methods of firing up engines at the roundhouse.

Coal spilled from engine tanks being filled too full.

Coal spilled from engine deck on account of its not being kept clean.

Coal wasted through grates on account of the fireman shaking grates improperly.

Coal wasted on account of firing not being properly done.

Heat Wasted on Account Of—

Ash-pans not properly made for admission of air to give proper combustion or not kept cleaned out.

Engines not drafted right to give proper combustion.

Boilers or flues being dirty.

Steam leaks in firebox or front end that interfere with the proper combustion of the fuel as well as wasting heat by the leakage.

Forcing the fire too hard, drawing the gases out of the stack at too high a temperature.

Engines not properly lagged.

Heat wasted which might be saved by hollow fire-brick arches, combustion tubes, feed-water heaters or special devices of this nature that have been proven economical.

Steam Wasted Due To—

Valves or cylinder packing blowing.

Cylinders not smooth. That is, where the inside of the cylinder wall has not become glazed so as to reflect the heat and keep it in the cylinder, instead of absorbing it and radiating it out as a cylinder which is pitted or unglazed will do.

Leaks across steam passages.

Leaks in steam valves.

Pipes or fittings leaking, either on the engine or in the cab.

Improper location or piping or working of the injectors.

Air leaks on the engine or cars.

Steam heat leaks.

Hot water leaks at any point from boiler or fittings.

Steam wasted through the pops on account of the engine not being fired properly.

Power Wasted on Account Of—

Valves set improperly.

Lack of lubrication.

Improper feeding and firing of the boiler.

Improper running and handling of the engine.

Drafting the engine so as to give excessive back pressure.

Improper handling of the air.

Brakes set up too close.

The waste of time on a railroad is almost always accompanied by a waste of energy because cars, engines and men are lying around when they might be doing useful work.

Time Wasted at Roundhouse Due To—

Engineers not making proper work reports. Some one has said that the word "examine," as used by engineers on work book reports, has cost the railroad companies hundreds of thousands of dollars. Get the men to make correct work reports.

Inefficient or insufficient force not getting work done promptly, thus delaying a $15,000 machine for want of a machinist or helper.

Sand house, coal chute, water tank and cinder pits not properly arranged. A study of the terminal may suggest some improvement in the layout that can be made at reasonable cost and would save more than enough in the cost of handling engines to pay the expense.

Lack of proper supplies at storehouse, requiring engineers to hunt up foremen and then spend more time robbing other engines to get what they want.

Lack of tools on engines, so that engineers cannot do necessary work promptly. A good locker room where tools, oil cans and overalls can be locked up will save most of this trouble.

Employing a boy who cannot be depended upon to do calling, when a few dollars more a week would pay for a man who would have some judgment and discretion and would save five times that amount in terminal overtime.

Not having a proper record of where men live and can be called.

Not having extra men enough to keep power moving as fast as ready and wanted.

Not having men called in time so they can get ready to go out on their call.

Time Wasted on Road Due To—

Not having proper tools on engines in case anything happens.

Trying to spot an engine at water tank with a long train instead of stopping short and cutting the engine off.

Not having fire in condition to go after meeting a train or getting orders.

Not oiling around promptly.

Engineer and conductor not working together to make meeting points or figure on station work.

Careless handling of train and pulling out drawbars and bad ordering cars.

Not watching for signals from train crew.

Not having a supply of sand at convenient points between terminals for bad weather or emergencies.

Engines not properly washed out, causing foaming and consequent loss of tonnage or time.

Allowing coal to get into tanks, stopping up injector supply pipes.

Not cleaning strainers in injector supply pipes at frequent intervals.

Water accumulating in main reservoir, thus requiring a longer time than necessary to release brakes.

Not keeping sanding devices in good working order, with result that engine slips badly in starting train or on hard pulls.

Engineer and fireman not working together so they will have steam and water where needed.

Fireman not awaking to the fact that ash-pan needs cleaning until engineer and train crew are ready to go.

Engineer "lying down" when something goes wrong with his engine when with a little thought and some energy he could have fixed things and brought his train in.

Crew stopping to eat just where it suits them without notifying the despatcher or regarding the possible disarrangement of his plans.

Engineer or conductor not advising despatcher if anything is going wrong so they cannot make the time expected of them. This hurts the other fellow at meeting points and maybe ties up the road.

Engineer not willing to admit there is anything wrong with his engine, resulting in long argument between engineer, conductor and despatcher with consequent waste of time. This is due in many cases to the fact that the engineer is "burned up" so badly if he admits an engine failure that he will deliberately say there is nothing wrong with his engine when he knows he could not make ten miles an hour with the train. Do not let the men get false ideas about not admitting there is anything wrong so the train can be reduced if necessary.

There is a great deal of energy wasted in the yard and on the road directly chargeable to the transportation department, part of the cost of which in many cases falls on the mechanical department. For example, time wasted in not having trains made up, crews ready or the yard open so the engine can get to the train and get out on call.

Indifference in matter of switching coal to chutes, cars of company material to the rip track or roundhouse, switching bad orders to the "rip" track and pulling and setting "rip" tracks properly, pulling cinder track, etc. Along this line may be mentioned the seeming delight some switchmen take in blocking the roundhouse leads, so engines cannot get in or out.

There is also time wasted getting the bills and orders, all of which is reflected in cost of coal charged against engines and wages of enginemen, etc.

On the road there may be waste due to poor distribution of time on schedules, poor despatching, slow orders out which should have been canceled, orders put out at points where it is hard to stop and start when some place where train would have to stop for water or a meeting point could have been used just as well.

Another waste is due to trains being made up improperly, loads behind instead of ahead, empty car doors open, short loads in what is supposed to be a through train, etc.

Slow orders put out by the maintenance department also add to the fuel bill, because unfortunately they are usually necessarily placed on track just at the foot of a grade or on a curve on some hard pull.

Many water tanks are located so that it is up-hill both ways away from them. Of course, the streams are usually found at the bottom of hills, but it is cheaper to pump water to a tank at the top of the hill than to pull the train from a standstill to the same point; stations are located so the train has to be stopped on a curve, and sidetracks so that with a full train the brakeman has to jump off and sprint for the switch, because "if they stopped they would have to double in."

Some one has said that "the eye of the master is worth the hands of all the servants." What a waste it is to have the master mechanic walk back and forth from office to office four or five times a day when a telephone would save him that time, and think of the two or three months' old correspondence the road foreman must answer, many times in long-hand, when he might be out on the road with some new man or new engine, saving energy instead

of wasting it. Work should be so arranged that it would not be necessary to keep a high-priced man doing cheap jobs. Following this same thought, some roads are noted for their prompt and courteous service and the fine discipline and loyalty of their men. Is it not due to good management, fair treatment and an example of loyalty, courtesy and fairness among their officials? The old saying, "Like master, like man," is true on railroads as elsewhere, and the waste of energy among a set of men who are not disciplined, are not loyal to the company or courteous to its patrons, is perhaps the greatest loss of all.

In view of the many ways in which energy may be wasted it may seem surprising that there really is any left. One must be alert and watchful to keep them down to a minimum for waste is a prolific creature and unless watched and controlled increases and multiplies to such proportions as to ruin good men's careers and wreck good roads.

Samuel M. Felton.

The resignation of Samuel M. Felton as President of the Chicago & Alton was announced last week. Control of the Alton passed to the Toledo, St. Louis & Western last August, and on December 4 Theodore A. Shonts, its President, was elected to take Mr. Felton's place. The consolidation of various offices of both roads has been gradually going in effect. Mr. Felton now goes to the Mexican Central to take the place of A. A. Robinson, who resigned as President a year ago. The new President's first training in the railroad service was as an engineer, and he has since had charge of both traffic and operation. Mr. Felton was born in 1853 in Philadelphia, Pa., and began railroad work as a rodman. He worked for six years in the engineering department of different roads in Pennsylvania which are now part of the Philadelphia & Reading. The next year he was made General Superintendent of the Pittsburgh, Cincinnati & St. Louis, where he remained for eight years. He was then appointed General Manager of the New York & New England, but in a few months went to the New York, Lake Erie & Western as Assistant to the President, in particular charge of the New York, Pennsylvania & Ohio, which is now part of the Ohio division of the Erie. He was made General Manager of the New York, Pennsylvania & Ohio at the end of the year, and the next year was elected Vice-President of the New York, Lake Erie & Western in charge of traffic; in a few months he was given charge of the operating department also. In 1890 he left to become President of the East Tennessee, Virginia & Georgia, now part of the Southern Railway. This office he held until 1899. During part of this time he was also Receiver of the Cincinnati, New Orleans & Texas Pacific; President of the Alabama Great Southern; Receiver of the Kentucky & Indiana Bridge Company, and Receiver of the Columbus, Sandusky & Hocking. In the fall of 1899 he was elected President of the Chicago & Alton, succeeding E. H. Harriman, who then became Chairman of the Executive Committee.

Samuel M. Felton.

Injunctions in Alabama.

At Montgomery Nov. 27, Judge Thomas G. Jones, of the United States District Court, granted a restraining order temporarily suspending all the railroad legislation just passed by the Alabama Legislature as it applies to the Louisville & Nashville, the South & North Alabama, the Nashville, Chattanooga & St. Louis and the Central of Georgia. In the case of the Central of Georgia the order was made returnable December 16, and in the case of the other railroads December 2. These orders are directed to the sheriffs, solicitors and clerks of the counties and to all citizens, restraining them from attempting to enforce the laws until the court disposes of the litigation. Scores of deputy marshals were employed to serve the processes throughout the state. The Central Trust Company of New York, owner of the second preferred bonds of the Central of Georgia, was complainant in the bill against the Central, but the other bills were filed by the railroads against the state. The bills attacked the classification acts of the special session as being "manifestly unfair and unjust." Railroads which entered into agreement with Governor Comer, it is alleged, received unjust and illegal preference over the railroads which refused to enter into the agreement. The Louisville & Nashville has filed a bill in the United States Court, praying that the litigation on the docket of the court in respect to the old laws shall not be dismissed.

It appears that, in all, 21 laws were passed affecting railroads. They were enacted indiscriminately, and almost without discussion. Governor Comer having declared that the contents of the bills did not much matter, the only issue being whether the state or the railroads should be supreme. It was boasted that the laws were "injunction-proof." The penalties for their violation were to be enforced from the day that the railroads took any of them into court to test their legality—either a Federal or a state court. Even the lawyers have difficulty in analyzing the acts or making sense of them.

As long as any state officer by designation had the power to enforce a rate law, that officer could be served with an injunction by a Federal judge; so the Legislature, in one of these laws, repealed an act which placed the enforcement of the rate law in the hands of the Railroad Commissioners, the Governor and the Attorney-General, and also enacted laws which made it a misdemeanor for ticket and freight agents to charge more than the maximum rates and gave passengers and shippers charged excessive rates a right of action, for 10 years, for damages against the railroad companies. It was supposed that there would therefore be no state officers to enjoin, but Judge Jones decided that the attempt to deprive the Federal court of jurisdiction could be met by employing a large number of special deputies and serving writs on practically everybody; the sheriffs, their deputies, solicitors, law clerks, passengers and shippers; and that was what was done.

Foreign Railroad Notes.

Investigations by the railroad administration at Königsberg showed that the heating value of the locomotive smokestack cinder produced varied from 6,930 to 11,160 B.t.u., depending on the kind of coal burned. In recent years the better grades of cinder have been sold for 40 cents per ton, a low price considering their heat value. With a view to a more profitable utilization of this material experiments were made with it for the production of power gas. As the result of these experiments two power gas plants using smokestack cinders have been built, the gas being used for the production of electric current. At the main shops at Königsberg there are three generators built by Julius Pintsch, and three double-acting Deutz gas engines, each with an output of 180 h.p. and direct-connected to a dynamo of 230 volts. The second plant, at Insterburg, has two gas generators supplying two single-acting Nuremberg gas engines of 90 h.p. each, each of these being belted to a dynamo of 230 volts. Both installations have proved in every respect highly satisfactory. At first the cinder consumption was rather high, 2.75 lbs. per h.p. hour. Changes in the gas generators have reduced this to 1.33 to 2.1 lbs. per h.p., according to the load on the dynamo. On the average 12 tons of smokestack cinders are produced per locomotive per year. Based on this a third installation, calculated for 150 h.p., is to be made.

The Prussian State Railroads have comparatively recently had a limited number of freight cars equipped with continuous brakes. It is now decided to increase the number, and during the current year 320 cars are to be equipped, and 140 next year, making a total of 600, which will for the most part be run in certain fast freight trains making regular trips. Heretofore, on certain lines, no more than 60 axles were permitted in such trains, but hereafter there may be 80.

GENERAL NEWS SECTION

NOTES.

The yard trainmen on the Grand Trunk throughout Canada have had their pay increased 12 per cent. The change affects about 600 men.

The Chicago & Alton announces that henceforth in the state of Missouri passengers will be admitted to trains only on showing their tickets.

Judge Munger in the Federal court at Omaha, Neb., November 26, made perpetual the injunction granted a year ago forbidding ticket scalping in Nebraska.

At Bloomington, Ill., recently a fireman of the Illinois Central had an arm blown off by the explosion of a fusee. It is said that the fusee had not been lighted.

Freight trainmen on the New York Central heretofore running through between New York and Albany, 142 miles, will henceforth turn around at Poughkeepsie, about half way between the two cities.

One day last week the Wabash took out of Chicago on a single train 500 passengers bound for St. John, N. B., over the Canadian Pacific. At St. John the passengers were to take the steamship "Empress of Ireland" for Europe.

The lumber producers of Oregon, Washington and Idaho who complained against the increase in eastbound freight rates, announced by the transcontinental railroads a month ago, have filed a new complaint with the Interstate Commerce Commission. It is signed by 41 lumber companies.

The Brotherhood of Railway Trainmen has sent to the Postmaster-General a complaint charging that the tracks of the Missouri Pacific are in some places unsafe. The reason given for sending the complaint to the Post Office Department is that the lives of railway postal clerks are endangered.

The Texas State Railroad Commission on Nov. 26 ordered 38 railroads to purchase cars and engines. Fourteen roads had already been ordered to buy. It does not appear that these roads are insufficiently supplied with rolling stock, but, rather, that the orders are issued because the cars and engines in use are owned by parent companies not domiciled in Texas.

In the Federal court at Atlanta, November 30, Judge Newman refused the application of the Central of Georgia for an injunction against the reduced rates ordered by the State Railroad Commission. Judge Newman says that the railroad should put the new rates in force for six months so as to afford ground for a study of results, as compared with a similar period under the old rates.

Bank checks, issued in large quantities, payable to bearer, for use in place of currency, because of the scarcity of the latter have appeared in New York this week, the New York Central paying part of its December wages in such orders, marked payable through the Clearing House. At Chicago more than $7,000,000 of this currency is in circulation. According to the New York *Sun's* reports from cities in central New York this so-called currency is usually cashed only at a 10 per cent. discount.

The Interborough Rapid Transit Co., operating the elevated and subway lines in Manhattan, New York City, has organized a uniformed police force for service at its most crowded stations. These officers will have full police power. The men appointed have been approved by the police commissioner of the city, after a thorough inquiry into their records, and regular city policemen will co-operate with the railway company's police when necessary. Fifty men began work in this service November 29.

The Supreme Court of the United States has decided that the Pennsylvania Railroad must show its books in the cases of the coal companies suing on a complaint of discrimination. The Webster Coal Company and the Pennsylvania Coal & Coke Company sued to recover damages alleged to have been sustained by reason of the road's discrimination in favor of other companies in the transportation of coal. The Supreme Court holds that officers of the railroad can be required to exhibit its books for inspection by the coal companies before the trial of the case itself.

On Monday last the Supreme Court in the case of the Louisville & Nashville vs. Bitterman and others, involving the right of the defendants to engage in scalping the tickets of the railroad company, decided in favor of the company, the decision being handed down by Justice White. The United States Circuit Court for the Eastern district of Louisiana held the practice to be wrong, but decided that relief could only be granted in individual cases, thus requiring a separate action for every offense committed. The Circuit Court of Appeals for the Fifth Circuit held that the wrongdoing was of a continuing nature and granted a permanent injunction. The scalpers then carried the case to the Federal Supreme Court and have now lost it.

Stereopticons, as introduced on the Cincinnati, New Orleans & Texas Pacific several years ago by W. J. Murphy, are now in use on the Union Pacific, for testing the familiarity of trainmen with the indications of fixed signals. An officer of the Union Pacific says that the use of this means of education is to be allowed a part of the credit for the excellent records made by the enginemen on that road, as shown by the surprise tests. On the Union Pacific and the Southern Pacific together the number of surprise tests now averages 45 a day throughout the year. In the last monthly record published, the number of surprise tests was 1,360. Imperfect compliance, 17. In 12 classes, including the most important, the record was perfect.

The Union Pacific reports that under the special reduced rates offered by that company to stimulate the shipment of coal before winter a heavy movement has been going on from the fields of Utah and Illinois. The company itself has stored hundreds of thousands of tons at points along its lines and those of its allied roads nearly to the Pacific coast. The railroad company has furnished free storage ground, wherever necessary, to stimulate the shipment of coal from the mines. A record has been kept of the action of the shippers and consignees in response to the company's efforts to avert a coal famine, and if there should be a scarcity of fuel the records will be brought out to show who is responsible. New mines are to be opened near Kemmerer, Wyo., to produce 3,000 tons of coal a day, and another new mine near Rock Springs, Wyo. These mines will be opened by independent interests and the railroad companies are going out of the commercial coal business.

Honduras Railroad Building.

The Vaccaro Brothers Railroad, now being built along the north coast of Honduras from Laceiba west to Porvenir, Salado, San Francisco and Santiago, 35 miles, is expected to be in operation some time in the spring of 1908. Three spurs from the main line at different points will penetrate five to eight miles inland, tapping farming country, while projected extensions of these spurs will eventually reach hard-wood timber some 20 miles from the coast. The completion of this first instalment of the 150 miles of projected road is expected to divert the greater part of the marine commerce from the towns mentioned and centralize it in Laceiba.

Oregon's Forest Wealth.

The state forestry authorities report that Oregon has 300 billion feet of standing timber, substantially all of it soft woods. This is more than is reported for any other state in the union, and one-sixth of the estimated supply of the United States. At the present rate of consumption, not allowing for any new growth, Oregon's timber supply would last 150 years. At $12 per 1,000 feet, the state's timber is now worth $3,600,000,000, or more than the total amount of money in circulation in the United States. The most productive area lies west of the Cascades, where the average of standing timber is 17,700 feet to the acre, but many tracts are found that yield 50,000 feet, and single logs, that in the form of sawed lumber are worth from $50 to $100, are common. Six hundred saw-mills, employing 15,000 men, besides 7,000 men in the logging camps, produce two billion feet of lumber every year, for which the world's markets pay Oregon nearly $45,000,000, including forest products of all classes. Federal withdrawal of extensive forest reserves and the state's new laws for the protection of its forests are depended upon to prolong indefinitely the existence of Oregon's timber supply as its principal source of revenue.

Alabama's Injunction-Proof Rate Laws.

Any one owning a patent process for turning out railroad-rate laws that are Judge-Jones-injunction-proof could probably get immediate employment with Governor Comer, of Alabama. The Governor will provide the legislature.

Governor Comer has just suffered another heart-breaking disappointment. He had tried one experiment with the Alabama rate laws and at once found himself tangled up in some of Judge Thomas Goode Jones' federal injunctions. At first it looked as if Governor Comer would join Governor Glenn, of North Carolina, and secede from the Union. On second thought, however, he decided to call his Alabama lawyers and Alabama legislators together and enact new anti-railroad laws that Judge Jones could not temporarily suspend by any of his federal restraining orders.

There were about 20 bills in all. They regulated passenger rates. They classified all kinds of freight. They fixed fares for

certain distances and between certain cities. They were to go into effect Dec. 1. And they were "injunction-proof."

The legislature passed them all and adjourned Saturday evening. Governor Comer signed the last of them Tuesday night and was waiting for the ink to dry when Judge Jones stepped in with another federal order restraining the State Railroad Commission, all solicitors, clerks of court, shippers and passengers from obeying or enforcing the Governor's injunction-proof laws until it could be ascertained whether they violated the Constitution of the United States.

It was tragic. And to think that it was all due to the notions about the United States Constitution held by a Southern jurist who had fought and shed his blood for the Confederacy, who had once been Governor of Alabama himself and who had been appointed United States District Judge by that other celebrated railroad regulator Theodore Roosevelt! Instead of going into effect next week, Governor Comer's injunction-proof laws must withstand the test of the courts. And the worst of it is, Governor Comer knows that if he interferes he is liable to go to jail by Judge Jones' orders for contempt.—*New York World.*

Reciprocal Demurrage in Texas.

The Texas State Railroad Commission has promulgated its order establishing "reciprocal" demurrage rules, effective December 10. The rules provide that freight in carloads must move at the rate of at least 30 miles a day and less than carloads 25 miles. Sundays and legal holidays are excluded and the rules do not apply to live stock and perishable freight. The time of the movement of a car is counted from the beginning of the second day after it is loaded. One day additional is allowed at division terminals. A 25-bale lot of cotton is to be treated as a carload. For failure to move freight promptly railroads must pay shippers as follows: Delay of 10 days or less, 2½ cents per 100 lbs.; 20 days and over 10 days, 3¾ cents; 30 days and over 20 days, 5 cents; 40 days and over 30 days, 6¼ cents; 50 days and over 40 days, 7½ cents, and for each additional 10 days or part thereof 1 cent per 100 lbs. Forty-eight hours' additional time shall be allowed at junction points or division terminals when it is necessary to transfer a shipment.

Shippers applying for cars must be supplied within three days, if five cars or less; within five days if nine cars; within eight days if 10 or more. In furnishing cars to shippers there must be no discrimination in favor of shipments going to stations on the home road. Failure to furnish a car according to the rule imposes a penalty of 50 cents a day, but only provided the shipper has deposited $2 a car, which is to be retained by the company if he does not load. If empty cars have to be hauled 50 miles to deliver to a shipper he may be required to deposit $5 a car; if hauled 100 miles a deposit of $7.

Ordinary demurrage is $1 a day after 48 hours. Failure to notify consignee of the arrival of freight involves a penalty of 50 cents, and the same is the penalty for failure to place a car promptly after a consignee has stated his wishes as to placing.

The rules for supplying cars to shippers allow less time than was stipulated in the suggestions offered to the Commission by the recent conference of railroad officers and shippers. It is now made obligatory upon the roads to furnish as many cars as are desired within eight days. Roads are required to average 30 miles for each 24 hours in the movement of freight. When the conference was called, the shippers asked for an average of 2½ miles an hour, or 60 miles a day. The cutting down of the time to 25 miles a day was a concession from the shippers which was made after much parleying. In the Commission rules no provision is made for the exemption of railroads from penalties in cases of accident or other causes over which the roads have no control.

South Manchurian Railroad Rebates.

According to a consular report, the South Manchurian Railroad has decided to give rebates to heavy shippers. Those paying freight charges amounting to $19,800 during the 12 months beginning October 1, 1907, will receive a rebate of 3 per cent. and one-half of 1 per cent. additional rebate for each additional $24,900 in freight payments up to $249,000. The rebate thus amounts to 7 per cent. at the last named figure and it remains at this percentage on all amounts greater than $249,000. It is pointed out that Japanese merchants, as the largest shippers, will get most of the benefit of the system, giving them distinct advantages in competition with the exporters of other countries.

A New Builder of Gas Engines.

The Wisconsin Engine Co., Corliss, Wis., builder of Corliss steam engines, has begun the manufacture of gas engines for all services, in sizes from 400 b.h.p. to 5,000 b.h.p. The engines use natural, producer, coke-oven or blast-furnace gas in the Otto cycle, and are of the horizontal tandem and twin-tandem double-acting types. The company controls the Sargent patents on internal combustion engines, and has Charles E. Sargent as the engineer of the gas engine department. Mr. Sargent is well known as an engineer, and in 1898 designed a horizontal tandem double-acting gas engine, which was a wide departure from the common practice of those days. It was then considered an impracticable type by many. Now, with one exception, all large units in this country are being built in that type.

The gas engines of the Wisconsin Engine Co. have some of the distinctive features of their large Corliss engines, and utilize in design most of the Sargent patents. The design is simple. There is but one poppet valve for each explosion chamber. It is located on the bottom of the cylinder and thus avoids cumbersome and unsightly air and gas pipes, as well as stairs, galleries and railings about the engine. Provision is made against the occurrence of dangerous pressures caused by possible pre-ignitions. The engines are started automatically. Tests of these engines, even small units, show a heat consumption of less than 9,000 b.t.u. per brake horsepower hour.

This company recently shipped some large steam engines to a number of large concerns, including the Illinois Steel Co., Jones & Laughlin Steel Co., Packard Motor Car Co., American Sheet & Tin Plate Co., Amoskeag Manufacturing Co., New Hampshire Spinning Mills, National Tube Co., the city of Milwaukee, Carnegie Steel Co., American Woolen Co., United States Envelope Co. and the Carnegie Natural Gas Co.

Fairbanks-Morse Motor Inspection Car.

The accompanying illustration shows the new type C gasolene motor inspection car sold by Fairbanks, Morse & Co., Chicago. The car is built by the Sheffield Car Company, Three Rivers, Mich. Much of the value of this kind of inspection car is due to its convenience.

Gasolene Inspection Car; Fairbanks, Morse & Co.

It can be kept ready for immediate use, as in a gas engine there is not the delay as in the case of the steam locomotive of getting up steam. Its maximum speed is comparatively high. One of the first cars made, which was sold to the Michigan Central, traveled 2,327 miles, consuming one gallon of gasolene in 19 miles and one gallon of lubricating oil in 17 miles. On this trip it ran 66.4 miles at the rate of 40 miles an hour and 39.6 miles at the rate of 53 miles an hour. The car illustrated here embodies several changes and improvements over this early machine.

Oklahoma Orders.

The Corporation Commission in the new state of Oklahoma issues a number of sweeping orders almost every day. One promulgated last week requires all railroads to build stations at state boundary lines, in order that passengers may have advantage of the 2-cent fare for interstate traveling as well as within the state. All trains will be compelled to stop at the state line stations, giving passengers time to secure 2-cent fare tickets within adjoining states.

On the 22d of November the commission notified all railroads that a 60 per cent. reduction in coal rates would go into effect January 3. The notice was issued after a lengthy conference with Attorney-General West. It specifies that the rate to be established shall be similar to the one maintained in Arkansas.

The board also issued orders requiring the railroads to submit the extent of their holdings to ascertain the value of the properties

and to make known in writing the method employed in leasing rights of way.

November 27 the commission issued a number of orders, including the following: Requiring railroads in case of wrecks or washouts, to run special trains immediately from both directions; when a regular passenger train is an hour or more late, to run a special on the regular schedule; requiring station agents to report correctly on bulletin boards in conspicuous places the running of trains, showing what the delay, if any, and despatchers to notify agents truthfully regarding running of trains; requiring railroads to submit all depot plans to the commission for approval before construction is commenced, and in case depots are built at state lines, they must be erected on site selected by the commission, compelling railroads to haul lumber, coal and other products, interstate shipments, at the same rate in Oklahoma as in adjoining states.

An order requiring separate coaches for whites and blacks was issued on the 27th.

At El Reno separate cars will be required, by the city, on the street railroad.

Work on the Panama Canal in 1907.

The annual report of the Isthmian Canal Commission for the fiscal year ended June 30, shows the following financial statement:

Total available appropriations to June 30, 1906		$26,990,786
Total appropriation, year 1907		25,456,415
Total appropriation, year 1908		27,161,367
Total appropriations		$79,608,568
Expenditures		
Total construction and engineering		$39,452,498
Total civil government		2,948,276
Total sanitation		5,530,208
Total miscellaneous	$6,442,906	
Less	5,478,779	
		964,127
Total expenditures		$48,285,110
Balance available July 1, 1907		31,323,458
Total		$79,608,568

The foregoing tabulated statement of appropriations and expenditures shows that $79,608,568 have been appropriated for the construction of the canal between the Atlantic and Pacific oceans, and that of this amount, at the close of the fiscal year a total of $48,285,110 was expended. The project adopted by Congress was estimated by the board of consulting engineers to cost $139,705,200, exclusive of sanitation and the expenses of the Zone government; the estimates submitted did not contemplate or provide for waterworks, sewers and paving in Panama and Colon, made necessary to secure improved health conditions, nor is any provision made for the re-equipment of the Panama Railroad. Under the circumstances, the foregoing table is prepared with a view to showing the amount expended for the construction of the canal on estimates under which the commission is operating.

The completion of the canal will necessitate the abandonment of the present main line of the Panama Railroad, and the preliminary surveys for the location of a new line on the east side of the canal were commenced the latter part of July and completed in November. The location of the line was practically determined in March and involves the excavation of 1,600,000 cu. yds. of material and the placing of 12,000,000 cu. yds. of embankments.

The skilled labor supply from the United States numbered 4,400 on June 30, 1907. The unskilled labor from the West Indies and Europe on this date numbered 4,317 Europeans and 14,600 West Indians. The total labor force was 29,446, compared with 19,600 on June 30, 1906, an increase of nearly 10,000.

From the Culebra division 5,570,432 cu. yds were cut during the year. On the Chagres division only preparatory work was done. In the Colon district the excavation in the year amounted to 1,112,321 cu. yds. From La Boca division 1,235,897 cu. yds. of material were dredged.

West African Railroads.

The work of opening up West Africa by railroads and harbors is one that is proceeding continuously on a large and wise scale, but which attracts little attention from the general public. In Sierra Leone actual construction of the railroad was begun in 1896, and by 1905 222 miles was completed. It is 2 ft. 6 in. gage, and the main line between Freetown and Baüma taps extensive palm oil forests, and serves a large population. There are numerous steel viaducts and long bridges, and, in places, feeders are being built. On the Gold Coast the line from Sekondi, on the coast, to Tarkwa, the center of the mining district, was begun in 1898. In 1900 it was decided to extend to Kumasi, the capital of Ashanti, and this was finished in 1903 after great difficulties. Other lines are projected. In Nigeria the line from Lagos was started in 1896, reaching Ibadan by December, 1900, and is now being extended to Ilorin, some 250 miles from the coast. Great cotton-growing areas are thus opened up, and will be available as soon as there are harbor facilities to enable steamers and railroads to transship without difficulty.

The British Strike Settlement.

State regulation is a safeguard against socialism. An approach is made to it in the settlement of the threatened railroad strike and consequently extremists in the Labor party are critical and discontented. They think that the trade unionists have been outmanœuvred by Mr. Lloyd George, President of the Board of Trade, and the railroad chairmen. Free labor rather than trade unionism will be represented in the various conciliation boards, and anything like all-grades cohesion will be impossible. The federation of masters will carry every point when the workmen are split up into sections. The Amalgamated Society, after expending $35,000 in rallying the workers and getting them to authorize a strike, has enabled non-unionists to talk over grievances and reforms with the railroad directors. It is a victory for free labor rather than the trade union. Yet something has been done. Arbitration is provided automatically, if disputes are not adjusted by conciliation. Thus we have a tentative application of compulsory arbitration to railroad controversies for seven years. For seven years the community has an adequate safeguard against railroad strikes, and a system not differing essentially from compulsory arbitration. Mr. Bell, not being a socialist, pays little heed to the reproaches of extremists. He knows that so stupendous an experiment in collectivism as public ownership cannot be tried under existing financial conditions. Instead of disarming the workmen he has taken all questions relating to wages and hours of railroad servants of every grade out of the hands of the employers and put the directors under bonds to accept the decisions of arbitrators at least for seven years. —*New York Tribune's London Letter.*

Colorado & North-western Subject to Federal Law.

The United States Circuit Court of Appeals at St. Louis on Nov. 29 reversed the decision of the United States District Court in Colorado, which had held that a railroad wholly within a state, though carrying goods consigned from a point in another state, was not subject to the interstate commerce law and to regulation by the Interstate Commerce Commission. The decision is given in the case of the United States against the Colorado & North-western, which operates a narrow gage railroad of 40 miles in Boulder county, Colorado.

The government sued to recover penalties for failure to have air-brakes on freight cars. The Court of Appeals orders a new trial.

The majority opinion, written by Judge Sanborn, of St. Paul, and concurred in by Judge Van Deventer, of Cheyenne, says in part: "Every part of every transportation of articles of commerce in a continuous passage from an inception in one state to a prescribed destination in another state, is a transaction of interstate commerce. The rebilling practised by railroads without any new consent or contracts with the owners could not destroy or affect the interstate character of the shipment or of the transportation. The constitution reserved to the nation the unlimited power to regulate interstate and foreign commerce, and if that paramount power cannot be effectually exercised without affecting interstate commerce, then Congress may undoubtedly, in that sense, regulate interstate commerce."

In a dissenting opinion Judge Phillips, of Kansas City, says: "The philanthropic feature of this prosecution is but the rose in the mailed hand." The inspectors of the Interstate Commerce Commission "discovered this inconsequential, neighborhood road, out in the mountains of Boulder county."

INTERSTATE COMMERCE COMMISSION RULINGS.

No Coast Terminal Rates for Santa Barbara.

The Interstate Commerce Commission has denied the petition of parties in Santa Barbara and Ventura, Cal., that these points be given the benefit of coast terminal rates. The opinion, by Commissioner Lane, says: "Although there is active competition between ocean and rail carriers to Pacific coast points, Santa Barbara does not enjoy such water competition as to compel the installation of terminal rates voluntarily by the carriers. No steamship line from Atlantic ports stops at Santa Barbara. Eastern traffic destined to Santa Barbara and coming by boat is either unloaded at San Diego or at San Francisco, and thence transshipped either by rail or water carrier. In the absence of any showing adverse to the reasonableness of the transcontinental westbound rates to Santa Barbara in and of themselves, we are constrained to deny complainant's petition."

Through Rate Reduced to Sum of Locals.

The Commission has announced its decision in the case of the Coffeyville Vitrified Brick & Tile Company against the St. Louis & San Francisco and the Rock Island. Complainant shipped a car of brick, a through shipment, but the joint through rate was more than the sum of the locals. The complainant asked that the through rate should not exceed the sum of the locals, and for a general ruling that through rates must not exceed the sum of the locals. The Commission decided in favor of complainant on this car but held that it can make no such general ruling; each case must be disposed of upon its own merits.

Commission Divides a Through Rate.

In the case of the Birmingham Packing Company against the Texas & Pacific and others, the Commission established a joint rate of 50 cents per 100 lbs. on cattle from Fort Worth to Birmingham. This rate was put into effect but carriers were unable to agree upon the divisions of the rate and made application to the Commission to fix these divisions. The Commission held that considering the terminal charges of the receiving and the delivering lines and the ferry charge of the intermediate line the rate should be divided upon a mileage basis, but declared that this conclusion should not be taken as implying that all joint rates established by the Commission should necessarily be divided upon a mileage basis.

TRADE CATALOGUES.

Santa Fe Employees' Magazine.—The November number is one of the most interesting numbers of the magazine yet published. The opening article, "Atchison Claims the Honor," tells why that city, rather than Topeka, claims to be the birthplace of the Atchison, Topeka & Santa Fe. "Camels in the Southwest," by Sharlot M. Hall, is reprinted from *Out West*. It tells of the experimental attempt of the Government in 1855 to introduce camels into the Southwest. "The History of the Gulf Lines," "Modern Brake Practice," "Teamwork—Its Power to Win," and "Taking Care of Hot Bearings" are other articles. There is also an account of the dinner and presentation of a chest of silver to Alfred Lovell, the retiring Superintendent of Motive Power, by officers of the mechanical department of the road and others of his friends.

Pipe Coverings and Weather Proof Sockets.—The H. W. Johns-Manville Company, New York, is distributing a folder telling of the advantages of asbestos sponge felted pipe covering. This covering, it is claimed, is particularly advantageous because of its sponginess, which increases its non-conductivity of heat; also because of its long life and because it can be removed and replaced without injuring it. Price lists are given. Another folder issued by the company concerns J-M moulded weather proof mica electric lamp sockets. A photograph shows an incandescent lamp fitted to one of these sockets, the lamp being lit and both lamp and socket immersed in a bowl of water. Price lists for different sizes suited to various makes of lamp are given.

Hydraulic Jacks.—Richard Dudgeon, New York, has published a pamphlet describing his universal hydraulic jack, on which the last patent was taken out on October 15 of this year. The pamphlet devotes some space to the history of the hydraulic jack and then describes in detail the improvements and advantages of the newest form. The types in which the jack is furnished include: plain jack for use in presses or where there is a firm foundation; railroad jack where both stability and portability are required; and the base jack, which has a broader base than the other types. The pamphlet is illustrated with perspective and sectional views of different jacks and their prices. Full dimensions and price lists are given.

Turret Lathe.—The Niles-Bement-Pond Co., New York, has issued a pamphlet describing its rigid turret lathe. It is designed for work ordinarily done on engine lathes, and is especially adapted to work on gear blanks, fly wheels and gas engine cylinders. It can also be used for heavy bar work. It is regularly built in two sizes: 21 in. and 28-in. Different views of the machine show its advantages, and a series of line drawings show the kinds of work which can be done on it.

Gas Engines.—The Lazier Gas Engine Co., Buffalo, N. Y., has issued a pamphlet describing multiple cylinder vertical gas engines. Tables showing comparative operating costs of producing 100 h.p. by simple and compound steam engines, by electricity and by engines using illuminating, natural and producer gas are given. The pamphlet is well illustrated with perspective and sectional views of the Lazier two cylinder engine and its important parts.

Rheostats.—Bulletin No. 4,532 of the General Electric Co., Schenectady, N. Y., describes some direct-current motor starting rheostats in sizes up to 50 h.p. and 550 volts. There are two types, S. A. and S. O. Each type has the no-voltage release attachment, which allows it to be used with either shunt, compound or release wound motors, while the type S. O. has an overload coil in release with the motor armature. In the smaller sized rheostats, a new resistance unit is used, known as form P. The wire is wound on a tube, which is afterwards coated inside and out with a reinforcing compound, then fitted with porcelain bushings at each end and finally baked.

Track Drills.—The Cook Standard Tool Co., Kalamazoo, Mich., has issued a pamphlet on labor saving track appliances. Most of the space is devoted to the Climax track drill made by the company. The Standard track tool grinder and Cook's combination chuck are also illustrated and described in this connection. Prices of bits and parts of the grinder and of the track drill are given. Cook's steel and wooden cattle guards are also illustrated. The company also makes car and track jacks.

Rock Island Employees' Magazine.—The December number is the sixth to be issued. "The Passing of the Hobo" and "The Rock Island Testing Department," are the chief articles. Other shorter articles of interest describe the dining car service of the Rock Island, tell why it is better for a railroad to buy equipment and supplies rather than manufacture them, and how and why the Rock Island now erects its own steel bridges.

Water Gage.—A folder issued by the Ashcroft Manufacturing Co., New York, describes the Ashcroft prismatic water gage. The glass is fluted on the inner surface so that it gives a prismatic effect, breaking up the light so that the water shows black and the steam space looks silvery; the water level is thus most clearly indicated. Price lists of different types and parts are given.

Storage Batteries.—Catalogue T, of the Westinghouse Machine Company, East Pittsburgh, Pa., deals with portable storage batteries. Types suitable for electric vehicles and for car lighting are illustrated and described, with weights, capacity and price for each type and size. This is the first catalogue which the company has issued dealing with portable storage batteries.

Valves.—Catalogue H, of the Nelson Valve Co., Philadelphia, Pa., describes globe valves, check valves and gate valves of different types for various uses. Full dimensions and price lists are given of both valves and parts. The larger sizes are made up to 24 in. diameter of pipe. The catalogue is fully illustrated with half-tones and line drawings.

MANUFACTURING AND BUSINESS.

John C. McMynn has resigned his position with Robert W. Hunt & Co., Chicago.

The name of the Dominion Dump Car Co., Ltd., Montreal, Que., owner of Canadian patents for Hart convertible side and center ballast cars and Otis drop bottom dump, coal and ore cars, has been changed to the Hart-Otis Car Co.

W. H. S. Wright, St. Paul, Minn., representative of the Railway Steel-Spring Company, New York; the Adams & Westlake Company, Chicago; the Latrobe Steel & Coupler Company, Philadelphia, and the Railway Materials Company, Chicago, died on November 28.

The Expanded Metal & Corrugated Bar Co., St. Louis, Mo., has shipped 1,000 tons of open-hearth steel corrugated bars for the United States Reclamation Service. The bars are being used on irrigation works in connection with the Tieton project. This order is one of several for corrugated bars for irrigation work.

The new locomotive shops of the Grand Trunk at Stratford, Ont., are to be equipped with 55,000 sq. ft. of Paradigm skylights by Arthur E. Rendle, of Montreal, Que.; New York and Chicago. Mr. Rendle also has the contract for about 17,000 sq. ft. of skylights for the Grand Trunk car shops at London, Ont.

F. Weber & Co., Philadelphia, Pa., makers and importers of artists' materials and draftsmen's and engineers' supplies, have been made sole agents in the United States for Fabriano hand-made drawing paper. This paper, which is made in Italy, is furnished in three styles, with surface suitable for pen, pencil and water color work.

Iron and Steel.

We are informed, generally but indefinitely, by the United States Steel Corporation, that correspondence and inquiries from railroads concerning rail orders for 1908 delivery are much increased, and that the situation is distinctly encouraging. It is believed that

the rail makers and the railroads generally are in accord and accept as settled all of the specifications upon which agreement was reported by the rail committee of the American Railway Association and that this, by so much, clears the air and helps the situation. The one remaining unsettled rule as to discard from the ingot and also, the price are for the present the sole subjects of inquiry

OBITUARY NOTICES.

Robert Angst, Chief Engineer of the Duluth & Iron Range, died at Duluth, Minn., on November 30 after a short illness. Mr. Angst was 60 years old.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad conventions and engineering societies, etc., see advertising page 24.)

Engineers' Club of Philadelphia

At a business meeting to be held December 7 a paper on "Foundations," by A. B. Clark, illustrated by lantern slides, will be presented.

Franklin Institute.

At a section meeting of the Institute, December 5, the subject was "Process and Apparatus for the Production of Carbon Bi-Sulphide in the Electric Furnace," by Edward R. Taylor, of Penn Yen, N. Y.

American Society of Civil Engineers.

At a regular meeting of this society December 4 a paper on "Invar (Nickel-Steel) Tapes on the Measurement of Six Primary Base Lines," by Owen B. French, was presented for discussion. This paper was printed in the October number of "Proceedings," 1907.

Railway Signal Association.

The next meeting of this association will be held at the Engineering Societies' building, 29 West 39th street, New York City, Tuesday, January 14, 1908. At that meeting there will be a paper on "Economical Operation of Electric Signals and the Care of Storage Batteries," by T. R. Cook.

Canadian Society of Civil Engineers.

At a meeting of the general section Dec. 5 a discussion took place on the paper by T. M. Fyshe entitled "Discussion, Designs and Specifications for a Reinforced Concrete Bridge Abutment," which was read at the October 17 meeting.

A paper by J. S. Armstrong entitled "Schemes Showing the Possibilities of St. John, N. B., as a Great Port, and how the Interior of New Brunswick can be Opened up to Ocean Traffic," was also read by the author.

Wood Preservers' Association.

The fourth annual meeting of the Wood Preservers' Association is to be held in Kansas City, Mo., on the third Tuesday in January, 1908. The headquarters will be at the Baltimore Hotel. The topics for discussion are as follows: Impurities of foreign matters in creosote oil that should be avoided. Cylinder cars, tracks and guard rails; how they should best be constructed. Should the supply tank be overhead or under ground? Best methods of measuring oil. Best method of impregnating wood with preservatives of ordinary use, when pressure is not available. Method of treating wood that is refractory to treatment, and at the same time very subject to decay. Results thus far accomplished in the United States in preserving wood. Discuss best method of treating piles to use in southern waters. Can freshly cut timber be well treated, and how? Best method of keeping records of treated ties in the track. Compilation of various data in reference to the life of treated timbers, especially ties, in the United States under all treatments. Best practice of treating butts of telegraph poles, telephone poles and signal poles. Is it necessary, practical or otherwise, to correct oil measurements for temperature?

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Chicago & Alton.—Theodore P. Shonts, President of the Toledo, St. Louis & Western and of the Interborough-Metropolitan, has been elected also President of the Chicago & Alton. George H. Ross, Second Vice-President and General Traffic Manager of the T., St. L. & W., has been elected also Vice-President of the C. & A.

Cincinnati Southern.—D. G. Edwards, formerly General Passenger Agent of the Cincinnati, Hamilton & Dayton, has been appointed a Trustee of the Cincinnati Southern, succeeding Amor Smith, Jr., resigned. This road is owned by the city of Cincinnati and leased to the Cincinnati, New Orleans & Texas Pacific.

International & Great Northern.—H. W. Clarke, Superintendent of Transportation of the Mobile & Ohio, has been elected Second Vice-President and General Manager of the International & Great Northern, effective January 1, succeeding Leroy Trice, resigned.

Kansas City Southern.—F. W. Meyer, freight and passenger accountant, has been appointed Assistant Auditor, succeeding E. P. Hall, resigned to go to another company.

Louisville & Nashville.—T. B. Harrison, Jr., General Attorney, with office at Louisville, Ky., has resigned to practice law in New York City.

Tampa & Jacksonville.—H. W. Waite has been appointed Auditor with office at Gainesville, Fla., succeeding C. R. Wood, resigned.

Toledo, St. Louis & Western.—See Chicago & Alton.

Operating Officers.

Boston & Albany.—J. L. Truden, Acting Superintendent of the Albany division, has been appointed Superintendent of that division, with office at Springfield, Mass. Charles Firth, formerly Superintendent of this division, is now agent at Worcester, Mass. T. W. Carter has been appointed Trainmaster of the Boston division.

Chicago Great Western.—Otto Cornelison, Superintendent of Transportation, has been appointed General Superintendent, with office at St. Paul, Minn., succeeding G. A. Goodell. See Great Northern.

Chicago, Rock Island & Pacific.—M. L. Ellis, chief despatcher at Goodland, Kan., has been appointed Assistant Trainmaster at Limon, Kan.

Durham & Charlotte.—John H. Kennedy, Auditor, has been appointed also General Manager, with office at Gulf, N. C.

Great Northern.—G. A. Goodell, General Superintendent of the Chicago Great Western, has been appointed General Superintendent of the Central district of the Great Northern, with office at Minot, N. Dak.

Louisiana Railway & Navigation.—E. C. Hastings has been appointed General Agent at Kansas City, Mo.

Mexican Central.—J. N. Galbraith, who resigned last summer as General Manager of the Tehuantepec National, has been appointed General Manager of the Mexican Central.

Mobile & Ohio.—E. C. Rendell, chief clerk to the Superintendent of Transportation, has been appointed Superintendent of Transportation, succeeding H. W. Clarke. See International & Great Northern.

Northern Pacific.—F. S. Rawlins, Superintendent of Transportation of the Kansas City Southern, has been appointed Trainmaster of the Northern Pacific at Missoula, Mont.

Rio Grande Southern.—A. S. Meldrum, General Superintendent, has resigned and the office has been abolished. C. D. Wolfinger has been appointed Acting Superintendent, with office at Ridgway, Colo.

St. Joseph & Grand Island.—James Berlingett, General Superintendent, has been appointed to the new office of General Manager, with office at St. Joseph, Mo.

Southern Pacific.—J. W. Metcalf has been appointed Assistant Superintendent at Los Angeles, Cal., succeeding T. McCaffery, resigned.

Traffic Officers.

Chicago & North-Western.—J. E. Brittain, General Agent of the passenger department at Boston, Mass., has been appointed General Agent of both the freight and passenger departments at that city, assuming the duties of C. H. Wise, General Agent of the freight department, who has been assigned to other duties.

Delaware & Hudson.—Duncan I. Roberts, formerly General Passenger Agent of the Erie, has been appointed General Canadian Freight and Passenger Agent of the Delaware & Hudson and General Passenger and Freight Agent of the Quebec, Montreal & Southern. Mr. Roberts, who is 54 years old, was born in Pennsylvania and began railroad work in 1873 as a clerk in the office of the General Freight Agent of the Pittsburgh, Cincinnati & St. Louis. He worked up through the car service and traffic departments, being made district passenger agent of the road in 1885. The next year he was made Assistant General Passenger Agent of the Pennsylvania Lines West, and in 1890

went to the New York, Lake Erie & Western, now the Erie, as Assistant General Passenger Agent at Chicago. He was General Passenger Agent of the Erie from 1891 to 1901. He was then for three years Vice-President of the Little Kanawha and President of the Marietta, Columbus & Cleveland. He has been out of railroad service since 1905.

Intercolonial.—D. A. Story, division freight agent at Halifax, N. S., has been appointed General Freight Agent, with office at Moncton, N. B., succeeding J. J. Wallace, who retired last August.

Missouri Pacific.—H. B. Kooser, General Agent at Dallas, Tex., has been appointed General Agent at Omaha, Neb., succeeding J. O. Phillippi, resigned. S. W. Bradford succeeds Mr. Kooser.

Quebec, Montreal & Southern.—See Delaware & Hudson.

St. Louis, Brownsville & Mexico.—The office of William Doherty, Traffic Manager, has been moved from Corpus Christi, Tex., to Kingsville.

Engineering and Rolling Stock Officers.

Boston & Albany.—L. G. Morphy, Assistant to the Principal Assistant Engineer of the New York Central & Hudson River, has been appointed Assistant Engineer of Maintenance of Way and Construction of the Boston & Albany, with office at Boston, Mass.

New York Central & Hudson River.—S. P. Hull, Engineer of Signals, has been appointed Engineer of Maintenance of Signals, with office at New York City, with authority over all divisions except the Electric division. He will report to the General Superintendents. W. H. Elliott, an Assistant Signal Engineer of the Electric division, succeeds Mr. Hull, with office at New York, with authority over all divisions except the Electric division. See Boston & Albany.

Purchasing Agents.

Chicago & Alton.—The authority of E. S. Wortham, Purchasing Agent of the Toledo, St. Louis & Western, has been extended over the Chicago & Alton. E. V. Dexter, Purchasing Agent of the Chicago & Alton, has been appointed to the new office of General Inspector of Fuel, Equipment and Material.

Toledo, St. Louis & Western.—The office of the Purchasing Agent has been moved from Toledo, Ohio, to Chicago. See Chicago & Alton.

LOCOMOTIVE BUILDING.

The Peoria & Pekin Union has ordered three switch engines from the American Locomotive Company.

The Grand Trunk, which was reported to be in the market for locomotives in the *Railroad Gazette* of July 19, 1907, has ordered 10 simple mogul (2-6-0) locomotives for September, 1908, delivery; 10 simple switching (0-6-0) locomotives for August, 1908, delivery; 10 simple ten-wheel (4-6-0) locomotives for May, 1908, delivery, from the Baldwin Locomotive Works, and 20 Richmond compound consolidation (2-8-0) locomotives for September, 1908, delivery from the Locomotive & Machine Company of Montreal. The specifications are as follows:

General Dimensions.

	Mogul.	Switching.	Consolidation.	Ten-wheel.
Type of locomotive	Mogul.	Switching.	Consolidation.	Ten-wheel.
Weight, total	161,976 lbs.	139,500 lbs.	211,200 lbs.	167,300 lbs.
Weight, on drivers	138,176 "	139,500 "	184,800 "	126,420 "
Cylinders	20 in. x 26 in.	20 in. x 26 in.	22½ & 35 x 32 in.	19 in. x 26 in.
Diameter of drivers	63 in.	56 in.	63 in.	73 in.
Boiler, type	Ext. wagon top.	Straight.	Ext. wagon top.	Ext. wagon top.
" steam pressure	200 lbs.	190 lbs.	210 lbs.	210 lbs.
" outside diameter at smallest ring	62 in.	66 in. inside.	67 in.	60⅜ in.
" tubes, No.	283	264	373	270
" tubes, diameter	2 in.	2 in.	2 in.	2 in.
" tubes, length	11 ft. 11 in.	12 ft. 9½ in.	15 ft.	13 ft. 6 in.
Firebox, length	120 in. inside.	98½ in. inside.	96⅞ in. inside.	108⅛ in. inside
" width	40⅜ in. inside.	40¼ in. inside.	75¼ in. inside.	40⅝ in. inside
" depth	76¾ in. front.	69 in. front.	72¾ in. front.	72 in. front.
" depth	65 in. back.	67 in. back.	56¼ in. back.	60 in. back.
Heating surface, tubes	1,863 sq. ft.	1,772 sq. ft.	2,757.1 sq. ft.	1,946.8 sq. ft.
" " firebox	188 "	148 "	168.2 "	160.2 "
" " total	1,991 "	1,920 "	2,925.3 "	2,077.0 "
Grate area	33.43 "	27.44 "	50.62 "	30.5 "
Tender	Hopper style.		Hopper style; water bottom.	Hopper style.
Truck	Grand Trunk stand. with wooden bolster		Grand trunk stand.; metallic bolster.	
Water capacity	6,000 gals.	5,000 gals.	7,000 gals.	6,000 gals.
Coal capacity	10 tons.	8 tons.	10 tons.	10 tons.

The San Antonio & Aransas Pass, it is said, has decided not to order the ventilated box cars and the plain box cars on which they asked bids, as reported in the *Railroad Gazette* of November 29.

The Galveston, Houston & Henderson, as reported in the *Railroad Gazette* of August 9, has ordered two six-wheel switching (0-6-0) locomotives from the Baldwin Locomotive Works.

General Dimensions.

Type of locomotive	Switching
Weight, total	120,000 lbs.
Diameter of drivers	51 in.
Cylinders	19 in. x 24 in.

The Grand Trunk Pacific, which was reported to be in the market for locomotives in the *Railroad Gazette* of July 19, 1907, has ordered 30 simple American (4-4-0) locomotives from the Locomotive & Machine Company of Montreal for March to July, 1908, delivery, and 20 simple American (4-4-0) locomotives from the Canada Foundry Company, Toronto, for April to August, 1908, delivery. The specifications are as follows:

General Dimensions.

Type of locomotive	American
Weight, total	121,688 lbs.
Weight, on drivers	74,060 "
Cylinders	18 in. x 24 in.
Diameter of drivers	69 in.
Boiler, type	Extended wagon top
" steam pressure	200 lbs.
" outside diameter at smallest ring	55¼ in.
" tubes, No.	210
" tubes, diameter	2 in.
" tubes, length	11 ft. 2¾ "
Firebox, length, inside	95¾ "
" width, inside	41⅞ "
" depth, front	63 "
" depth, back	50 "
Heating surface, tubes	1,259 sq. ft.
" " firebox	126 "
" " total	1,385 "
Grate area	28 "
Tender	Hopper style, water bottom
Truck	Grand Trunk standard with cast-steel bolster
Water capacity	7,000 gals.
Coal capacity	10 tons

CAR BUILDING.

The Northern Pacific is reported to be considering the purchase of new passenger equipment for the coming year.

The Utilization Co., Grand Rapids, Mich., has ordered two steel gondola cars of 100,000 lbs. capacity from the Pressed Steel Car Co., for January, 1908, delivery. These cars will be 40 ft. 4 in. long, 9 ft. 4⅞ in. wide and 4 ft. 6 in. high, inside measurements. The special equipment includes:

Brakes	Westinghouse
Couplers	Climax

The Northwestern Pacific has ordered 13 coaches, one mail and express car and one baggage car from the American Car & Foundry Company. The coaches will weigh 88,000 lbs., and will measure 67 ft. 8¾ in. long, 10 ft. ⅜ in. wide and 14 ft. 1″/₁₆ in. high, over all. The special equipment includes:

Brake-beams	Diamond special
Brake-shoes	Diamond S, flanged
Brakes	Westinghouse
Couplers	Janney
Curtain fixtures	Forsyth
Curtain material	Pantasote
Draft rigging	Sessions
Heating system	Frumveller
Light	Pintsch
Paint	Sherwin-Williams
Vestibules	Pullman

RAILROAD STRUCTURES.

Buffalo, N. Y.—The New York Central & Hudson River, it is said, has plans made for at once putting up a new roundhouse to cost about $125,000.

The New York Central & Hudson River, it is said, will build a new swing bridge to be operated by electricity to replace the present structure connecting with Tonawanda Island.

Houston, Tex.—The Colorado Southern, New Orleans & Pacific, it is said, has given a contract to the Union Bridge Company, of Kansas City, Mo., for building the sub-structure for a bridge over the Trinity river. There will be four piers.

Mission City, B. C.—A proposition is under consideration to build a combined steel highway and railroad bridge, to replace the present wooden bridge over the Fraser river.

NEW YORK, N. Y.—Plans have been filed by the New York City Railway Co. for a new office building and car-house to be built at the northwest corner of Lenox avenue and 146th street, adjoining the power station and car sheds in 146th street, which were damaged by fire last April. The new building is to be of brick, two stories high, fronting 199.10 ft. on the avenue and having a depth of 469 ft. on 147th street. It is to cost $400,000. The power station and shops are to be finished about the same time, making of them a four-story building as originally designed; the work of completion costing an additional $25,000.

PRESCOTT, ONT.—The Canadian Pacific, it is said, will spend $40,000 on its yards here this winter. An appropriation of $100,000 has been made for a new station.

VICTORIA, B. C.—A contract has been given by the British Columbia Electric Railway Company to W. A. Gleason of Victoria, at $10,000 to put up a brick car barn 82 ft. x 200 ft.

WILLOW, CAL.—The bridge to be built over the Sacramento river here by the Northern Electric Railway Company of Chico, is to be a combined railroad and toll bridge 570 ft. long.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

ABERDEEN & TOMBIGBEE.—The surveys for this proposed line have been made. It is from Okolona, Miss., southeast via Woodson, Aberdeen and Columbus to Pickensville, Ala., 65 miles, of which 59 miles is in Mississippi and six miles in Alabama. Grading is finished between Okolona and Aberdeen 17.5 miles, also from Columbus to Pickensville, 11.5 miles. The company is building the line with its own men. W. T. McKee, Chief Engineer, Aberdeen, Miss.

AKRON & YOUNGSTOWN (ELECTRIC).—Rights of way are reported secured and application has been made in Ohio for a charter by a company under this name with a capital of $100,000. The company proposes to build an electric line from Akron, Ohio, east to Youngstown, about 50 miles. T. L. Childs, E. F. Veris, Judge J. A. Kohler and others are interested.

ATCHISON, TOPEKA & SANTA FE.—The Guthrie, Fairview & Western, chartered early in 1904 to build a line from Guthrie, Okla., west through Logan, Kingfisher, Blaine and Woods counties to Fairview, to a connection with the Kansas City, Mexico & Orient main line, has been sold to the Santa Fe. J. S. McCaul was the promoter and general manager of the line. The company had a portion of its proposed route graded west from Darrow in Blaine county and some track laid within the city of Guthrie. Valuable traffic arrangements had been made with the Denver, Enid & Gulf and other Oklahoma roads.

CANADIAN NORTHERN.—Application will be made to Parliament by this company to build extensions in the west as follows: Humboldt, Sask., southwest to Calgary; Brandon-Regina line near west boundary of Manitoba west to Lethbridge, Alb.; North Battleford, northwest to Athabaska Landing with a branch to Green Lake; Strathcona, Alb., south to Calgary, with a branch to connect with authorized line from Regina to Red Deer river; Regina southwest to international boundary; Edmonton to headwaters of McLeod and Brazean rivers; Russell, Man., via Yorkton to authorized line near Goose Lake, Sask.; south of Neepawa, Man., to main line crossing of South Saskatchewan river. Application will also be made for extending the time for commencement and completion of the following lines: North of the line between Winnipeg and Ste. Anne to international boundary; between Port Arthur and Fort Frances to Quebec, with branches to Port Arthur, Ottawa and Montreal; Battleford west to the Brazean river; Regina to Humbolt and via Carrot river to Pas Mission, and between Humbolt and South Saskatchewan river to crossing of same river south of Prince Albert; and to authorize the increase of the capital stock of the company by $19,250,000.

CANADIAN NORTHERN ONTARIO.—This company will apply to Parliament for authority to build a line from a point on the line already authorized between Udney and Rathburn, to Orillia.

CANADIAN PACIFIC.—According to reports from the state of Washington, this company is making surveys for two lines, one from Spokane through the Yakima valley across the Cascade mountains to Tacoma and Seattle, and the other a connecting north and south line from Sumas on the international boundary to Seattle and Tacoma. Permanent surveys have already been made for a coast line from Sumas south to Deming, 40 miles. The company, it is said, has options on 200 acres of Tacoma deepwater terminals.

CLEVELAND, CINCINNATI, CHICAGO & ST. LOUIS.—Contracts are reported let by this company for straightening its line and reducing grades from Bellefontaine, Ohio, north to Harper, about six miles.

DELAWARE & HUDSON.—Work on the contract given to O'Brien & Mularkey, of Montreal, extending the Quebec, Montreal & Southern from Pierreville, Que., to St. Jean des Chaillons, 48½ miles, towards Quebec, has made satisfactory progress. About three-fourths of the tracks are on the ground and sub-structures of the bridges at Nicolet, Becancourt and East Gentilly as well as for several smaller structures are about finished. Contracts for an additional 41 miles will probably be let this winter. (March 15, p. 383.)

FLORIDA EAST COAST.—In reply to the report that work had been abandoned last spring on the Key West extension of this road, L. Larson, Northwestern Agent is quoted as follows: A large force of men has been at work all summer, and the number has been increased to 3,000 to finish the line as far as Knight's Key, 50 miles from Key West, this year.

GEORGIA ROADS (ELECTRIC).—Surveys are being made by the Columbus Power Co. for an electric line to be built from Columbus, Ga., north along the Chattahoochee river to West Point, 34 miles.

GRAND TRUNK PACIFIC.—G. O. Leask, Assistant Chief Engineer of this company in the West, announces that the final route through the Rocky mountains has been located through the Yellow Head Pass. The surveyors are now working on this route from the pass to the Nechaco and Bulkley valleys. This section of the road will be 400 miles long and 150 men will be engaged on the surveys all winter. The company is planning to begin construction work in the mountains in the spring. Two years will be required to complete the road from Edmonton to the Pacific coast.

GUTHRIE, FAIRVIEW & WESTERN.—See Atchison, Topeka & Santa Fe.

HOUSTON & TEXAS CENTRAL.—See Missouri, Oklahoma & Gulf.

IDAHO & WASHINGTON NORTHERN.—This company was incorporated last April in Idaho with $5,000,000 capital to build a line from McGuire's Station, Idaho, on the Coeur d'Alene & Spokane division of the Spokane & Inland Empire north to Newport, Wash., thence north along the Pend d'Oreille river to Metaline near the British Columbia boundary. The line is finished from McGuire's Station to Newport, 51 miles, including a seven-mile branch. F. A. Blackwell, President, Coeur d'Alene.

ILLINOIS CENTRAL.—The new double-track belt line, which this company has been building around Memphis, Tenn., is to be put in operation about the first of next year. (Oct. 4, p. 403.)

INTERCOLONIAL.—Hon. George P. Graham, Canadian Minister of Railways, states that a large amount of money is being spent for improvements on this road. New concrete shops and terminals are being constructed at Moncton, N. B., large enough to accommodate the Grand Trunk Pacific as well as the Intercolonial. A contract for a gas-producer plant for the supply of power and light has been let. Double-tracking work has been started from Moncton to Halifax. New and heavier bridges are being put in on the line of the old Canada Eastern from Chatham, N. B., to Fredericton, which is now part of the government system.

LIMA & TOLEDO TRACTION.—This company, it is said, has opened part of the extension it is building from Leipsic, Ohio, north to Toledo on the section from Leipsic north to Deshler, about 10 miles. (Nov. 15, p. 665.)

MISSOURI, KANSAS & TEXAS.—Engineers are laying out extensive improvements in the yards and on the main line of this road near McAlester, Ind. T. This change is in accord with the plan to double-track the entire line from Denison, Tex., north to Muskogee and later to Parsons, Kan.

MISSOURI, OKLAHOMA & GULF.—This company, operating a line from Wagoner, Ind. T., south to Dustin, 75 miles, is building an extension north to Joplin, Mo., 120 miles. It is said that the road is now the property of E. H. Harriman and associates. The northern extension is to be continued north to a connection with the Union Pacific at Lawrence, Kan., 240 miles, and on the south from Dustin south to Denison, Tex., 128 miles. The new road will give the Harriman system in Texas and the Southwest a direct outlet to the Middle West and the Northwest. It will connect with the Houston and Texas Central at Denison. Construction work is now in progress south of Wagoner, Okla. A gap of about 45 miles remains to be built between the two places. The final location of the route north from Wagoner to Lawrence is being made. The building of an outlet for the Harriman lines in Texas was made necessary by the recent completion of the Trinity & Brazos Valley between North Texas points and Houston. The traffic of the Rock Island, the Frisco and the Colorado & Southern, which formerly went to the Houston & Texas Central, is now being turned over to the Trinity & Brazos Valley. (Nov. 1, p. 541.)

NORTH & SOUTH.—Surveys are being made for this proposed line from Portsmouth, Ohio, south to Pound Gap, Ky., 180 miles. Construction is to be started in the spring. The line lies through

a rich ore territory. Major T. J. Kirkpatrick and Dr. L. E. Niles, of Springfield, Ohio, are interested. E. Parsons, Chief Engineer.

North-Western Pacific.—Application will be made to incorporate this company, which proposes to build a line from Fort Churchill on Hudson Bay west to the Pacific coast. Murphy & Fisher, 46 Elgin street, Ottawa, are the Attorneys.

Ontario & West Shore (Electric).—This company, with office at Goderich, Ont., proposes to build an electric line from Goderich northeast to Owen sound, about 75 miles.

Pennsylvania.—Plans are reported made by this company to double-track the Belvidere division from Trenton, N. J., north to Manunka Chunk. Work is to be started in the spring.

Public Service Corporation of New Jersey.—President T. N. McCarter is quoted as follows: The Public Service Corporation is now operating all the gas and electric properties which it controls, having merged them into a new company known as the Public Service Railway Company. The company has decided for the present to stop new construction on every work that will bear postponement.

Public Service Railway.—See Public Service Corporation.

Quebec, Montreal & Southern.—See Delaware & Hudson.

St. Louis & San Francisco.—President A. J. Davidson, of this company, is quoted as saying that it is expected that trains of the Frisco will be running from St. Louis direct into Dallas over the Carrollton and Irving cut-off by January 1. Track laying is finished. (March 11, p. 391.)

Temiskaming & Northern Ontario.—Plans are under consideration by the Ontario Railway Commission to reduce the grades from 1.25 per cent. to 0.5 per cent. on 21 miles of this railroad from a point ten miles north of North Bay, Ont. The road will be made seven miles longer but the grade-reduction will more than offset the loss.

Texas & New Mexico.—Surveys have been made by this company for 80 miles, and grading has been finished on four miles of its proposed line from McKinney, Tex., west via Denton, Krum, Bridgeport and Jacksboro to a point 175 miles west of McKinney. Contract has not yet been let for the work. The company wants to negotiate with a railroad contractor to form a construction company to finish the line. Right-of-way and the sites for terminals are assured. W. J. Healy, V.P., McKinney.

United Railways Company of St. Louis.—John I. Beggs, President of this company and the Laclede Gas Light Company, is quoted as saying that all employees of the construction and extension departments of these corporations, as well as of the Union Electric Light & Power Company, have been laid off indefinitely. No new work is to be carried out until conditions change and confidence is restored.

Valley River.—This company, with office at Mill Creek, W. Va., is said to be buying material to build its proposed line from Mill Creek southwest to Clover Lick, 43 miles. Surveys made and right-of-way and capital partly secured. W. A. Dromgold, President, York, Pa.; J. G. Hoffman, Jr., Vice-President; L. E. Shull, General Manager; John Alden, Chief Engineer, Elkins, W. Va. (July 12, p. 51.)

Wichita Falls & Northwestern.—Announcement is made that this company has opened its line for freight and passenger service between Wichita Falls, Tex., and Frederick, Okla., 50 miles. (Sept. 13, p. 308.)

RAILROAD CORPORATION NEWS.

Alabama Great Southern.—The $1,750,000 first mortgage 6 per cent. bonds maturing January 1, 1908, are to be extended to December 1, 1927, with interest at 5 per cent. The Guaranty Trust Company, New York, which is receiving deposits of the present bonds up to December 20, 1907, for extension, will pay the January 1, 1908, coupon on each bond as soon as deposited.

Burr's Ferry, Browndel & Chester.—The Texas Railroad Commission has given this company permission to register an issue of $165,000 bonds on 11 miles of completed road from Rockland, Tex., west. The road has been in operation from Aldridge to Rockland, eight miles, for some months, and is being extended to Browndel, 22 miles. It is projected from Chester, on the Missouri, Kansas & Texas, east via Rockland and Browndel to Burr's Ferry, 80 miles.

Canadian Northern.—This company is to ask the Canadian Parliament for permission to increase its authorized capital stock from $30,750,000 to $50,000,000.

Chicago, Burlington & Quincy.—This company, according to press despatches, has bought the Colorado & Wyoming, a subsidiary of the Colorado Fuel & Iron Company. It has $100,000 capital stock and $4,500,000 first mortgage 4 per cent. bonds of 1953 outstanding. It owns 53 miles of road, of which 15 miles are from Hartville Junction, Wyo., to Sunrise, connecting with the Burlington at Guernsey and with the Colorado & Southern at Hartville Junction. The rest of the mileage is mostly in Colorado without connection with the road in Wyoming.

Colorado & Wyoming.—See Chicago, Burlington & Quincy.

Evansville Railways.—This company, which was incorporaaed last June as a consolidation of the Evansville & Eastern Electric and the Evansville & Mount Vernon Electric, has issued $500,000 6 per cent. cumulative preferred stock. The company has $900,000 common stock outstanding and operates 38 miles of road from Newburg, Ind., to Rockport and from Evansville to Mount Vernon, with a three-mile branch. It has trackage rights from Newburg into Evansville.

Hocking Valley.—See Kanawha & Michigan.

Illinois Central.—A circular signed by most of the directors has been sent to stockholders. The circular reiterates the criticisms already made of Mr. Fish's actions while President.

Interborough-Metropolitan.—The $3,000,000 6 per cent. six months' notes sold last May are to be taken care of by paying 30 per cent. in cash and extending the remainder for about six months at 6 per cent. These notes were to have been retired with the proceeds of part of the $15,000,000 collateral trust 5 per cent. three-year notes which were authorized last spring, but never issued.

Kanawha & Michigan.—Of the $2,500,000 second mortgage 20-year 5 per cent. bonds authorized last June, $2,078,000 have been issued. The proceeds have been used to pay off the $1,095,000 special equipment and betterment loan and other debts to the Hocking Valley and the Toledo & Ohio Central.

St. Joseph & Grand Island.—This company is one of the few to show large increases in net earnings for the fiscal year ended June 30, 1907. There was but a slight increase in operating expenses, the increased cost of conducting transportation being nearly offset by a decrease in the amount spent on maintenance of way and structures, while maintenance of equipment increased a little. The accrued surplus on hand at the end of the year was $982,417. The company has $5,500,000 5 per cent. non-cumulative first preferred stock, $3,500,000 4 per cent. non-cumulative second preferred and $4,600,000 common. The Union Pacific acquired, in 1906, 63 per cent. of the common, 17 per cent. of the first preferred and 36 per cent. of the second preferred. No dividends have been paid on the first preferred since 1902 and none have ever been paid on the other classes. The surplus earned last year would be just enough to pay full dividends on both classes of preferred. Nothing was appropriated out of earnings for betterments in 1907. In the previous year $62,000 was so spent. The income account is as follows:

	1907.	Change.
Gross earnings	$1,734,558	Inc., $212,511
Operating expenses	1,068,844	" 4,581
Net earnings	665,713	" 207,930
Taxes, interest and betterments	247,379	Dec., 67,475
Surplus for the year	418,335	Inc., 275,406

Toledo & Ohio Central.—See Kanawha & Michigan.

Toledo Railway & Terminal.—A reorganization plan for this property, sold under foreclosure last May to a committee of the bondholders, has been prepared. A new company is to be organized with $6,000,000 capital stock and $6,000,000 4½ per cent. 50-year bonds. Of the bonds $4,000,000 are to be issued and the remainder reserved for extensions, etc. The $382,856 accrued interest on the old $3,500,000 4½ per cent. bonds is to be paid in new bonds and cash at the rate of $100 in bonds and $10 in cash for each $110 of interest. The Pere Marquette, the Cincinnati, Hamilton & Dayton, the Pennsylvania Company, the Lake Shore & Michigan Southern, the Michigan Central, the Grand Trunk Western and the Toledo, St. Louis & Western are to guarantee the new bonds, and the entire capital stock is to be held by these companies as follows: Pere Marquette and Chicago, Hamilton & Dayton, 20 per cent. each, and the other five companies, 12 per cent. each.

Underground Electric of London.—Speyer & Co., New York, and their allied banks abroad, have arranged to buy at face value the coupons falling due December 1 of the $33,000,000 5 per cent. profit-sharing notes, whose principal is due June 1, 1908. A plan is being prepared for the extension and conversion of the notes and the raising of additional money, and the note-holders are asked to deposit their holdings for provisional agreement with the plan with the Guaranty Trust Company, New York.

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EDITORIAL ANNOUNCEMENTS.

THE BRITISH AND EASTERN CONTINENTS edition of the Railroad Gazette is published each Friday at Queen Anne's Chambers, Westminster, London. It contains selected reading pages from the Railroad Gazette, together with additional British and foreign matter, and is issued under the name Railway Gazette.

CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.

ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

OFFICERS.—In accordance with the law of the state of New York, the following announcement is made of the office of publication, at 83 Fulton St., New York, N.Y., and the names of the officers and editors of The Railroad Gazette

OFFICERS:

W. H. BOARDMAN, *Presi. and Editor.* — RAY MORRIS, *Secretary*
L. A. SIMMONS, *Vice-President.* — R. S. CHILDLOM, *Treas* / I. B. HINES, *Cashier* / L. B. SHERMAN, *Western Manager*

EDITORS:

RAY MORRIS, *Man'g Editor* — GEORGE L. FOWLER
BRAMAN B. ADAMS — FRANK W. KRAEGER
CHARLES H. FRY — HUGH RANKIN
RODNEY HITT — BRADFORD BOARDMAN

CONTENTS

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The relief which the railroads are now experiencing from the tremendous traffic pressure of the past two years gives opportunity to get back to normal economical conditions of operation. During the long period of congestion and stress, under the constant urgent need of moving the tonnage, conducting transportation costs were necessarily a secondary consideration. Train after train had to be made up and sent out whether the locomotives had full tonnage or not; in fact, so accustomed have division officers on some roads become to running such trains that many of them, as one officer puts it, "probably have forgotten how to run full-tonnage trains." Already alert managers are busy correcting this condition. One large western system has had an officer of special capabilities traveling over the different lines for a month or more for the sole purpose of investigating such conditions and of taking such measures to tone up the service and increase efficiency as the situation may require. A lowered operating ratio will doubtless reward his efforts.

REPORT ON MELBOURNE ELECTRIFICATION.

An extended abstract of a recent report of Thomas Tait, Chairman of the Victorian Railways Commissioners, to the Minister of Railways on his inquiries in Europe and America about steam railroad electrification, is published on another page. Although this investigation was made with the particular object of getting information which would be helpful in considering the question of electrification of the Melbourne suburban lines, it is of great general interest as a summary by a skilled railroad officer of the progress and results of electrification of steam railroads throughout the world.

Mr. Tait, as need hardly be mentioned to readers of the *Railroad Gazette*, resigned his position of Manager of Transportation of all the Canadian Pacific's railroad lines to go to Victoria in 1903 as managing head of the Government railroads and tramways. His accomplishment in this work has been described by a Melbourne paper as "a story of almost romantic success." Instead of a yearly deficit the roads now return year by year a surplus; this after providing for deferred payments bequeathed by the previous administration. Thus his viewpoint is that of a trained and successful manager completely equipped for observation and investigation, who has the advantage of not having been in close touch with any electrification project. This very aloofness tends toward sharp and impartial judgment.

Pending the report of the consulting electrical engineer, whose engagement was one result of his tour of inspection, Mr. Tait does not attempt to choose between the different systems of electric traction or, finally, to pass upon the desirability of electrification of the Melbourne lines. Charles H. Merz, who had charge of the electrification of the Tyneside lines of the North Eastern Railway, has been selected for this important post. Mr. Tait shows, however, that many of the steam railroad electrifications have been made because of special reasons which do not apply in the case of the Melbourne lines. The Valtellina line, for example, had water powers available which made electric motive power much cheaper than steam. The electrification of the New York Central and of the New York, New Haven & Hartford at New York was undertaken as a result of a legislative act. Neither of these arguments apply in the case of the Melbourne lines.

Again he alludes to the statement of J. A. F. Aspinall, General Manager of the Lancashire & Yorkshire—to which we have often alluded in the *Railroad Gazette* as a fundamental truth about electrification that often seems to be forgotten—that the company undertook electrification not to save money but to make money. Previously the train service was infrequent and the passenger traffic was being lost to competing tramway lines. The gains from electrification have come, not from reducing operating expenses, but from increasing the expenses and the gross earnings still more, so that the net result is profitable. Mr. Tait points out that this argument does not apply at Melbourne because the train service on six of his steam suburban lines is now greater than the service on the electrified Liverpool and Southport line; on two of these it is greater by a third. Furthermore, Melbourne is not growing, and as all the lines are owned by the government, there is no incentive to attract suburban travel away from one line to another.

It is evident that Mr. Tait does not make out a case for general and speedy electrification of the Melbourne suburban lines. On the other hand, without prejudging Mr. Merz's conclusions, he points out that there are two stretches of track which seem to be specially adapted for electrification. These are two short and busy lines close together but separated from the rest of the system, leading from the busiest stations in the city south to the ocean, one to

Port Melbourne, the other to St. Kilda. Not only are these lines separated from the others even at the junction stations, but they have no through traffic, so that if electrified, the experiment could be carried out without interfering with the working of the other lines.

More than this, steam locomotives and cars which are greatly needed on the other lines would be released. As Mr. Tait points out, this is one of the important things to be considered in any proposed electrification. If the steam locomotives and cars used on a particular line before electrification are needed to augment the rolling stock on other lines for which new locomotives and cars would otherwise have had to be bought, then the value of the rolling stock relieved from service on the converted line can, to the extent it is useful on the other lines, fairly be offset against the cost of the new electric rolling stock. The interest charges on the cost of the electrification of that line would in such case be reduced accordingly. As a shortage of locomotives and cars now exists on the Melbourne lines, this factor will be an important one in the final decision.

EQUIPMENT PURCHASES ORDERED IN TEXAS.

We reproduce herewith an exact copy (except for the corporate name) of an order which the Texas Railroad Commission has recently promulgated. According to our advices, every railroad doing business in the state of Texas has received a similar one, except, of course, that the equipment required to be ordered is different in each case.

OFFICE OF
RAILROAD COMMISSION OF TEXAS.
Austin, Texas, Nov. 23, 1907.

HEARING No. 765.—Order requiring the Rome & Athens Railroad Company to purchase and acquire additional rolling stock and equipment.

In pursuance of notice, Circular No. 2641, dated July 30, 1907, the above numbered and entitled cause, having been called for hearing before the Railroad Commission of Texas, at its office in Austin, Texas, on the 10th day of September, 1907; and the said Commission having heard the evidence and statements presented pertaining to the matters embodied in said notice;

It is therefore ordered by the Railroad Commission of Texas, in pursuance of the authority conferred upon it by the Act of the 30th Legislature of the state of Texas and published as Chapter 155 of its general laws, that the Rome & Athens Railroad Company be, and it is, hereby ordered to purchase rolling stock and equipment, in addition to that now owned and contracted for delivery during the year 1907, for use in the operation and business of its line of railway, as follows:—

1. For delivery during the year ending Dec. 31, 1908, twenty (20) locomotives; fifteen (15) passenger cars; and four hundred (400) freight cars, including one hundred (100) stock cars and fifty (50) coal cars.

2. For delivery during the year ending Dec. 31, 1909, twenty (20) locomotives; fifteen (15) passenger cars; and four hundred (400) freight cars, including one hundred (100) stock cars and fifty (50) coal cars.

3. For delivery during the year ending Dec. 31, 1910, sixteen (16) locomotives; six (6) passenger cars; and two hundred (200) freight cars, including fifty (50) stock cars and twenty-five (25) coal cars.

All of the above specified equipment to be of first-class standard and design, suitable for the business of its railway, and suitable for interchange with other railways.

It is further ordered that the said company shall maintain all equipment which it now owns in first-class condition, suitable for its own business and for interchange with other railways in this state, and shall at once replace such equipment as may be dismantled or destroyed by other similar equipment in addition to that hereinbefore ordered.

It is further ordered that should the said company find it necessary to issue additional stock, bonds or other obligations in excess of those now outstanding to provide for the purchase of the additional equipment herein ordered, this Commission will approve and authorize the issuance and registration of same as provided by law, provided that the contracts for the purchase of said equipment shall be submitted in advance for the approval of this Commission in order that it may determine the reasonableness of same.

It is further ordered that this order be held open subject to amendment without further notice.

. . . . . Chairman.

(Signed) L. J. STOREY,
(Signed) O. B. COLQUITT
[SEAL.] Commissioners.

I. B. McLEAN, Secretary.

We can learn from Mr. Hale's car efficiency bulletins that his Group 9 covering roads in Texas, Louisiana and New Mexico, had, in June, 1907, slightly fewer cars on line per mile of line worked than any of the other groups, although the averages for Group 8 (Missouri, Arkansas, Kansas and Colorado) and for Group 6 (Iowa, Illinois, Wisconsin, Minnesota and the Dakotas) were not very much higher. But it must be only too obvious to the Texas commissioners at the present time that the roads under their supervision are not facing car shortage. What with the cotton growers holding back for 15c., and the threat of hard times, it is apparent enough that the roads in the Southwest, just like the roads in every other part of the country, are soon going to begin to play hearts with their cars for the 50 cents per diem, so that if Texas should develop a need for freight cars, there will be states anxious to accommodate her on both sides and at the top.

Now, the Texas Commission has had far too much experience not to understand this. What, then, made it send out an order which, if carried out, would require new capital at a time when it cannot be had, for a purpose for which it is not needed, and would stop dividends and cause insolvency and receiverships? Was it the personal folly of the commissioners and their desire to earn their pay as corporation oppressors? We can freely acquit them; they were carrying out the instructions of the last state legislative session, and had no choice. The real motive of the legislation appears in the clause in the last paragraph but one, with reference to the approving of contracts. It would be a simple matter for the road upon which the attached order was cited to transfer equipment into Texas from its lines in other states, but if it did this, Texas would lose a golden opportunity of raising new tax funds. So, at a time when traffic was in excess of facilities, the state ordered its roads to supply new equipment in such a manner that the taxes on this equipment would stay at home, but the order is not actually promulgated until a time comes when facilities exceed traffic, and when every conservative manager is making whatever retrenchment lies in his power.

We presume that this particular order can be set aside, or at least tied up in the courts until it becomes possible to raise money again. But no better example could be given of the fatuity and harmfulness of direct legislative interference with railroad operation. Since we are discussing Texas and not Alabama, we may assume that the Governor and the legislature do not really wish to cause receiverships, yet, if sustained by the courts, they have taken an infallible means to that end. The Texas Commission is no longer to be classed among the radical bodies; it has learned much, and has made honest, if occasionally wrong-headed, efforts to do its duty. But the legislature is not content to leave the Commission in charge of detail; it must needs interpose its own superior wisdom. There used to be a saying that *noblesse oblige*. Is it no longer true that those in authority have responsibilities, and that their duty to be fair and intelligent increases in proportion to their power to be unfair and to wreak havoc by their lack of intelligence?

A NEW PHASE OF RAILROAD MONOPOLY.

The contention of President Mellen before the Interstate Commerce Commission for the New Haven's right to cancel the New Jersey Central through freight tariff suggests a situation big with possibilities. In proportion as it shuts down on a certain part of the freight business via Jersey City so does it open up the question of the New Haven's transfer of business to its Poughkeepsie Bridge route and its getting an outlet via the Lehigh & Hudson River. The latter road, some 81 miles long, connects with the Poughkeepsie Bridge route at Maybrook, N. Y.; extends to Easton, Pa., and connects with or crosses five important lines—the New York, Susquehanna & Western; the Delaware, Lackawanna & Western; the Lehigh Valley, the Central Railroad of New Jersey, and the Pennsylvania. On business with the New Haven it would give that line a longer haul than now and to the other lines a shorter haul; and the business to be thrown upon the L. & H. R. by the New Haven will naturally involve the question of an increase of L. & H. R. facilities by the six companies owning it, or its continuance as a line which the owners do not want the New Haven to use. This shifts the objective point of future interest to the Lehigh & Hudson and its status as a line held under a tenure which is "in restraint of trade," a point pressed strong by President Mellen in last week's hearing.

It is not likely that President Mellen will yield easily that point which involves a southern and western outlet for his system via the Poughkeepsie Bridge. Nor is it by any means impossible—it is even probable—that he may himself take the case of the Lehigh & Hudson before the commission. Should he succeed in such a contention and open up the Lehigh & Hudson to a large volume of business, the diversion of freight traffic from the Jersey City-Harlem transfer route can hardly be measured nor its ultimate effect on terminal plans at New York and Brooklyn bearing upon New England business. For these reasons the Lehigh & Hudson now becomes, we repeat, a line for acute watchfulness in the eastern railroad situation.

But the situation is larger than that. It involves a new and important phase in the development of close territorial control. Heretofore such control under the trite term "monopoly" has been viewed chiefly in its public relation often as an object of censure and criticism, sometimes just, sometimes unjust. Railroad companies, as a rule, each seeking monopoly more or less and pushing a policy of absorption and consolidation, have not been in a position either to obstruct the doctrine or to criticize it. But the swift policy of President Mellen, accentuated by his Poughkeepsie Bridge plan, now shifts the view-point of territorial control from its relations to the public to its relations with connecting lines. And the per diem dispute leads up to the same subject.

Step by step but with unfaltering purpose and with results nearly accomplished the Mellen policy has advanced forward its territorial supremacy in New England. It embraces all but one of the really profitable railroad lines in six states. It is protected locally by ownership of nearly all the trolley lines of Connecticut and Rhode Island and large trolley systems in central and lower Massachusetts. It has its dominating navy on the Sound and by the Ontario & Western it reaches to the coal fields and the lakes—this less as an affluent of business than of future opportunity. It controls coastwise lines externally; and, internally, it reaches every New England city of even secondary size and importance. A region of the country with a population of some 7,000,000, thick with population, of high industrial energy and a great producer of railroad freight of the upper class is now in the New Haven grasp with all the vantage powers which such control implies. It can fix rates. It can divert traffic to long hauls and points of greatest profit. It can throw its valuable business so as to extort concessions. New England, as producer and consumer, supplies a huge volume of railroad traffic to the country. Its interior must be reached, and to its interior, as to its ports, the New Haven company holds the key which now, with control assured, it is beginning to turn. Other railroad systems of the country have monopoly of extensive regions but none under such ramified and unique conditions as the New Haven and with so close and varied relations with connecting lines.

As distinguished from the public aspects of monopoly, so often discussed, this new aspect of a railroad monopoly's policy toward other railroads, all of them strong systems, rises to vivid prominence and challenges attention not less as a dramatic situation in itself than for the other dramatic situations to which it may lead. The Interstate Commerce Commission has just passed upon one of its issues. There are others yet to come which may be writ large in our railroad history.

THE CONGO RAILROAD.

The Congo Railroad, the building of which was a tragedy for the first three years, has turned out to be a very profitable enterprise. The Congo and its tributaries form a navigable system of more than 9,000 miles, which was substantially isolated from the rest of the world by rapids and shoals beginning about 100 miles from its mouth. The only outlet for the basin of the river below Stanley Pool, about 350 miles from its mouth, was by a foot-path through the wilderness, over which porters could carry a burden of 66 to 77 lbs. in 17 to 20 days, at the risk of their lives and with incredible fatigue. In 1887 about 2,200 tons were so carried—largely ivory—and the path was lined with the skeletons of those who had succumbed on the way, and men could not be had to carry more. The railroad was planned to give an outlet to the thousands of miles of navigable streams above Stanley Pool. Its lower terminus was established at Matadi, 90 miles from the mouth of the river, which is reached by ocean steamers. Thence to Stanley Pool, 250 miles, it was estimated that a railroad of 30-in. gage could be built for 25,000,000 francs. Actually when 25 miles had been built this original capital was all gone, and only by a loan from the Belgian government could the work be continued. It was two years before six miles of track could be laid, and at the end of the fourth year there were but 65 miles, and it was eight years before the road was completed, at a cost of 82 millions, instead of the 25 of the original estimate—at the rate of $63,632 per mile for a light 2½-ft. gage road with very little equipment.

After following the precipitous left bank of the Congo for a little distance the road goes up a tributary toward mountains, and there the climate threatened to kill off the whole working force, white and black. The negroes deserted by the hundred and fled into thickets, where as the work went on many of their bodies were found. When a steamboat arrived with materials it was fairly stormed by men who were eager to return to Europe. The work had such a bad name all along the African coast that very few negroes could be had, and an importation of Chinese coolies was made. These, usually considered climate-proof, fared so ill that many deserted and started for the rising sun on foot, and some of them have been found since up the river some 600 miles from where they were working. The total number of deaths was 132 whites and about 1,800 others.

The railroad does not follow the river, but for the most part is 30 or 40 miles distant from it. Beginning at Matadi, 86 ft. above sea level, it climbs a coast mountain range, the summit of which it crosses 144 miles from Matari at an elevation of 2,432 ft., descending thence 1,483 ft. to Stanley Pool. At places there are grades of 185 ft. and even 238 ft. per mile, and curves of 164 ft. radius. Ascending the range not far back of Matadi the road rises 710 ft. in 4 1-3 miles. There are 99 bridges, the longest only 328 ft. long, and 1,250 culverts. All but three of the bridges have but a single span. The torrents carrying trees are hard on bridge piers. There is no tunnel.

At present there is a passenger train three times a week in both directions. It does not run at night, but makes the trip in two days, remaining overnight at the mountain summit. There is traffic for three freight trains daily in both directions, but to avoid crossings, six trains are dispatched every other day. They are three days on the road.

The net earnings of the road last year were about 7 per cent. on the whole capital; but as most of this is in bonds at a low rate of interest, the surplus over fixed charges was about 17 per cent. on the stock. The working expenses are very heavy. White employees must be paid nearly five times European wages, and a very large number of negroes is required for the work which they can do—1,850 in all.

When the road was opened in 1898, it seems to have been the policy to make the rates not very much lower than the old foot-path charges. All freight up the road, except salt, was charged 70 cents per ton per mile; salt, half as much, making about $12.50 per barrel for salt! The 70-cent rate was charged only on ivory shipped down the road, which could very well bear it, though it amounted to nearly 9 cents per pound. India rubber was taxed at the rate of $3.80 per 100 lbs. for the 250 miles; coffee, $2.50, and some articles which are cheap on the coast as low as 88 cents, which is about 7 cents per ton per mile. But reductions have been made from time to time, and now very few up freights pay the 70 cents per ton-mile rate. Rice pays half as much; most other provisions, clothing, machinery, etc., 14 cents. On down freights the original high rates are maintained only on ivory and india rubber, and the rate on all other down shipments is about 12½ cents per ton-mile. There is not much other down freight, however, about half of the cars which go up loaded coming down empty. The original passenger fares of 39 cents per mile, first class, and 3.9 cents second class (natives), have been reduced to 15½ and 2 cents.

The traffic, considering the enormous region which the railroad serves, is light, and at the lowest of the above rates cannot be expected to become very large. The first year the road was open through it carried 10,522 passengers and 14,062 tons of freight, and earned gross $1,961,053. In 1905-6 it carried 22,331 passengers and 31,715 tons of freight, and earned gross $2,209,223. The reductions in rates have attracted some business which the old rates prohibited, but have added not much to the earnings. These last were largest in 1899-1900, when they amounted to $2,557,463, or $10,230 per mile.

The various lines to be built above the rapids on upper reaches of the Congo are not enterprises of the Congo Railroad Co., but of the Congo Free State. The railroad company is required to carry materials and men for them at cost. They are mostly in a high and healthy country and should not cost nearly as much per mile as the Congo Railroad. The traffic which they and the connecting lines of steamboats develop will chiefly pass over the Congo Railroad. There is a possibility of a very large development of traffic in this enormous region, one of the lines reaching what are said to be very rich copper mines a little north of Rhodesia; but there are two other railroads progressing towards these mines, and the distance by the Congo route must be over 2,500 miles. There must be a very great reduction of rates over the Congo Railroad to make large and long-distance shipments possible; and the road must be substantially rebuilt to be able to carry large shipments. Its largest traffic heretofore has been at the rate of 30 passengers and 42 tons of freight each way daily, which can be handled very well on

a 30-in. railroad with 43-lb. rails 23 ft. long. But changing into a heavy railroad fit for trunk-line business will be child's play compared with the original construction.

Cincinnati, New Orleans & Texas Pacific.

The Cincinnati, New Orleans & Texas Pacific leases the Cincinnati Southern, which was built by the city of Cincinnati and finished from Cincinnati south to Chattanooga, Tenn., in 1880. The road has 336 miles of line between these two cities and is one of the most important through routes between the southern and gulf states and trunk line territory. It forms the northern end of the Queen & Crescent Route, which is made up of the Vicksburg, Shreveport & Pacific; the Alabama & Vicksburg; the New Orleans & North-eastern; the Alabama Great Southern, and the Cincinnati, New Orleans & Texas Pacific, leading from Shreveport and New Orleans, La., north through Birmingham, Ala., and Chattanooga, Tenn., to Cincinnati. More important still, it forms the connection between the Southern Railway lines in the south and the St. Louis-Louisville lines of the Southern as well as with the Chicago, Indianapolis & Louisville, in which the Southern controls a half interest, and the other connecting lines north of the Ohio river. For these reasons and because it has no branch lines, it is primarily a through traffic road.

Control lies with the Cincinnati, Hamilton & Dayton and the Southern Railway jointly, with Southern Railway interests actively in control. Their policy has for years been to improve the property out of earnings. Maintenance of way cost $3,893 a mile last year, against $4,901 in 1906 and $4,562 in 1905. A through line naturally requires more maintenance than a branch line especially if it carries heavy traffic, but this road, mostly single track, never required $5,000, or for that matter $3,000, a mile for actual maintenance. Maintenance of equipment expenses have also been heavy. Repairs and renewals of locomotives cost $3,774 per locomotive in 1907, against $3,751 in 1906; repairs and renewals of passenger cars, $1,479 per car in 1907 and $2,086 in 1906, and repairs and renewals of freight cars, $66 per car, against $65 in 1906. These are all large unit charges—the passenger car figure probably the largest on any road in the country.

One result of the large maintenance of way expenditures is that the road now has automatic block signals protecting all but ten miles of its line. It had no double track three years ago. By the end of 1907 it is to have 64 miles in service. Sixty-three miles of this is north of Harriman Junction, Tenn., most of it between this point and the St. Louis-Louisville line connection. This is greatly needed. Harriman Junction is the principal connecting point on the south with the Southern Railway. According to President Finley, writing not as President of the Cincinnati, New Orleans & Texas Pacific but of the Southern Railway in that company's last annual report, last winter this connection was paralyzed. During the rush of traffic of the last two years the Cincinnati Southern line has suffered greatly from traffic congestion, principally because the northern part of the road had more trains than it could handle. Still more double-tracking will undoubtedly be done when funds are available.

Besides the improvement expenditures included in operating costs, appropriations are also made out of net income for permanent improvements, new and additional tracks, etc., which are known as rental betterments and revert eventually to the lessor, the city of Cincinnati. Under this head only $115,000 was appropriated last year, against $440,826 in 1906. President Finley states, however, that expenditures amounting to $359,837 for permanent improvements were charged direct to expenses. The policy of the owners is apparently to go build up the property out of earnings during the present years of the lease that during the latter part of the lease, which runs till 1966, they will reap correspondingly large benefits in dividends. At present payments at the rate of 5 per cent. are being made both on the $2,000,000 preferred and the $3,000,000 common stock.

Freight earnings for the year decreased 2 per cent., probably owing to the traffic congestion. Passenger earnings rose 10 per cent., and there were increases of from 8 to 16 per cent. in mail, express and miscellaneous earnings. The increase in gross earnings was $309,000, or 4 per cent. While maintenance of way decreased 21 per cent., maintenance of equipment increased 22 per cent. and conducting transportation 23 per cent. Operating expenses, therefore, were $639,000, or 10 per cent. larger. There was in consequence a decrease of $330,000, or 14 per cent. in net earnings. Also fixed charges were larger than in the previous year, so that net income was only $450,000, against $830,000 in 1906, a decrease of 46 per cent. By sharply reducing the appropriation out of income for permanent improvements, a surplus for the year or $85,000 was shown instead of a deficit. The 1906 surplus after an improvement appropriation three times as large was $138,000.

The difficult operating conditions of the year are shown in other ways. There was a decrease of 8 per cent. in the revenue trainload, which fell from 424 tons to 396 tons. The total trainload was 447 tons in 1906 and 413 tons last year. On the other hand, the average amount of revenue freight in each loaded car increased 4 per cent., from 17 to 18 tons. There was a decrease in the number of tons carried one mile but as the average ton-mile rate increased, there was a small rise in freight earnings instead of a decrease.

Over 3,000 new freight cars were added during the year of which 1,000 were box cars and 1,500 coal cars. The balance sheet shows that on June 30, 1907, the construction and improvement fund of $1,500,000 for which 5 per cent. notes, payable in ten semi-annual installments, were issued on April 1, 1906, was all used except for a small balance. The financial depression kept the company from getting any new funds until recently, when $500,000 three-year 6 per cent. notes dated December 2, 1907, were sold to provide for immediate necessities of improvement work.

The income account for the last two years ended June 30 is shown below:

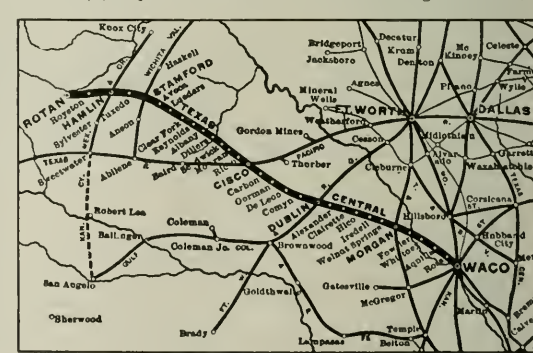
	1907.	1906.
Mileage worked	336	336
Passenger earnings	$1,587,238	$1,440,359
Freight earnings	6,521,220	6,406,587
Gross earnings	8,763,775	8,454,897
Maint. way and structures	1,307,917	1,646,706
Maint. of equipment	1,751,771	1,436,275
Conducting transportation.	3,540,459	2,880,083
Operating expenses	6,815,433	6,176,670
Net earnings	1,948,341	2,278,227
Net income	449,645	828,590
Dividends	250,000	250,000
Improvement appropriations	115,000*	440,826
Year's surplus	84,645	137,764

*There was also $359,837 included in operating expenses for "permanent improvements."

Texas Central.

This small railroad in the interior of Texas has had a prosperous year and makes a strong financial showing. A 42-mile extension from Stamford west to Rotan was put in operation February 22, 1907. The road now has a total mileage of 268 miles of line, the eastern terminus being at Waco on the Houston & Texas Central; Missouri, Kansas & Texas; International & Great Northern; St. Louis Southwestern, and San Antonio & Aransas Pass.

The company has $650,000 first mortgage bonds outstanding, or less than $2,500 per mile of road. The interest charges on all of these



Texas Central.

are only $31,000 a year, which is an annual fixed charge on each mile of road for bond interest of $116. There is consequently a large amount available for dividends. The company has $3,973,800 common and preferred stock outstanding. Five per cent. dividends amounting to $198,690 are paid on each class. Last year 5 per cent. was earned on the preferred and 15 per cent. on the common. Most of the balance went for improvements, $60,000 going to the general improvement fund to be spent for ballasting and for rebuilding the bridge over the Brazos river at Fowler and three other iron bridges that were put in when the road was built 25 years ago and are not equal to the present heavy loading, and $195,734 for additional equipment, including three sleeping cars rebuilt from parlor cars, and electric headlights which had to be put in on locomotives according to the Texas law passed last spring. The company, therefore, is both making a good return to its owners and improving its property. Last year it did better than "a dollar in improvements for a dollar in dividends," and spent about $1.30 in improvements for each dollar returned in dividends.

At the same time unit maintenance expenditures were not skimped. Maintenance of way cost $783 per mile, against $767 in 1906. This would not be a large figure for a large railroad, but it seems ample for a single-track line through agricultural territory in Texas. Vice-President Hamilton, however, says that the track has not been improved to the same extent as in other years because labor has been scarce and power and rolling stock much in demand, so that it was not possible to do any ballasting during

the year. The appropriation for new equipment included dump cars and a rock crusher and as soon as this is in operation the whole line is to be ballasted.

Maintenance of locomotives cost $1,700 per locomotive, against $2,092 in 1906, maintenance of passenger cars $607 per car, against $461 in 1906, and maintenance of freight cars $71 per car, against $79 in 1906. These are liberal charges for a small road.

Gross earnings rose from $945,000 to $1,244,000, a gain of 32 per cent. Operating expenses increased 31 per cent., leaving net earnings of $508,000, against $385,000 in 1906, an increase of 32 per cent. The operating ratio stands at 59 per cent. as in the previous year.

The following table sums up the operations of the last two years ended June 30:

	1907.	1906.
Mileage worked	241	227
Passenger earnings	$380,000	$281,404
Freight earnings	778,556	616,209
Mail, express, misc. earngs	84,650	44,031
Gross earnings	1,244,106	945,241
Maint. way and structures	188,704	174,182
Maint. of equipment	99,905	78,791
Conducting transportation	405,558	274,260
Operating expenses	736,491	560,614
Net earnings	507,615	384,627
Net income	458,870	345,316
Dividends	198,630	198,630
Improvement appropriations	255,734	115,269
Year's surplus	4,456	31,357

NEW PUBLICATIONS.

National Association of Railway Commissioners; Proceedings of Eighteenth Annual Convention. Edited by H. B. Meyers, 334 Dearborn street, Chicago. Price, $7.50 in buckram, and $10 in leather.

This report, a thick book 9 in. x 12 in., contains not only the proceedings of the meeting held in Washington in 1906 (not 1907), but also full copies of the Interstate Commerce law, and other laws which the Interstate Commerce Commission deals with; the Anti-Trust law; the laws of the several states establishing railroad commissions; and a digest of federal and state court decisions pertaining to and construing the Interstate Commerce act and the state laws pertaining to railroad commissions. The laws fill 250 pages and the digest of decisions fills 135 pages. The whole work has been compiled by Herman B. Meyers under authority of the association. Many pages of advertisements are interspersed with the other matter in the first half of the book, the advertising being introduced apparently to insure the financial success of the compiler. Full page portraits are given of many of the members of the association. The work is edited by Elmer E. Barrett, a lawyer of Chicago, whose chief work apparently has been that of making the digest of decisions. The chapter containing the state laws includes every such law pertaining to state railroad commissions in effect at the date of publication, September 15, 1907.

Locking. By Frederick C. Lavarack. 1907. Published by the Author, 114 Park street, East Orange, N. J. Cloth, 80 pages, 40 plates. Price, $2.

The basic principle of any interlocking machine, whether it be a mechanical or a power-operated unit, is the means whereby the levers controlling the movements of all the switches and signals are interconnected and locked with each other in such a way that no two conflicting routes can be set up at the same time. The mechanism used to accomplish this end is termed mechanical locking or more often simply locking. It is of this single detail which the author treats in this book, in an elementary but, nevertheless, exhaustive way. The introductory chapter explains the fundamental theory of interlocking and the uses of all the accessory apparatus commonly employed. This is followed by a full explanation of the construction and operation of the Saxby & Farmer improved mechanical interlocking machine together with brief explanations of the other common types of machines, including the Style A, Johnson, National, all-electric and electro-pneumatic. Chapter IV. takes up the theory of designing the locking for these machines as affected by the track layout with which they are to be used. There are certain principles to be followed in this and the author discusses some of the common mistakes made in applying the locking, mistakes which do not necessarily involve danger in actual use but which burden the signalman with unnecessary work and inconvenient manipulation. The preparation of locking sheets and "dog charts," the use of specials and the numbering of dogs are fully explained in connection with typical interlocking plants covering the usual arrangements of tracks and signals. Chapter V. describes the usual methods of testing interlocking machines after they are built and in place to detect any errors in the design or construction of the locking. Both methods of testing, by the locking sheet and by the interlocking plan, are considered. A thorough knowledge of the principles of locking is essential to the person making such a test. The last two chapters cover installation and maintenance of locking and tower diagrams and manipulation charts.

The book is written by a practical signal man for signal engineers, inspectors and maintainers. It combines theory with practice. The many diagrams have been prepared with the utmost care and accuracy. The text is technical in terms but clear as to meanings. The layman with a little application can understand it as well as the signal man. An excellent index adds to the value of the book as a reference work.

CONTRIBUTIONS

Pennsylvania Electric Locomotive No. 10,003.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Referring to an article in your issue of November 22, on the Pennsylvania electric locomotives, and specifically to No. 10,003, the mechanical parts of which were built by the Baldwin Locomotive Works, we beg to call your attention to an omission which makes the article incomplete. The construction of this electric locomotive was undertaken at the instance of Mr George Gibbs, Chief Engineer of Electric Traction of the Pennsylvania Tunnel & Terminal Railroad Company, by and at the expense of the Westinghouse Electric & Manufacturing Company. The designs were worked out under Mr. Geo. Gibbs' direction at Pittsburgh, through the continuous co-operation of the General Superintendent of Motive Power, Mr. W. A. Gibbs, and the Mechanical Engineer, Mr. A. S. Vogt, of the Pennsylvania Railroad Company. The mechanical parts were constructed and erected in our works in Philadelphia, and were then shipped to the Westinghouse Electric & Manufacturing Company, Pittsburgh, where the electric equipment, which had been by them manufactured, was applied. BURNHAM, WILLIAMS & CO.

The Recommended Rail Sections.

Philadelphia, Pa., Dec. 9, 1907.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I have read the contribution entitled "The Recommended Rail Sections," by the Consulting Roll Turner, which you printed last week. I rather think the manufacturers can answer these questions quite fully. What we are in hopes of getting by making a better balanced rail section is a rail that can be rolled with metal in the head of greater density and finer grain, to be stronger, wear longer and require less cold straightening under the gag. The "Consulting Roll Turner" is well aware that a rail with a thin flange and a large head will, when cold, have "excessive curvature and distortion," due to the hot head contracting more than the cold base. He must also know that a better balanced rail section will permit more roll passes, making a finer grained metal in the head, consequently a better wearing and stronger rail. The thin base cools rapidly, preventing any further passes, however much they might be desired. It would be interesting if he would give us the information he withholds instead of saying he is prepared to do so. The man who objects should present something better. Glittering generalities to tear down are easy; to build up is the better plan. C. E.

Pittsburgh, Pa., Dec. 9, 1907.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Franklin E. Abbott in his article, "Rail Mill Practice and Rail Service," published in the *Iron Age*, Nov. 14, 1907, says in regard to the "crescent break" in the base of rails: "There are more failed rails from breaks of this character than from any other cause. It is found in varying degrees on all railroads and in all rails from all mills. The principal peculiarity of this break is that it starts at the center of the rail base, directly under the web, and develops longitudinally, extending from 6 to 18 in., and will then run out to the edge of the flange, resulting in a 'half moon' or flange break, and in many cases also extending upwards through the rail, causing a complete fracture of the entire section. It is safe to say that in more than 90 per cent. of the rails reported by the railroads as simply broken, the failures originate as above described, in the base, and more than 99 per cent. of such breaks occur on the ties. These are actual conditions as found by investigation. How can they be explained?"

There is a cause for these breaks that is easily explained. It is purely a mechanical defect caused by over strain, that is brought about by excessive gagging of a badly cambered rail with a defective gag, or a perfect gag imperfectly applied. This over strain causes the starting of the longitudinal seams along the base of rail, and the bearing of rail over the tie at point of gag mark completes the break as the rail sinks down in the tie, bringing more than its share of weight of traffic upon the edge of weakened flange. This is the reason the break so often comes on the ties. If the weakened flange has no bearing, or comes between ties, there is no pressure to complete fracture. This where the piece broken out of flange is short, the longer break comes from the fact that there are two defective gag marks, the distance apart that the break extends, and the rail bears on the tie between these defective gag marks, or weakened points, and the break extends from the one mark, across the tie, to the other. Where the break extends up into and through the rail, causing complete fracture, the heavy or

defective gagging is undoubtedly helped along by the minute cracks, coming from the too heavy reduction of the steel during period of rolling of rail section, as mentioned in my recent paper on the mechanical treatment of steel rails.

In substantiation of these facts relating to the improper application of the gag in straightening, and the excessive reduction in rolling, having to do with the crescent break in base of rail as stated by me, A. W. Heinle, Consulting Roll Turner, maintains that these injurious effects can be traced to first causes, namely: "In the manner in which the rail is produced in rolling and where the standard rail section is formed with approximately one-half the metal body proportioned to the flange and in such form that it (the flange) is shaped with about 50 per cent. greater reduction of the steel." The metal for the flange is therefore greatly reduced over that which is to form the head and at the same time is subjected to diverse conditions in both roll action and temperature. The rail head and web is formed more generally by a vertical pressure of the roll surface while the flange is latterally compressed by roll surface varying widely in diametrical speed. It is obvious that at the converging, and principally at the meeting place of these contrary surface actions, a difference of mechanical effect due to peripheral speed is encountered which advances the metal irregularly through the roll grooves, the effect of which is bound to materially alter the internal characteristics of the metal at the junction of the flange with the web and which subsequently assists in breaking up any natural arrangements of the crystals.

Mr. Heinle also says that certain internal stresses, besides the sliding of the crystals, are established in the rail section at a point where the web and flange meet, and the material is affected in a manner that would not show signs of failure until exposed to severe elastic strains in track. The internal stresses thrown into the metal while rolling at a low flange—combined with a higher head—temperature, would tend to weaken the structure of the rail as a whole, principally, because when cooling unevenly, there are certain diverse strains set up that contribute to the rail breaking more readily.

It can be readily seen that any rail section carrying internal conditions and characteristics of this kind in the rail base, is further injured by the improper application of the gag, and is the initial application, which causes a separation of the strained relations that exist at point of connection between base and web of all standard sections.

The mere fact that so many base breaks, compared to the total breaks of this nature, comes across the tie should prove that the break is a fulfilment of a previous strain, and not a break coming from any detrimental chemical action. If the fracture came from poor metallurgical conditions, it would be as likely to come at a suspended point as at point where it was supported.

S. T. FIERO,
Inspecting Engineer.

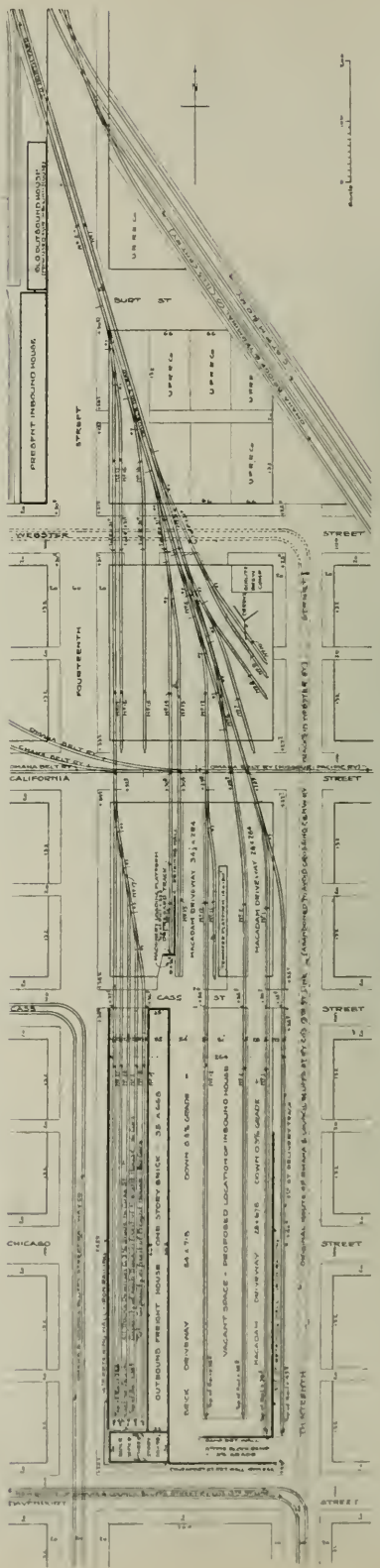
New Freight Terminal of the Chicago & North-Western at Omaha.

The Chicago & North-Western has opened its new freight terminal at Omaha, Neb., work on which has been in progress for more than a year. It is adjacent to the old terminal, and therefore is situated in a thickly settled portion of the east part of the city. To provide room for the new terminal it was necessary to buy improved property. Four and a half city blocks were secured, from which over 100 buildings, comprising residences, stores and a three-story brick hotel, were removed to make way for the improvements. Work was commenced in July, 1906. A large amount of grading was done, about 70,000 cu. yds. of material having been removed and deposited about a mile north on some swamp land owned by the company, on which new freight yards are to be built. The preparatory work included the construction of retaining walls along Davenport street between 13th and 14th streets, and on the latter two streets between Cass and Davenport, a distance of two blocks. These walls contain over 3,000 cu. yds. of masonry, the footing being of concrete, the body of sandstone and the coping blue Bedford limestone, the whole surmounted by an iron fence. Considerable changes had to be made in the city sewer system, water and gas pipes, electric conduits, telephone, telegraph and electric light wires. The electric railway lines on 13th street were diverted from Webster street to Davenport street to avoid crossing the terminal tracks in the former thoroughfare.

The new terminal is planned for both outbound and inbound freight houses. Erection of the latter house has been deferred for the present. The new outbound house is a one-story brick building with slate roof, 35 ft. wide by 668 ft. long, with a room for perishable freight at the north end, 20 ft. x 30 ft. The track side has Cross horizontal folding doors the entire length.

A three-story brick office building, 50 ft. x 98½ ft., is under construction at 11th and Davenport streets, adjoining the south end of the freight house. The principal offices will be on the second floor, which is at the street level.

For the driveways different materials were used. The main



Omaha Freight Terminal; Chicago & North-Western.

driveway in front of the freight house is brick, along the delivery tracks macadam is used, and the inclined entrance has stone block to furnish a good footing for horses.

The work has been directly under the supervision of F. Walters, General Manager of the Lines West of the Missouri River. A. A. Schenck, Engineer of Maintenance, and C. W. Engel, Assistant Engineer, planned and directed the work.

Theodore P. Shonts.

Theodore P. Shonts is now President of the Chicago & Alton, the Toledo, St. Louis & Western, and the Interborough-Metropolitan Company. On the face of it the holding of these offices would indicate that Mr. Shonts' activities were those of a man in particular charge of the finances of a company, the Interborough-Metropolitan being the holding company for the elevated, subway and surface lines in New York City. His reputation, however, is based on his success in building and operating railroads and in organizing their forces. One of his associates characterizes him as forceful, progressive and conservative. On the Interborough-Metropolitan he is also Chairman of the Executive Committee, which is composed of the operating heads of the component parts. As President of the Chicago & Alton, his duties will be similar to those he has performed on the Toledo, St. Louis & Western, that is, general supervision over the operation of the road. Besides this, as a member of the Alton's executive committee he will be in close touch with its finances.

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Theodore P. Shonts.

Mr. Shonts was born in Crawford county, Pennsylvania. He graduated from Monmouth College, Monmouth, Ill., in 1876 with the degree of B. A., and was given his M. A. degree three years later. He then studied law for two years. His first railroad work was on construction, beginning in 1881, when he was made Superintendent of the Iowa Construction Company. The next year he was appointed General Superintendent of the Indiana, Illinois & Iowa, which he helped to build. He was made General Manager in 1886 and in 1898 was elected also President. At this time, in conjunction with Paul Morton, then Second Vice-President of the Atchison, Topeka & Santa Fe, he acquired control of the Indiana, Illinois & Iowa. They eventually sold out to the Vanderbilt interests and in 1902 Mr. Shonts resigned. He then became interested in the Toledo, St. Louis & Western and was elected President and General Manager in 1904. In the spring of 1905 he was appointed Chairman of the Isthmian Canal Commission, which office carried with it the presidency of the Panama Railroad. In the two years which he spent on the Isthmus he began the building of a complete water and sewage system, the paving of Panama and Colon, the cleansing of both cities and the organization of a efficient sanitary force. He built quarters for the workmen, opened the commissary stores and arranged for the regular and prompt transportation of food supplies. He resigned last January to become President of the Interborough-Metropolitan, succeeding August Belmont.

Foreign Railroad Notes.

The Austrian State Railroads recently made contracts for 1,754,000 ties. Of these 28.9 per cent. are to be oak, 26.5 larch, 42.4 fir and 1.8 beech.

The Belgian Parliament recently provided for the purchase of one of the few remaining private railroads, which is 112 miles long. There remain but 200 miles outside of the state system, and these are worked by six different companies.

A local railroad in Munich, the favorite city of King Gambrinus, is attempting what might seem the hopeless task of tempting his subjects to desert by offering them soft drinks at cost price. It produces aerated waters and lemonades at its own works and sells them to its employees at the rate of ¾ cent for plain soda and 1¼ cents for lemonade for a bottle holding a plump tumblerfull. In each of the hot months last summer it disposed of nearly 6,000 bottles of these beverages which cool but do not muddle.

It is reported that the two most influential men in China, both of whom have been viceroys of provinces on the line, are ready, backed by European capital, to build a railroad from Tientsin (the port of Peking), south by east 515 miles in an air line to Chin-Kiang, which is on the lower course of the Yang-tse-Kiang, the great navigable river of China, a little below Nan-King. A capital of $25,000,000 is said to have been secured, and materials and equipment are to be taken for the amount of the foreign subscriptions. The railroad from Shanghai to Chin-Kiang, 185 miles, was to be opened Oct. 15. It is to be extended further west to Nan-King.

Those of us who are old enough may remember that before the days of electric trolley lines, hot-water locomotives, designed by Lamm and Franck, were urged as the motive power of street railways. After what seemed a total eclipse for more than ten years, they again make their appearance, said to be greatly improved. Three works in Germany are making them, and one of these is said to have disposed of no less than 163, of which 41 were for street railroads and the rest for manufactories.

Wisconsin Railroad Commissioners' Report.

The Railroad Commissioners of Wisconsin, B. H. Meyer, H. Erickson and J. H. Raemer, have issued their first general report covering the seven months from December 1, 1906, to June 30, 1907. There was an increase of railroad mileage in Wisconsin during that time of 278.22 miles, and there are now in the state 51 railroads operating a total of 7,292.38 miles of road in Wisconsin. In the seven months covered by the report there were were filed with the commission 72 formal complaints and 413 informal. The formal complaints are divided as follows: relating to taxes, 27; relating to station facilities, 16; relating to railroad crossings, 3; relating to train service, 20; relating to express and service, 4; relating to claims, 4.

The commission has undertaken on its own motion investigations relating to the weighing of freight; the testing of scales; sanitation of stations and cars; express rates; rates of service of sleeping car companies, and rates charged on milk and cream; also on the cost of track wear; on measures of safety in railroad operation; on dangerous highway crossings; on track inspection and on side track locations. At many crossings alarm bells have been ordered installed, in one case a subway ordered, and in others protecting gates.

An Investigation of Steam Railroad Electrification, with Particular Reference to the Suburban Lines at Melbourne, Victoria.

BY THOMAS TAIT,
Chairman of the Victorian Railways Commissioners.

It was the desire of the Government that I should, while on leave of absence, make inquiries in Europe and America in regard to the electrification of steam railroads in connection with the question of adopting electric traction instead of steam locomotives for the movement of suburban trains on some or all of the Melbourne suburban lines, and also select and engage a Consulting Engineer to visit Melbourne and report fully as to the advisability of such conversion, and as to the best system and methods to be adopted.

We are required on the Melbourne suburban lines to deal with a very large inward traffic in the morning and a similar outward traffic in the evening, a traffic so large at these periods of the day that it is necessary to work several of the lines to substantially their present full capacity; that is, to run trains with as large seating capacity as can be hauled with the locomotives we are now able

to employ, and following each other as closely as their speed and the length of the block sections will allow. A similar state of affairs occurs on the Essendon and Caulfield lines on the occasion of the larger race meetings at Flemington and Caulfield respectively, and on the former line at the time of the Agricultural Show. It is essential, moreover, that these trains should be run at a comparatively good speed between stations, and that they should not be burdened with too many stoppages, for otherwise too much time would be occupied in making the trip between the more remote suburban stations and the city.

The following statistics have recently been compiled about the Melbourne suburban railroad and tramway systems and their traffic:

For year ended June 30, 1907:	
Population of Melbourne and suburbs	531,000
Mileage of suburban railroads	149
Mileage of suburban tracks	263
Number of suburban stations	148
Suburban train mileage	2,992,283
Suburban car mileage	24,455,631
Number of suburban passenger journeys	64,162,344
Number of miles traveled by suburban passengers	305,071,565
Average distance traveled per suburban passenger (single trip)	4.76
Average cars per suburban train mile	8.17
Average seating capacity per car (suburban trains)	52
Average seating capacity per suburban train mile	420
Average number of passengers per car mile (suburban trains)	12.47
Suburban revenue, not including parcels, mails or miscellaneous	$3,227,240*
Suburban revenue per train mile	$1.0354†
Suburban revenue per car mile	12.66 cents.
Suburban revenue per passenger mile	1 cent.
Suburban revenue per passenger journey	4.82 cents.
Suburban revenue per mile of line	$21,660*
Suburban revenue per mile of track	$12,270
Number of passenger journeys on Melbourne tramways	60,974,203
Total railroad suburban and tramway passenger journeys	125,136,547
Average number of journeys per head of population per annum by suburban railroads	121
Average number of journeys per head of population per annum by tramways	115
Average number of journeys per head of population per annum by suburban railroads and tramways	236
Revenue, Melbourne tramways	$2,604,985*
Average fare per passenger on Melbourne tramways	4.10 cents.
Approximate annual amount paid in fares to and from Melbourne on suburban railroads and tramways per head of population	$11*
Approximate average number of passengers arriving at and departing from Flinders Street and Prince's Bridge stations on each week day	140,000

*Pounds transferred to dollars by multiplying by 5.
†Pence transferred to cents by multiplying by 2.

It would be manifestly impracticable to deal with such a traffic and meet these requirements with a service analogous to a street railway service—that is, a service consisting of one or two cars, or, in other words, smaller trains, making many stops. The capacity of a line for the conveyance of passengers is limited by the number of passengers which can be carried per train, and the number of trains which it is practicable to safely run within a given time, which latter is governed by the maximum time occupied in passing through any one of the block sections. To run lighter trains (which means trains with less seating capacity) would not enable us to run them much more frequently, that is, to follow each other throughout the block sections much more closely than at present during the busy hours of the day, for they would not take much less time to pass through the block sections, and what little gain there might be owing to the quicker time possible with lighter trains would be far more than offset by the reduction in the number of passengers per train such trains would be capable of accommodating.

As the Melbourne suburban lines were built originally for and are still operated by steam locomotives, we are chiefly concerned with railroads constructed originally for operation by steam locomotives and subsequently electrified. Inquiry as to the reasons for the conversion of such railroads to electric traction discloses the fact that in the case of most of them special conditions existed which made it more advisable than it would otherwise have been to electrify them, and which reasons favorable to electrification do not apply in the case of the Melbourne suburban lines.

In the case of a number of these converted lines the cheap generation of current from water power was the main factor which led to their electrification. This is true, for instance, of the converted lines using current generated at Niagara, of most, if not all, of the lines in Switzerland, and of the Valtellina and Milan-Varese lines in Northern Italy.

A number of other lines in the second group are largely underground railways, such as the Paris-Juvisy line, or have many or long tunnels, such as the New York Central and the Pennsylvania at New York; the Paris-Versailles; the Mersey, Simplon, and Baltimore & Ohio tunnels, and the heavy gradients existing on some of these lines have been an additional special reason favorable to electrification, as for instance the Simplon and Mersey tunnel lines. By the use of electric traction on such lines, all smoke in the subways and tunnels and the noise therein attendant on working such lines with steam locomotives were got rid of, and the air and ventilation were immensely improved, and, in addition, a cheap and convenient method of lighting the subways and tunnels as well as the trains, provided.

In other cases the relief afforded by electric traction (multiple unit control system—not electric locomotives) in inadequate and congested terminal stations and yards was an important factor in favor of electrification. By the use of electric traction with the multiple unit control system, that is, with the motors under the cars all operated as a unit from either end of the train, trains can be switched or despatched on their return trip with a considerable saving of track space in a congested terminal station or yard, for there being no locomotive and it being possible to drive the train from either end, no track is required to permit of the locomotive being got around from one end of the train to the other either for a return trip or for switching, and time is also saved in despatching such a train on a return trip or in switching, for it is only necessary for the motorman to transfer from one end of the train to the other. This was one of the reasons for the electrification of the North Eastern Railway's suburban lines on the north side of the Tyne at Newcastle, and of the Liverpool-Southport section of the Lancashire & Yorkshire.

Again, in other cases, it has been necessary to electrify lines owing to connecting lines adopting electric traction, as, for instance, the Hammersmith line (London) of the Great Western connecting with the Metropolitan Undergrounnd Railway, and the New York, New Haven & Hartford line connecting with the New York Central line near New York.

And still, again, in other cases electrification has been considered advisable either to meet the competition of electric street railways, by providing an improved and especially a more frequent train service, or to head off the construction of competing electric lines. In these cases especially, the train service, before conversion—unlike that on the Melbourne suburban lines—was, as a rule, infrequent, as for instance, on the Newcastle lines of the North-Eastern Railway, on the principal line of which there was before conversion approximately only an hourly service, except during the morning and evening, while on the other lines there were intervals of from one hour to two hours. In these cases the fact that in the event of the line's not being electrified a considerable part of the expenditure which would be involved for electrification would, in order to give the desired more frequent service, be required to provide additional steam locomotives and coaches and enlarge inadequate terminal stations and yards, has no doubt been an important factor in the decision to convert such lines.

As a matter of fact, and contrary to the general impression, there have been few lines (other than street railway lines), converted to electric traction except those in respect of which special conditions existed making it more advisable than it would otherwise have been to electrify them, and which reasons favorable to electrification do not apply in the case of the Melbourne suburban lines.

In this connection, it must be mentioned that there are many lines in the world to-day operated by steam locomotives on which there is a much heavier train movement than on any of our suburban lines, and that the administration of these lines have not yet deemed it advisable to adopt electric traction for them. A case in point is the Illinois Central, between Chicago and Woodburn Park, 7.71 miles, over which between 120 and 130 suburban trains are scheduled to run each way every working day, and this in addition to a large number of through passenger trains, goods trains and shunting movements. The management of that company at a comparatively recent date went most carefully into the question of the advisability of electrifying this portion of their line, and came to the conclusion that the financial results would not justify the expenditure involved. There is a very dense train movement on a number of the railroads running out of London, but, although in some cases the advisability of electrification has been inquired into, in only one case, except the Hammersmith line of the Great Western before referred to, has it as yet been actually taken in hand, viz., on the London, Brighton & South Coast, between London Bridge and Victoria Stations—a distance of about eight miles, where there is an exceptionally dense train service. There is also a very heavy suburban traffic on the lines of the Pennsylvania Railroad at Philadelphia, and on those of the Boston & Maine, and the New York, New Haven & Hartford at Boston, but those companies have not yet undertaken the electrification of their lines.

The progress which has been up to the present time made throughout the world in the electrification of lines originally built for operation by steam locomotives, apart from those converted by reason of special local conditions which rendered the conversion more advisable than it would otherwise have been, is not, it must be admitted, as strong an indication as has been supposed that the general electrification of the Melbourne suburban lines is advisable, but, as I shall explain later on, there are special reasons which may justify us in proceeding at an early date with the conversion of two of these lines to electric traction.

While in Europe and America, I made a special inspection of

the following lines originally built for operation by steam locomotives and subsequently electrified:

	Length of Route, Miles
Italian State Railways:	
Between Milan, Gallarate, Varese and Porto Ceresio	45.6
Between Lecco, Colico, Chiavenna and Sondrio (known as the Valtellina line)	67
Germany, Prussian State Railways:	
Hamburg, Altona	17
France:	
Orleans Railway, between Paris and Juvisy	12
Western Railway, between Paris and Versailles	11
England:	
North Eastern Railway, Newcastle-upon-Tyne (suburban lines on north side of Tyne)	41
Lancashire & Yorkshire Railway, between Liverpool and Southport	18.5
America:	
New York Central & Hudson River, New York (Grand Central Station) to Wakefield, and Mott Haven to King's Bridge	17

I also traveled frequently over many sections of the Underground railways in London, England, and obtained considerable information about those lines, and visited Chicago mainly for the purpose of inspecting and traveling on the new type of suburban coach in use on the Illinois Central. I also obtained considerable valuable information about the electrification of the West Shore (New York Central), between Utica and Syracuse, and as to the conversion to electric traction of some of the lines of the Long Island and the New York, New Haven & Hartford. Sir George Gibb was kind enough to provide a special train for the inspection of the North-Eastern electrified lines at Newcastle-upon-Tyne, and Mr. Aspinall and Mr. Wilgus were equally kind in according a similar privilege and convenience for the inspection of the electrified lines of the Lancashire & Yorkshire at Liverpool and of the New York Central at New York.

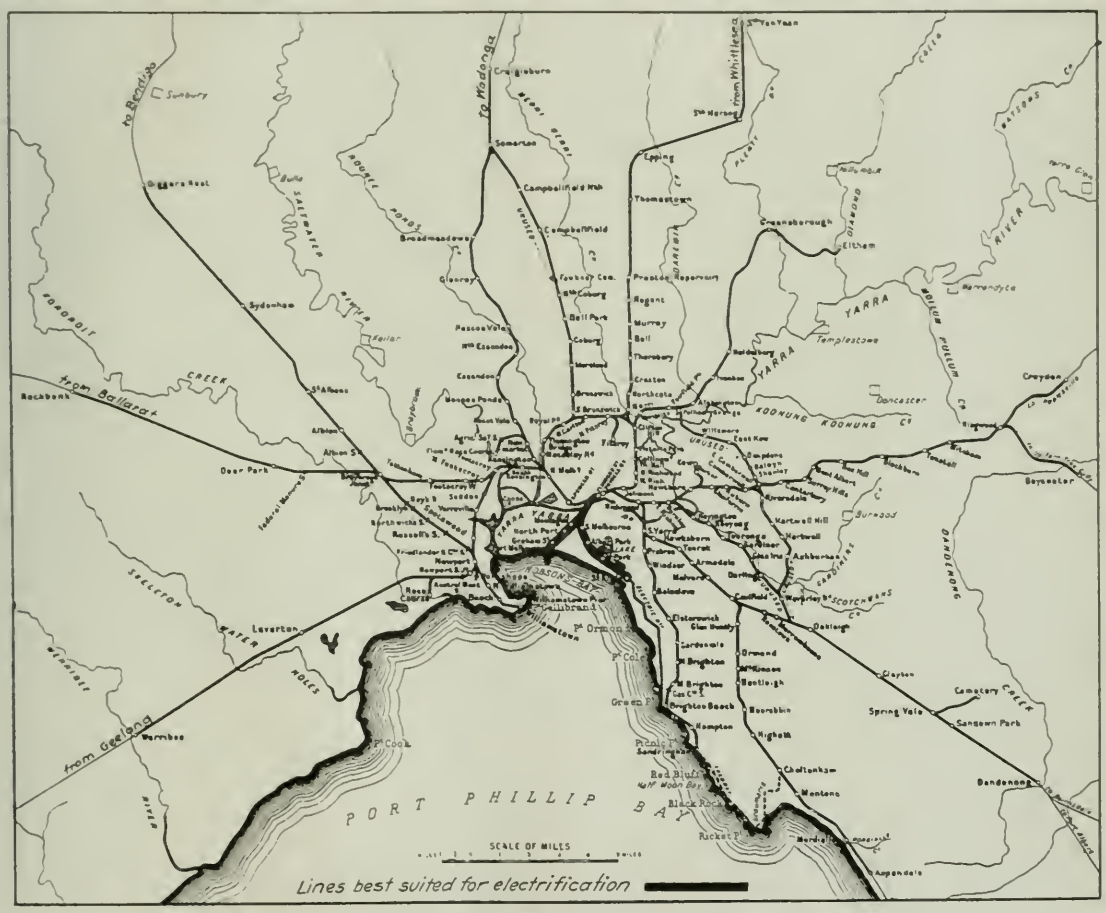
MILAN-GALLARATE-VARESE-PORTO CERESIO LINE.

This line, now owned and operated by the Italian Government, was converted to electric traction in 1901. It is 45.6 miles long, and is the main means of communication between Milan and the most important industrial and densely populated district of Northern Italy. It taps Lakes Maggiore and Lugano, and has a large tourist excursion traffic during the summer months.

The current is generated at Torre Avento, a steam plant having been first installed for use while the adjoining hydraulic plant was being constructed. Horizontal tandem compound engines of the Corliss type, and three phase 25-cycle alternators, with a normal rating of 750 k.w., were used in the steam plant. The high tension transmission system is nearly all in duplicate, consisting of two three-phase lines carrying 12,000 volts, which is reduced and transformed at rotary converter sub-stations to direct current at 650 volts for delivery to the motors through a third rail. The possible cheap generation of current by water power was doubtless the main factor in determining the authorities to adopt electric traction on this line.

VALTELLINA LINE.

This line, which is operated and owned by the Italian Government, was converted to electric traction in 1902. It is about 67 miles long, extending from Lecco, at the southwest end of Lake Como, along the west side of that lake to Colico, and from there northerly to Chiavenna and easterly to Sondrio. The possible cheap generation of current from water power, and the existence of many tunnels, doubtless led to the substitution of electric for steam traction on this line. The power plant is at Morbegno, 9½ miles from Colico, and 15½ miles from Sondrio. The water is brought between two and three miles by a raceway to turbines, to which are directly connected Schuchert three-phase alternators of the revolving field type of 1,500-k.w. capacity. These alternators supply current at 20,000 volts and 15 cycles directly to the high tension line which feeds the nine sub-stations where the pressure is stepped down to 3,000 volts. The locomotives and motor cars are equipped with three-phase motors which are fed through two overhead trolley wires and the track as the third conductor. Motor cars are used on the passenger trains, and electric locomotives for hauling the freight trains.



The Suburban Lines at Melbourne, Australia.

Port Melbourne and St. Kilda lines indicated by heavy shading.

HAMBURG-ALTONA LINE.

This line is owned by the Prussian Government. It was not finished when I visited Hamburg, but it will extend from Hamburg in one direction to Ohlsdorf, and in the other direction to Altona and Blankenese, a total distance of about 17 miles. It is being equipped, and will be worked on the single-phase system—the Winter-Eichberg system of the Allgemeine Elektricitäts-Gesellschaft.

PARIS-JUVISY LINE OF THE PARIS-ORLEANS RAILWAY.

This line forms the approach of the Paris-Orleans Railway to the new Quai d'Orsay station in Paris, and for a considerable distance cut from that station is a tunnel or subway line, which no doubt was the main consideration for the adoption of electric traction, as the smoke from steam locomotives would have been very objectionable, not only in the tunnel, but in the station itself where the tracks are below the level of the ground, and in the waiting rooms, etc. Indeed, the conditions on this line are very similar to those at the Grand Central Station in New York. The distance from Juvisy to Paris is 12 miles, and part of the line has been operated electrically since May, 1900, and the balance since July, 1904.

The current is generated by a steam plant (reciprocating engines) at a station about three miles from the Quai d'Orsay station, and is transmitted at 5,500 volts, 25 cycles to two sub-stations, where it is reduced and transformed by rotary converters into 600 volt direct current for delivery to the motors, partly by the third rail, and partly by overhead conductor. All the through trains between Juvisy and Paris are hauled by electric locomotives, weighing (the latest type) 55 tons, the change from steam to electric locomotives or vice versa on these trains being made at Juvisy. The local suburban service between Juvisy and the Quai d'Orsay station is performed by trains operated by the multiple unit control system.

PARIS-VERSAILLES LINE OF THE WESTERN RAILWAY COMPANY.

This line extends from the Invalides station of the Western Railway, in Paris, to Versailles, about 11 miles, and is operated electrically only in so far as the local suburban trains are concerned. The current is generated by a steam-driven plant at Moulineaux on the line at 5,500 volts, 25 cycles, which is reduced and transformed by rotaries at three main sub-stations into direct current at 550 volts, and conducted to the motors by a third rail. The trains were at first hauled by electric locomotives, but these have been abandoned in favor of the multiple unit system. The nuisance caused by the smoke from the steam locomotives in the partially-underground Invalides station and in a long tunnel was the main reason for the electrification of this line.

NORTH EASTERN RAILWAY LINES ON NORTH SIDE OF TYNE AT NEWCASTLE.

In 1904 the North Eastern converted most of its suburban lines on the north side of the Tyne to electric traction, and up to the present time about 41 route miles have been electrified. The direct-current third-rail system was adopted with electric locomotives for the goods work, and the multiple unit system for the suburban passenger trains. The current is purchased from the Newcastle-upon-Tyne Electric Supply Company which has at Newcastle one of the largest and most efficient electric power stations in the world. Three-phase current is generated by steam turbo-alternators (5,000-k.w.) at 40 cycles and a pressure of 5,750 volts, which is reduced and transformed at five sub-stations by stationary transformers and rotary converters to continuous current at 600 volts, at which pressure it is fed to the third rail.

Prior to the conversion of these lines, there was a comparatively sparse train service on them, especially during the slack hours of the day, viz., only about an hourly service, and consequently the North Eastern's traffic was seriously cut into by the competing tramway lines. One difficulty in the way of increasing the steam service was the lack of sufficient station and track room at Newcastle, and one of the reasons for the electrification of these lines was to permit of more trains being run on them without necessitating the provision of additional terminal accommodation at Newcastle. As I have previously explained, multiple unit trains require less track space and time at terminals than trains hauled by steam locomotives.

LIVERPOOL AND SOUTHPORT LINE OF THE LANCASHIRE & YORKSHIRE.

This line, about 18.5 miles long, extending from Liverpool to Crossens, was electrified in 1904, the direct-current third-rail system being adopted. Three-phase current is generated at Formby—about midway on the line—at 7,500 volts pressure, 25 cycles, which is stepped down by static transformers and converted by rotaries to direct-current at 650 volts. The power house was originally equipped with four 1,500-k.w. and one 750-k.w. alternators driven by reciprocating engines, but at the time of my visit a steam turbo-alternator was being installed. All trains are operated on the multiple unit system.

Prior to conversion there was a comparatively infrequent service between Liverpool and Southport (only 36 trains per day), and one of the advantages of electrification was to render it possible by the multiple-unit system of operating trains (no locomotive) to largely increase their number without providing any additional track or station accommodation at the congested Liverpool terminal.

NEW YORK CENTRAL & HUDSON RIVER—NEW YORK APPROACH.

The New York Central, to comply with the provisions of a legislative act requiring the discontinuance of the use of steam locomotives in the Park Avenue tunnel, a part of the company's approach to the Grand Central Station, has, within the last year, completed the conversion of its lines between that station and Wakefield on the Harlem division and King's Bridge on the Hudson division, a total distance of 17 miles, for electrical working.

The current—three-phase 11,000 volts, 25 cycles—is generated by a steam-driven plant at Port Morris (situate on the water front, but not directly on the electrified line), consisting of 5,000-k.w. steam turbo-alternators, and is reduced and transformed to a direct current of 660 volts for delivery to the third rail, which, it may be observed, is in this case effectively protected throughout. Local trains, that is, trains which do not run beyond the electrified sections, will be operated on the multiple unit system, while all through trains will be hauled by electric locomotives within the electric zone, and by steam locomotives beyond it. A very extensive rearrangement and enlargement of the Grand Central terminal, and, indeed, of all the accommodation and facilities within the electric zone, has been undertaken in connection with this conversion, and it is interesting to note that car-floor level platforms have been adopted at the suburban stations.

WEST SHORE ELECTRIFICATION BETWEEN UTICA AND SYRACUSE.

Within the last few months the West Shore, and a number of the principal electric lines in the central part of the state of New York, have, for the purpose of uniting several of these electric lines and affording a direct and frequent service between Utica and Syracuse, electrified the double-track West Shore line between these two large centers of population—a distance of about 44 miles. It should be explained that the New York Central had six tracks between these two places, viz., its own four-track line and the double-track West Shore line, and that very little use was made of the latter line for passenger traffic, its use being confined mainly to the movement of freight trains. The current is purchased from the Hudson River Electric Power Company, and is generated temporarily by a steam plant at Utica, and delivered at 60,000 volts, three-phase, 40 cycles. The current is reduced and converted at sub-stations to 600 volts direct-current for delivery to the third rail.

LONG ISLAND RAILROAD AT BROOKLYN AND LONG ISLAND CITY.

Under an agreement with the municipality, the company undertook to remove certain of its tracks from the street surface and to operate its passenger trains on certain lines by a motive power not requiring combustion on the trains themselves, and this has led up to the conversion to electric traction in 1905 of about 42 miles of railroad in the neighborhood of Brooklyn and Long Island City, on which there is a very heavy suburban and excursion traffic. The third rail 600-volt direct-current system was adopted, this current being reduced and transformed at sub-stations from a three-phase current at 11,000 volts generated by steam turbo-alternators (5,500-k.w. capacity) in a power house located on the water front at Long Island City. The trains are operated on the multiple unit control system.

NEW YORK, NEW HAVEN & HARTFORD—MAIN LINE TO STAMFORD.

This company's trains run over the same tracks as the New York Central between Woodlawn Junction and the Grand Central Station in New York, and, as in the case of the New York Central, it was required by an act of legislature to substitute some power for the movement of its trains through the Park Avenue tunnel, which did not involve combustion on the trains themselves. The New Haven has electrified its line between Woodlawn Junction and Stamford—a distance of 21 miles. Owing to the New York Central's having adopted the third-rail direct-current system, it was necessary for the New Haven to so equip its trains as to use direct-current with third-rail contact while on the New York Central line, but it is equipping its own line for single-phase alternating current at 11,000 volts, and overhead conductor. The current is generated by steam turbo-alternators (3,000-k.w. capacity) at Cos Cob power station, located on the Mianus river.

SWEDISH STATE RAILROADS.

The Swedish Government is making a very thorough inquiry as to the advisability of using electric traction on the State railroads, and of generating the necessary current by water power. In this connection it is converting some short lines as experiments.

RELATIVE ADVANTAGE OF THE TWO CONTACT CONDUCTORS.

I will mention briefly the principal relative advantages of the two methods of delivering the propulsion current to the trains or cars. The following are the principal relative advantages of the low-tension, protected third-rail conductor:

The third rail can be effectively protected so that there is very little liability of personal injury to shunters, trackmen, or others working on or walking along or across the tracks, as has been done, for instance, on the New York Central.

Can be maintained by trackmen, and does not require the use of special [illegible] tools and work cars for repairs as is the case of overhead conductors.

Ease of satisfactorily [illegible], [illegible] on account of location, where relative motion between track and rail is small and because there is no variation in grade of conductor as in the case of overhead conductor at low bridges or tunnels.

Can be readily inspected by track walker, whereas overhead conductor requires specially trained inspector.

Easier of sectionalization.

Much longer life, the life of overhead conductor being comparatively short on account of wear and where [illegible] are also in use by the [illegible] from them.

Less danger to men on top of cars.

Less danger generally from low tension than from high tension current.

Easier to make repairs, as can generally be worked on without shutting off current to make changes or repairs. Current must be shut off high tension overhead conductor to make slightest repairs.

No interference with view of signals, and no danger to men repairing or attending to signals.

Freedom from disturbance by lightning.

Less interference with telegraph, telephone and signal wires.

Additional electrified running track or sidings can be provided at less expense.

There are three principal relative advantages of the high-tension overboard wire conductor:

Entirely clear of roadbed, and therefore less interference with track maintenance.

No need to break contact at level crossing of public thoroughfares, except perhaps where there are street railway trolley wires.

Less danger to shunters; but there is very little danger to any one, if the third rail is well protected.

These relative advantages are not to be taken as indicating the comparative cost, economy and efficiency of the direct and single-phase alternating, and three-phase alternating systems.

EFFECT OF ELECTRIFICATION ON TRAFFIC AND GROSS EARNINGS.

Electrification has undoubtedly in most cases resulted in an increase in the traffic. A superior service in many respects over steam locomotive working is afforded by electric traction. With electric working there is no smoke, and consequently possible better ventilation; less noise; smoother starting and running; better means of lighting and heating; greater acceleration (that is trains gain speed more quickly on starting from stations), and consequently less time occupied, especially on runs with many stops; and last, but by no means least, there is considerably less additional expense involved in increasing the frequency of the train service than in the case of steam locomotive working. All these factors have attracted additional traffic.

In considering this almost universal result, however, in connection with the question of electrifying the Melbourne suburban lines, it must be pointed out that on most of the steam lines which have been converted to electric traction, a comparatively meagre train service existed prior to their conversion, and that in the case of a number of these lines the main object which the management had in view in undertaking electrification was to provide a more frequent train service, either for the purpose of developing possible traffic or to meet the competition of tramways, and, as regards the development of possible traffic, it must be borne in mind that in most large cities where conversion has taken place, there are two or more railroads, each of which has suburbs along its line, which it endeavors to develop at the expense of, or in any event, in preference to those lying along the lines of its rivals. A very good case in point is the conversion of the Southport line of the Lancashire & Yorkshire, at Liverpool. This line serves some pleasant suburbs and golf links to the north of Liverpool. The management desired to improve the train service to these suburbs, and thus make them more attractive for residents and others than the suburbs of the other railroads running out of Liverpool, and thus induce people to settle along its line instead of along the lines of its rivals. Before conversion, there were 40 trains each way between Liverpool and Southport; now there are 65.

Now, what is the situation in Melbourne? As all of the suburban lines are owned by the State, one of the objects which, for instance, the Lancashire & Yorkshire had in view, namely, to develop the suburban traffic on its line in preference to the lines of other companies, would be of no advantage to the State from a railroad point of view, for it would mean a large expenditure of money to attract traffic to one line which would to a considerable extent be obtained on that or other suburban lines without incurring the expenditure.

As a matter of fact, however, the existing train service, generally speaking, on the Melbourne suburban lines, compares favorably with that provided on electrified suburban lines elsewhere, especially as regards frequency, comfort and regularity. For instance, as I have mentioned, the Lancashire & Yorkshire now run 65 trains a day on its electrified Southport line. The North Eastern which, prior to conversion, only ran 16 trains each way between Newcastle and Tynemouth, and 52 between Newcastle and Monkseaton, now runs 44 and 84 respectively. But with steam locomotive working the number of trains run each way between Melbourne and the stations named hereunder is as follows:

	No. of trains each way daily
Hawthorn	[illegible]
Clifton Hill	95
[illegible]	76
[illegible]	74
[illegible]	72
St. Kilda	71

While therefore we may fairly anticipate that some gain in traffic and gross revenue will result from electrification due to improved train service, especially a slightly quicker and possibly somewhat more frequent service, no such proportionate increase can be looked for as the result of the conversion of the Melbourne suburban lines as in the case of electrified lines on which there was before conversion a considerably smaller service than now exists on most of our suburban lines, and, consequently, the results in the way of increased traffic resulting from conversion in such cases as the Lancashire & Yorkshire and North Eastern cannot be taken as a criterion of the results which will be obtained by the electrification of such of the Melbourne lines as already enjoy a frequent train service. In this respect, as in others, the proposal to convert any or all of our suburban lines must be considered with regard to local conditions.

An improved service under electrical working would, no doubt, bring some traffic to some of our suburban lines which is now carried on the tramways, but the gain in this direction would be comparatively limited, for our suburban railroads with trains stopping only at stations from half-a-mile to a mile apart, and terminating in the city at the Prince's bridge cannot, even if electrified, compete successfully for short distance travel with tramways running along the streets and stopping to set down or take on passengers as desired, and conveying their patrons to and from the business streets in the heart of the city. As for the longer distance suburban travel, that is, for distances over, say, three miles, we now hold our own very well on the whole as against the tramways wherever there is competition, but there would no doubt be some gain in respect to this traffic by electrification. Where we would probably gain principally in traffic by electrification would be from the transfer to the more distant suburbs along our lines of people now living in the city proper, or in the inner suburbs, especially in the case of people served exclusively by the tramways, or by both the tramways and the railroads, as a result of the improved accessibility of these more distant suburbs, that is, by the quicker, more comfortable, and possibly more frequent service afforded by electric trains.

It must not be overlooked, in considering the effect of electrification on the traffic and the gross revenue, that there is comparatively little increase taking place in the population of Melbourne, especially as compared with cities in America, Germany, and even England and Northern Italy; and that there are ample suitable vacant areas along existing lines available for a large increase in the present suburban population, and that there is now along most of these lines a suburban train service which, on the whole, for comfort, frequency, speed and regularity compares very favorably with the suburban train service of any other city in the world, not even excepting those where some of the lines have been electrified.

EFFECT OF ELECTRIFICATION ON OPERATING EXPENSES.

It has been the experience in most cases elsewhere that a dense train service—fairly steady throughout the hours during which trains are run—that is, with not too much difference between the minimum and maximum service, and employing sufficient power to require an electric generating station of fairly large capacity, in fact, substantially such a service as that existing, for instance, on several of our suburban lines, can be operated for less expense per train mile (exclusive, of course, of the increased interest charges) by electric traction than by steam locomotives; and, therefore, in the event of at least two of our busiest suburban lines being electrified, we may, I think, look for some reduction in the working cost (not including interest charges) of the existing service on those lines.

It is generally conceded that expensive coal is somewhat in favor of electrification, and, therefore, as the cost of coal in Melbourne is high, we may look for some saving in our fuel bill by electrification. One of the principal ways in which the working cost per train-mile can be reduced is the saving of the wages of the firemen now employed on the steam locomotives. It is generally recognized that with the "emergency" lever, it is safe to run electric trains with only one man—the driver or motorman on the front end.

In connection with this question of the comparative cost of electric traction, it may be mentioned that it appears to be rather the general impression that the weight of the steam locomotive is much greater than the weight of the electrical motive equipment on an average railroad train. At the last International Railway Congress, J. A. F. Aspinall, General Manager of the Lancashire & Yorkshire, speaking of his electrified Liverpool-Southport line, said:

"We do not find the weight of what we may call the locomotive

equipment of the train is any less than it would be with the steam locomotive; and dealing with main line work, there is no doubt that the aggregate weight of the motors, the collectors and electrical equipment will, in almost every case, come to as much as, if not more than, the weight which would be required if the train were going to be hauled by a steam locomotive."

This statement, however, does not, of course, apply to small units—for instance, the weight of the motive equipment on a two-car electric train (motor car and trailer) would not be nearly as much as on a two-car train hauled by one of our standard suburban locomotives, and in this fact—that the weight of the motive equipment under electrical working is much more nearly proportionate to the weight of the train than with steam locomotive working—lies one of the advantages of electrification.

FINANCIAL RESULTS OF ELECTRIFICATION.

The financial results of electrification depend, of course, not alone on the amount of the gross revenue, but on the amount of the net revenue (that is, the excess of the gross revenue over the working expenses) and on the sufficiency of the increase in the net revenue to pay the interest charges on the cost of electrification. In considering the financial results of electrification, regard must, therefore, be had to its effect on the gross revenue, the working expenses, and the interest charges.

As I have mentioned, we may fairly anticipate some increase in the traffic, and, therefore, in gross revenue, as a result of the more comfortable, quicker and possibly more frequent service accompanying the conversion of our suburban lines, but not nearly as large a proportionate increase as has been obtained on converted lines which, before electrification, had a comparatively infrequent service, and which, even after conversion, have not as frequent and, in many cases in other respects, as good a suburban service as now given on the Melbourne lines. It would appear, therefore, that the increase in net revenue after conversion to be applied against the increase in the interest charges will not on our suburban lines be as largely derived from an increase in traffic and gross revenue as has been the experience elsewhere. We have, therefore, to rely more largely than elsewhere on a reduction in the working expenses being effected by electrification to provide the additional net revenue required to meet the increased interest charges.

As I have already mentioned, we may look for some reduction in the cost of working the present train service (exclusive, of course, of the increased interest charges) in the event of at least two of our busiest lines being electrified. The question to be determined is whether the gain in traffic, and therefore the increase in gross revenue and the reduction in working cost (based on the existing train service), will together produce sufficient additional net revenue to meet the interest charges on the cost of electrification, or, if not, how far towards meeting these interest charges the additional net revenue will go.

Of any increase in traffic and gross revenue, a considerable proportion is anticipated by reason of a more frequent train service; but such additional train service may eat up the anticipated saving in working cost (based on the existing service). In this event, we would have to look entirely to the gain in traffic to provide the additional net revenue required to meet the increase in interest charges. Here again, regard must be had to the local conditions, and probably only experience will demonstrate what electric train service will be productive of the greatest net revenue.

What an important factor the interest charges on the cost of electrification are will be understood from the statement made by George R. Henderson, Consulting Electrical Engineer, of New York, that, broadly speaking, the cost of a steam locomotive is at the rate of $10 per horse-power, while that of a power house and line and other electrical equipment is at the rate of about $100 per horse-power. On this point, the following remarks made by George Gibb, Consulting Electrical Engineer of the Pennsylvania Railroad and in charge of that company's extensive electrical work in and around New York City, are interesting and valuable:

"The cost of inaugurating electric traction on a steam railroad has almost invariably been underestimated. Of its very high cost the public is absolutely ignorant, and to the few railroad men who have had occasion to inquire into the matter the figures have appeared staggering, and the reasons therefor incomprehensible. I shall not attempt in this brief talk to elucidate the matter further than to say that electric traction requires power plants of a capacity to take care of the peak load; the trains must be supplied with motive power, which displaces steam locomotives only at a much higher cost than the latter; lastly, an expensive continuous contact system over the entire line to supply current from the power plants to the trains. These items foot up to a very heavy total cost per mile of road; but, in addition—and this is a point which is often ignored by estimators—is the fact that electric apparatus cannot be supplied to any existing steam railroad without many changes in its physical feature and equipment. These changes amount in some cases to a virtual rebuilding of the line, and, according to my experience, the electric items making up the equipment of a steam railroad under average conditions are from one-half to two-thirds of the total cost only. Furthermore, it may not infrequently result that a steam railroad wishing to electrify and to properly adapt its lines to secure the legitimate advantage of same will be found obliged to double its capitalization per mile. This is a contingency which can be complacently faced by few railroads, and does not argue for early or wholesale conversion. * * *

"There has been a tendency for the public to generalize on the advantages of electric traction from too few examples, and this tendency promises to work injustice and hardship to the railroads unless growth of electric traction is guided along national lines. It is certain that heavy electric traction work may be called in the tentative stage at present, and its development must be accomplished for some time to come at heavy cost to the pioneers. Its introduction, as in the case of the terminals in New York City, is sometimes a public and operating necessity, but these conditions do not obtain to like extent in smaller centers of population, and the cost of introduction elsewhere for like purposes may easily be a crushing burden."

A factor which has an important bearing on the financial results of electrification and may frequently determine the advisability of conversion from a financial point of view is the extent to which the interest on the cost of the electrical rolling-stock is fairly chargeable against the cost of electrification. If the steam locomotives and the coaches employed in working a line before conversion are needed to augment the rolling-stock on other lines—that is, new rolling-stock would have to be provided for such other lines unless stock is made available from the converted line—then the value for service on such other lines of the rolling-stock relieved from service on the converted line (having due regard for its suitability and condition in arriving at such value) can fairly be off-set against the cost of the new electric stock and the interest charges on the cost of electrification be reduced accordingly. This consideration may have an important influence on the decision as to the advisability from a financial point of view of electrifying any of our Melbourne suburban lines.

It is to be regretted that the financial results obtained on steam railroad lines as a result of their conversion to electric traction are not more generally and readily available, but, generally speaking, it is difficult, if not impossible, to obtain this information. Sir George Gibb has promised to let me have it in respect of the electrified lines of the North Eastern at Newcastle, but I have not yet received it. It is generally understood that the increase in the net revenue since the conversion of these lines yields a fair return on the additional capital expenditure. The Lancashire & Yorkshire is not disposed to furnish the financial results of electrification of its Liverpool and Southport line, and this is the case in respect of other electrifications; while in other cases, where both steam and electric traction are used, on the same line, reliable data is not available; and again, in other cases, the conversions are of such recent date that no complete reliable figures as to the financial results have yet been compiled. The financial results of the conversion of lines for which the current is generated from water power would, of course, be practically of no use to us, and, as a matter of fact, the financial results obtained on any converted line would be of very little if of any assistance in enabling us to determine whether or not the electrification of any or all of our suburban lines is advisable from a financial point of view, for the conditions in our case are, to a great extent, different from those in any other place where steam suburban lines have been electrified, and, therefore, the financial results of electrification obtained elsewhere cannot be taken as indicating the results which will follow the conversion of any of the Melbourne suburban lines to electric traction.

While the financial results of the conversion of the Manhattan Elevated Railway of New York are generally understood to be satisfactory, this cannot be said in regard to the conversion of the Metropolitan District Railway of London.

At a half-yearly meeting of shareholders of the latter company last year, Sir George Gibb is reported to have said that:

"The total capital expenditure up to June 30, 1906, in connection with the electrification of the railway and all its concurrent improvements amounted to £1,783,000, and during the half-year under review the company had carried over 32,750,000 passengers, which is an increase of 5,000,000. As far as numbers are concerned, this is a record but, unfortunately, the expenses have also increased in an almost alarming ratio, and the net result is that after paying the dividends on the *guaranteed* stocks there is a deficiency of nearly £5,000."

It is of interest to note that the Metropolitan District Railway carried 32,750,000 passengers on its 24 miles of route in six months, while the Melbourne suburban lines with 149 miles carried 64,162,344 passengers last year. That is substantially the same number of passengers on six times the mileage. But, of course, much of our suburban mileage has but a sparse traffic, while the Metropolitan District line has a very dense traffic throughout its whole length.

While I was in London, all of the underground electric railway companies, owing to unsatisfactory financial results, entered into an agreement to raise their fares, and in this connection the Central of London (the "twopenny tube") has abandoned the principle of a uniform fare, irrespective of distance, and adopted graduated fares according to distance—the same practice as prevailed on the other London underground lines.

The appointment of a Consulting Electrical Engineer, to investigate thoroughly and report fully as to the use of electric traction instead of steam locomotives for moving and dealing with the traffic on any or all of the Melbourne suburban lines, has been made.

Charles H. Merz, of Newcastle-upon-Tyne, who has an office

also in London, is to undertake the work. Mr. Merz was strongly recommended by Sir George Gibb, Managing Director of the Metropolitan Railway, and in fact of all of the London Underground Railways except the Central of London, by Mr. Granville Cunningham, General Manager of the Central of London (Twopenny Tube), Mr. J. C. Inglis, General Manager of the Great Western of England, and many others. Mr. Merz acted as Consulting Engineer for the North Eastern Railway in the electrification of their suburban lines on the north side of the Tyne at Newcastle—indeed, he had full charge of the conversion of those lines, and Sir George Gibb, who was at that time the General Manager of the North Eastern, speaks in the highest terms of the manner in which this work was planned and carried out by Mr. Merz.

SPECIAL REASONS FOR ELECTRIFICATION OF ST. KILDA AND PORT MELBOURNE LINES.

Without in any way anticipating the recommendations which the Commissioners may make after consideration of the report and recommendations of Mr. Merz, I may mention that there are special reasons in connection with the question of electrifying the St. Kilda and Port Melbourne lines which may turn the scales in favor of the conversion of those two lines, although from a financial point of view only—that is, an increase in the net revenue sufficient to meet the additional interest charges—their conversion may not be quite justified.

First.—It is necessary that additional locomotives and cars be built for our Melbourne suburban traffic at an early date; indeed, they are now much needed. We are now compelled, owing to shortage of the suburban type of locomotive, to use ten-wheel and other types of locomotives, built and suitable for country trains, for hauling suburban trains. These locomotives are unsuited and too costly in construction and working for this service, and should be relieved by suitable suburban type locomotives. We are also frequently compelled to make use of cars built for country traffic on our suburban trains, but the principal need of additional cars for the suburban traffic is to replace the obsolete stock which, I regret to say, it has been necessary to still continue to use for that traffic. By converting the St. Kilda and Port Melbourne lines to electric traction and building new electric rolling-stock (motor cars and trailers) for them, the steam locomotives and cars now running on these lines would become available and could be used for replacing the country traffic locomotives and cars now employed on the other suburban lines and replacing some of the obsolete cars still employed in the suburban traffic. The value of the steam locomotives and coaches thus relieved from the St. Kilda and Port Melbourne lines (having due regard to their condition and their suitability for service on other lines) would be a credit to the cost of the electrification of these lines, and the interest charges be reduced accordingly. In view of the possibility of the electrification of our busiest suburban lines, it would appear to be unwise to build more steam locomotives and cars of the suburban type.

Second.—The St. Kilda and Port Melbourne lines are practically isolated from the balance of the railroad system. The tracks of these two lines are separate from those of the other lines at Flinders street station, lying as they do on the extreme river side of that station, and there are no country trains running over these two lines. There would, therefore, be less complication arising out of the conversion of these two lines than of any other lines of our suburban system.

Third.—If the St. Kilda line be electrified, current from the power house supplying it can be used for working the St. Kilda & Brighton Electric Tramway, and the power house at Elsternwick, at which the current for that tramway is now generated, can be abandoned.

Fourth.—The financial and other results of the electrification of these lines would be of great assistance in determining the advisability of converting our other suburban lines. Their conversion would especially be of value in enabling us to ascertain the expense of electrification, the cost of electrically working our suburban trains and lines as compared with steam locomotive working, and the increase in traffic and in revenue which may be anticipated from the improved electric service, especially in competition with the tramways.

An official survey of the water powers of Bavaria has been made for the purpose of determining their availability for generating electric power which may be economically applied, primarily as motive power on railroads. Recently a report of this survey has been made in a stately volume, and an atlas of plates, which costs nearly $15 and is doubtless worth hundreds to those who have similar investigations to make elsewhere, not to speak of its direct use in Bavaria. It contains an elaborate discussion of the conditions which make either electricity or steam the more economical motive power, and the expenditure for plant and for operation per horse-power per year in various locations, for both steam and water power, showing immense variations from place to place. That the report is likely to have immediate practical results is shown by the introduction of a bill appropriating $1,700,000 in the next fiscal year for the introduction of electricity as motive power on certain specified lines of railroad.

Double Tracking Through Eagle River Canyon on the Denver & Rio Grande.

The through line of the Denver & Rio Grande about half way between Pueblo, Colo., and Grand Junction, crosses the continental divide by a tunnel 2,572 ft. long through the main range of the Rockies at Tennessee Pass. From Pueblo to the headwaters of Tennessee fork the road closely follows the Arkansas river. The highest elevation reached by the track is 10,239 ft. above sea level. The maximum grade on the eastern slope between Pueblo and Tennessee Pass is 1.42 per cent.

On the Pacific slope of the divide the road follows the course of the Eagle river from its head to its confluence with the Grand river, thence down the canyon of the Grand river to the mouth of the Gunnison river at Grand Junction. The first 21 miles from the summit west to Minturn is a descent on a 3 per cent. grade. From Minturn west to Glenwood Springs, 58 miles, the maximum eastbound grade is 1.33 per cent., and from Glenwood Springs west to Grand Junction, 90 miles, 1 per cent. Minturn is a terminal for freight locomotives, engine crews and train crews, and for locomotives and engine crews in passenger service. The other end of the engine district east of Minturn is at Salida, 66 miles east of Tennessee Pass. Salida is a division terminal where all locomotives, engine crews and train crews are changed. Thus the 87 miles of main line between Minturn and Salida form an engine district for both freight and passenger service.

Tunnel at Belden.

A great many helping engines are used on the 21 miles of 3 per cent. grades between Minturn and the summit. These helpers start out from Minturn and return light to that point from Tennessee Pass. This tends to double the train movements over this stretch of track. This has led to congestion of traffic and the necessity of building second track over part of this distance. A further argument for building this second track was the expected increase in business on completion of the Western Pacific, which is to be in operation in about a year.

Some years ago the Denver & Rio Grande, in order to facilitate the despatch of trains entering and leaving freight terminals, adopted the policy of building double track for a short distance on each side and through the yards of such terminals. Double track was built through the Minturn terminal as far east as a point called Rex. The new double-track work began at Rex and the road is now double-tracked from Rex east to Red Cliff, five miles. This is a short stretch in distance but on account of the mountainous nature of the country it was a very difficult and expensive piece of work. This new second track through the Eagle river canyon

cost more than $100,000 a mile. The accompanying photographs show the nature of the country through which this line passes and explain the high cost of the work.

The Eagle river here flows through a narrow and sinuous canyon, so narrow that it was not possible to lay a second track side by side with the existing single-track line. Therefore the new second track for most of its length is on the opposite side of the river from the original line. The natural difficulties of the location were complicated by the fact that this is a mining region and that the land on both sides of the original right-of-way is taken up by numerous patented lode and placer mining claims, of which many are operated. Shaft houses and ore bins are perched high up on narrow ledges above the river and mining operations come down to the stream at many points. Some of these can be seen in the largest of the accompanying photographs. The new line passes through numerous claims with their various surface improvements, tunnels and waste dumps. Long and careful negotiations were necessary before the new right-of-way was obtained. In some cases in order to provide ground space for mining operations to replace that used by the new line, retaining walls were built on the river side of the roadbed.

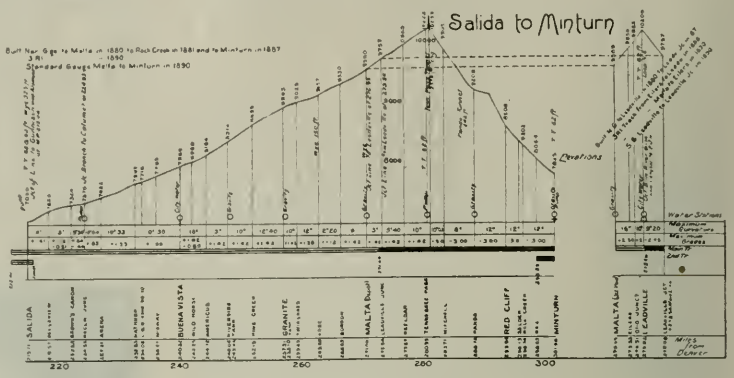
The maximum curvature of the new second track is 10 deg. and there are only three curves of this radius. In order not to exceed this curvature five crossings of the river and 31 tunnels were necessary. All but one of the bridges and three tunnels are on curves. The five steel bridges have reinforced concrete floor slabs with fine crushed rock ballast under the track. The three tunnels are about 100 ft., 300 ft. and 400 ft. long respectively. The maximum grade on the new line was reduced from 3 per cent. to 2.30 per cent. In consequence the new line is to be used for east-bound or up-hill trains.

The rock drilling was done by air. A compressing plant was installed at Belden, midway between the two ends of the work. From this plant compressed air was piped in both directions to be used as power both in the tunnels and in the open cuts. The classification of pay quantities was as follows:

Embankment	135,220 cu. yds.
Loose rock excavation	115,315 "
Solid rock excavation	153,705 "
Rip rap	2,670 "
Retaining wall	6,150 "
Tunnel	760 lin. ft.

The tunnels were all driven through solid rock without timbering or other lining. They are notable because of their large section, 18 ft. x 25 ft., which was adopted in order to conform to the Denver & Rio Grande standard clearance diagram for steel bridges. As so large a part of the grading quantities was rock excavation, the work was carried on through the winter. Great care in setting off blasts was necessary on account of the frequent movement of trains passing very close to the work. In this the contractors made a fine record.

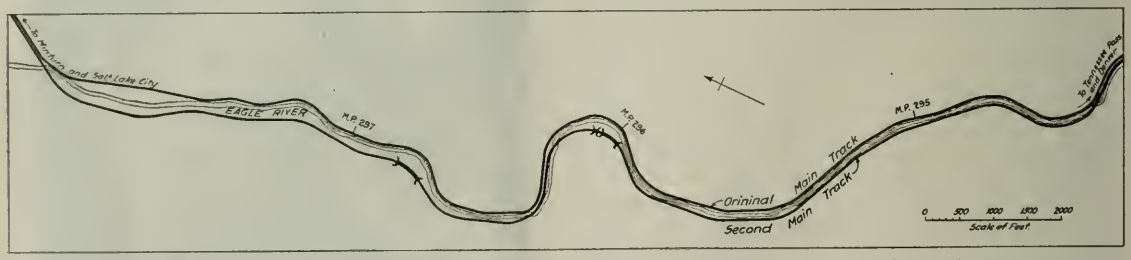
Of the five bridges, one 80-ft. deck girder span is on a tangent;



Profile Across the Continental Divide, Salida to Minturn, and Leadville Branch; Denver & Rio Grande.

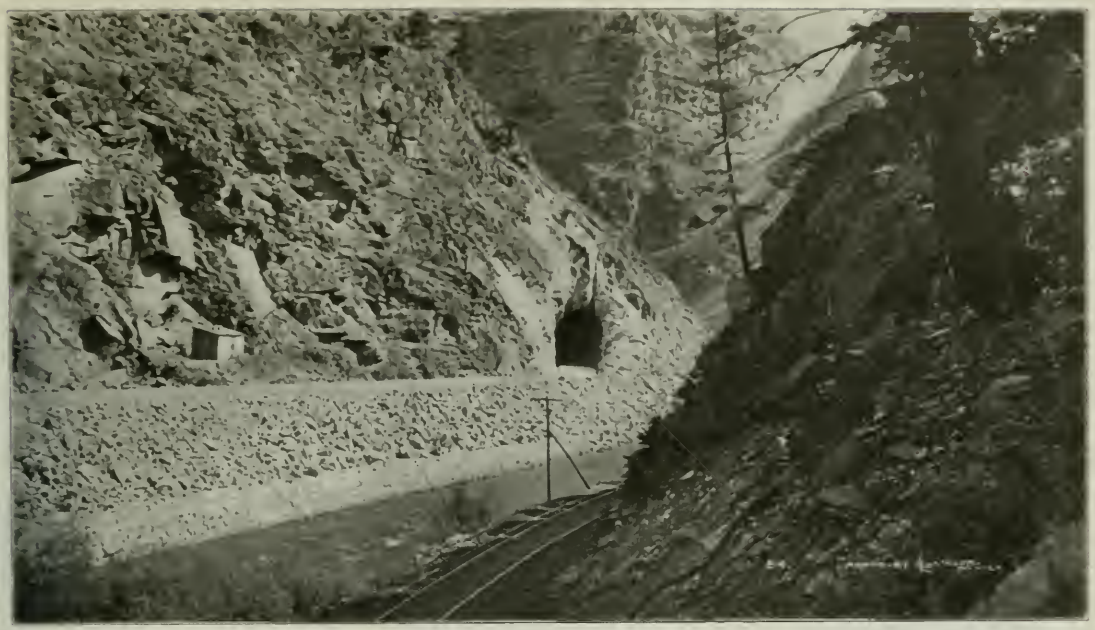
the other four bridges, one double-track 48-ft. through girder; one single-track 80-ft. deck girder, and two single-track 80-ft. through girders, are on sharp curves. The abutments were built of plain concrete masonry founded on rock. The girders were designed for a reinforced concrete slab floor and track ballast conforming to the Denver & Rio Grande specifications for steel bridges. As a result they are very heavy The ballast used is the best quality of broken stone. Great care was taken to get the right kind of concrete in the floor slabs. Riveting in the field was accomplished by air power obtained from a flat car fitted with a steam-driven air plant. For the smaller drainage openings under the roadbed cast-iron pipe culverts and reinforced concrete box culverts were used. The construction of the concrete abutments and all other field work on the bridges and culverts was done by the company's forces.

The contractors for this work were the Phillips Construction Company & O'Gara, who began work in the fall of 1906.



Plan of First Track and New Second Track Through Eagle River Canyon; Denver & Rio Grande.

Abutments of Bridge 296A, on New Second Track Near Belden; Denver & Rio Grande.



Belden from the East; Retaining Wall and Tunnel on New Second Track.

Belden, Col., from the West, New Second Track on Right; Denver & Rio Grande.

Weaver's Rail Lock for Drawbridges.

Mr. E. M. Weaver, Signal Engineer of the Long Island Railroad, has designed and patented a rail lock for drawbridges which serves both to keep the rails in line and to hold them to the sleepers and, therefore, takes the place of the rigid trough usually used for the lift rails at the ends of swing drawbridges. As shown in Fig. 1, which represents half of a double-track swing drawbridge, enough of these locks are used to hold each rail as firmly as though it were spiked. In this case, it will be seen, there are five pairs of locks for each rail. The bridge shown in the drawing is that at Broad Channel, on the Rockaway Beach division. The movement and locking of the bridge are done by manual power. *C* represents the connection to the lever which moves the signal regulating the approach of trains to the bridge, the locking being so arranged that the bridge lock, *A*, cannot be released until the signal is set to indicate stop. *B* is the connection for electric circuits where such are used on the draw. The tumbler lock at *A* being released, the bridge and the rails are unlocked by the lever at *E*, actuating longitudinal rod *D*. The rail-locks are released by revolving the transverse rods on their axes.

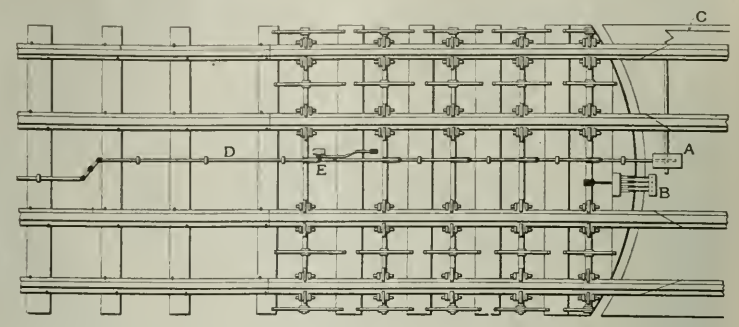


Fig. 1—Rail Locks for One End of Drawbridge, Long Island Railroad.

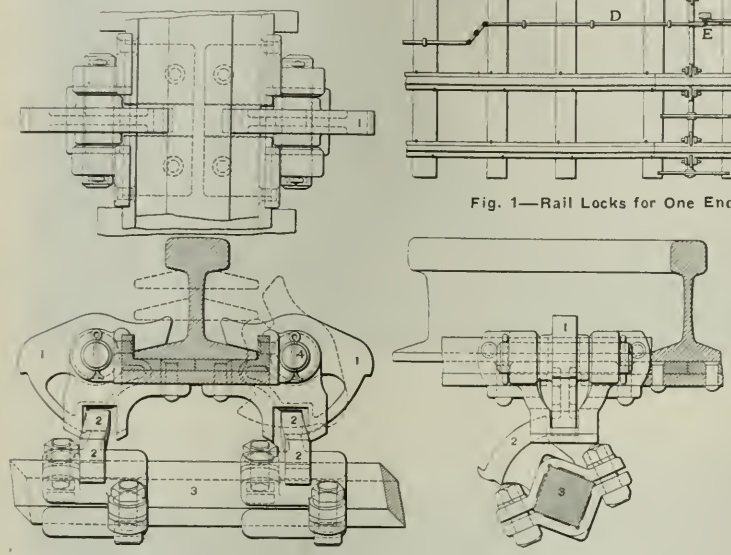


Fig. 2—Weaver's Rail Lock for Drawbridges.

The lock itself is shown in Fig. 2, in which 1 is the rail-dog, a steel casting; 2 is a projection on the transverse rod 3, which locks 1 in position. This projection is fixed in an inclined position, and it locks the dog as by a wedge, thus perfectly taking up all lost motion. The dog revolves on the pin 4. To take up excessive lost motion due to wear the lock bars (2, 2) may readily be moved on the transverse bar. The dotted lines show the position of the dog when it is open to allow the rail to be lifted preparatory to swinging the bridge.

The lock bars (2) being withdrawn so as to leave dog (1) free, the lifting of the rails turns the dogs; and on closing the bridge the dropping of the rails pulls the dogs down into the lock position.

The appearance of the dogs is better shown in the three views in Fig. 3, made from photographs, where a pair of dogs is shown in three different positions. The lock (2) is in the same position, the unlock position, in all three of the photographic views. The working of the lock may be understood by reference to *a*, Fig. 3. Lock bars 2, 2 are seen in the unlocked position. To lock they are pushed forward by the revolution of transverse rod 3.

On the drawbridges of the Long Island road the rails at the ends are mitered, as shown in Fig. 1, and there is a mitered joint farther back with a less acute angle, to provide for expansion. All of the rails used for joints of this kind are bent before being planed, thus strengthening the rail by utilizing the web for the whole length, as shown by the dotted line in Fig. 4.

Fig. 5 shows the Long Island Railroad standard arrangement of rails, guard rails and guard timbers for drawbridges.

These locks have been in use on Broad Channel drawbridge for four months and have given excellent service. The design appears to combine cheapness, simplicity and efficiency.

Fig. 3—Weaver's Rail Lock for Lift-Rails of Drawbridges.

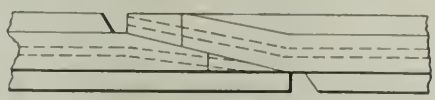


Fig. 4—Mitered Rail.

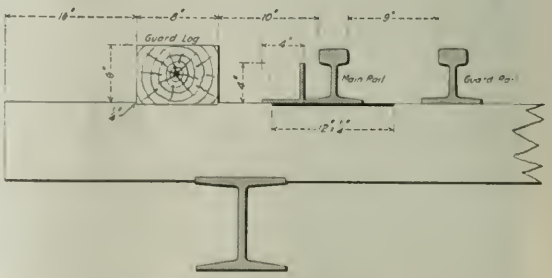


Fig. 5—Standard Guard Rail Arrangement for Drawbridge—Long Island Railroad.

The Smoke Consuming Question Forty-Eight Years Ago.

BY C. H. CAUTHERS.

"Is it practicable to avoid smoke from locomotive engines using bituminous coal?

"Is the prevention of smoke in locomotives attended by economy of fuel?

"What are the relative values of Pittsburgh and Broad Top coals for use on locomotives on this road?"

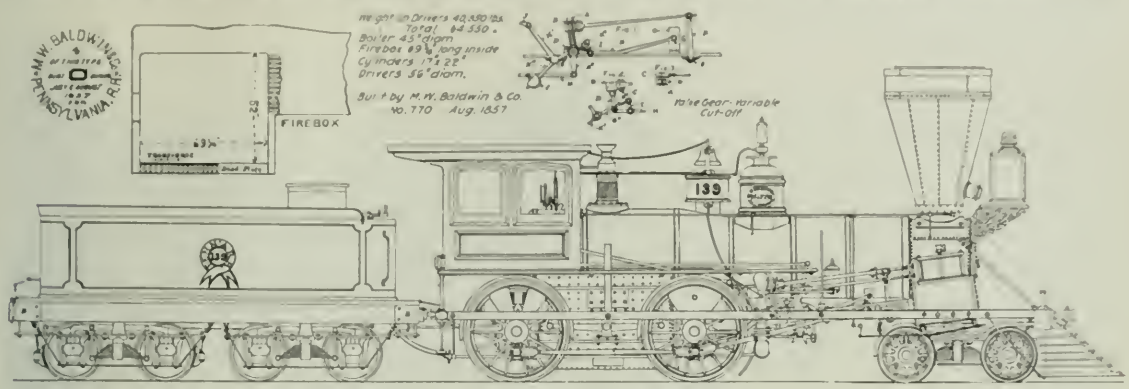
In the *Railroad Gazette* of December 1, 1905, the writer in an article entitled "Early Experiments in Smoke Consuming," referred to a series of experiments conducted on the Pennsylvania Railroad in 1859 under the auspices of General William J. Palmer, who was at that time connected with the motive power department of the company.

Since the publication of the article referred to, there has come into my hands, through the courtesy of General Palmer, a copy of the pamphlet describing these experiments in detail, and with the pamphlet the full permission of its author to publish any desired parts of the report in connection with the present article. Hence I cannot imagine a more fitting introduction than the three opening sentences, which are copied from the front cover and the title page of the work referred to.

While the third of these sentences quoted pertains simply to the coal most available at that time in the practice of one railroad, the other two are just as pertinent to-day to every road using bituminous coal of any brand as fuel in its locomotives, and if one may form an opinion from the emission of smoke from the stacks of the average passenger or freight locomotives now using bituminous coal, the first query does not seem to have fully approached a solution after all these years.

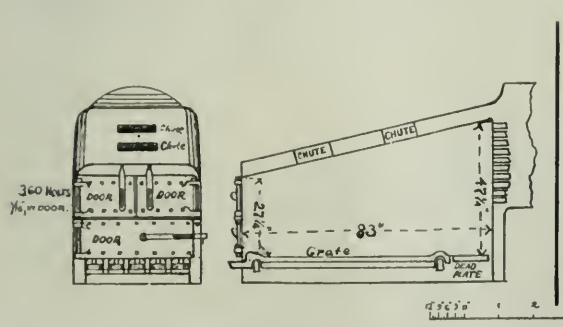
Of course the best arrangements of fireboxes, and other parts of the engines directly used in connection with the fuel and the resultant gases, etc., of combustion, are after all under human control, and undoubtedly much depends on the discipline of the company and the degree of strictness with which the employees are required to conform to such discipline. It should also be remembered that in practice, conditions are continually arising which upset the best of theories. In other words, sitting in a cosy office and devising mechanism or methods for handling locomotives is a vastly different proposition from filling the position of engineman or fireman and keeping a locomotive drawing a heavy train up to time and to all the requirements of a necessarily strict discipline amid all sorts of conditions, and withal meeting the approval of the officials of every rank and the patrons of the company.

Up to the time of conducting the experiment referred to, all the passenger engines and a large number of those in the freight service of the company used wood as fuel, and in the opening chapter of the report its author in enlarging on the questions quoted, asks if it is practicable to use raw bituminous coal of the various kinds found along the road, in passenger engines without emitting cinders to an extent that would annoy passengers; and if this would be found practicable what would be the best device for obtaining that object, and what saving would result from the substitution of coal for wood as fuel in such engines? It must be borne in mind that at that period the forests of the state existed in almost their primal glory over a large part of its territory and the cost of obtaining an ample supply of wood was not such a serious matter as it has now become; still the probabilities of the future and the excellent service derived from the freight engines using bituminous coal even then induced the company to consider its use in passenger locomotives.

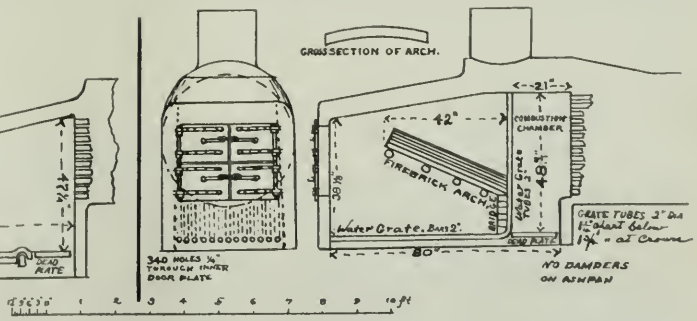


Number 139.

These experiments were conducted from April, 1859, to August of the same year, and were made on two different portions of the road; one consisting of the ascent of the Allegheny mountains from Altoona to Gallitzin, a distance of 12 miles, with an average ascent of 95 ft. to the mile, and the other the division between Altoona and Mifflin, $82^{3}/_{10}$ miles, in which the heaviest grade was 21 ft. to the mile.



Firebox of No. 51.



Firebox of No. 120.

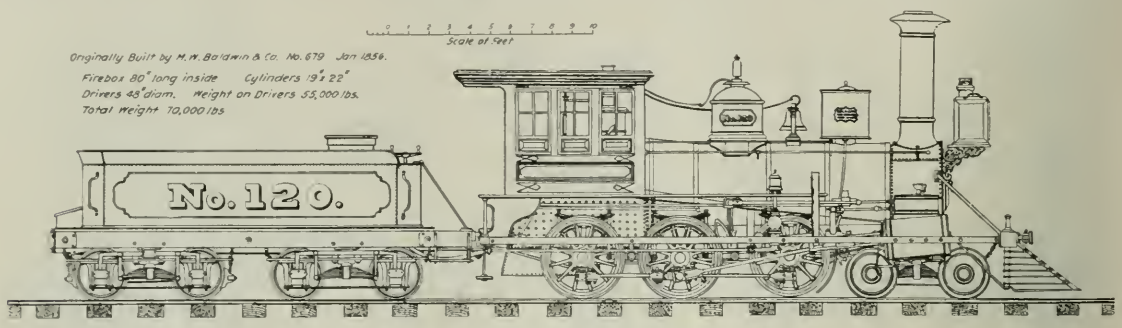
Table 1.—*Data of Track on Which Freight Tests Were Made.*

Items.	Altoona & Mifflin. East.	Altoona & Mifflin. West.	Altoona to Gallitzin, west only.
Level	12.14 miles.	.....	1/7 mile.
Straight line	7 miles.	.....	7 miles.
Curved line	.....	.....	5 miles.
Ascending grade	16.21 miles.	54.15 miles.	11.66 miles.
Average inclination, to 1 mile	8.76 ft.	16.13 ft.	85½ ft.
Maximum grade	10.56 "	21.12 "	95 "
Total ascent	.....	.....	982 "
Maximum curvature per 100 ft.	6° 20' per 100 ft., or radius of 910 ft.	ra-	9° or radius of 637.3 ft.
Prevalent curvature per 100 ft.	3° per 100 ft., or radius of 1,910 ft.		.....
Other curves	.....	.....	8½°, 8°, 7°, 6°, 5½° and larger radii.
Grade reduction on curves	.....	.....	.025 to .038 ft. per 100 ft. for each deg. of curvature per 100 ft.
Running speed per hour	13.32 miles.	13.32 miles.	7.57 miles.
Average curvature on 5 miles	.....	.....	4¾° per 100 ft. or 1,207 ft. radius.

The train hauled on the mountain trials consisted of eight

"eight-wheel" box cars (four-wheel cars were in use in those days, hence the statement of the number of wheels per car), all loaded and forming with their load an average weight of 138½ net tons, or 188½ tons including engine and tender. The train used between Mifflin and Altoona consisted of 20 similar cars amounting with their load to a net weight of 347 tons and 397 tons with the engine and tender.

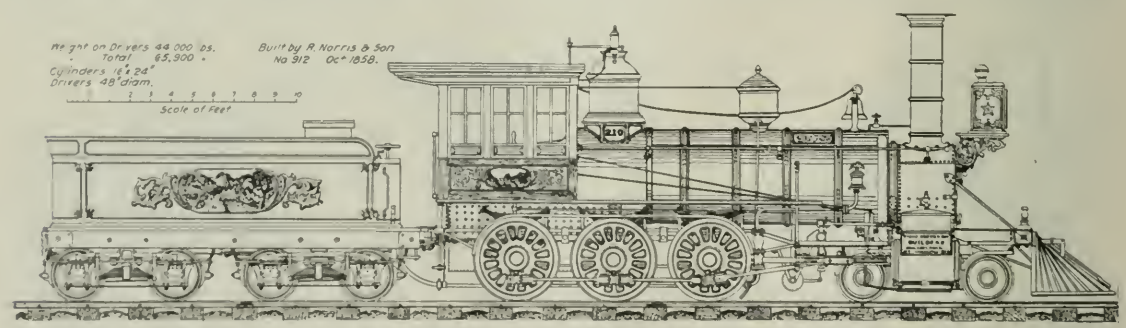
All details pertaining to the coal, wood and water used were attended to with the utmost care. Coal and wood were weighed in every instance and the engines were charged with the amount used in each from the moment of lighting the fire. Each engine boiler was washed out and refilled with cold water before every test in order to effectually prevent danger of priming. This water was of as nearly a uniform temperature in each instance as possible and all measurements of water in the tenders were taken accurately



Blue Ridge, No. 120, Rebuilt at Altoona Shops in 1857.

on a level. When water was supplied at points where the track was inclined, the tenders were raised to a level by screw jacks carried along for that purpose on the engines. The temperature of the feed water was also carefully noted. It ranged from 42 deg. to 72 deg. Fahr., the evaporation was calculated for the standard of 62 deg. Fahr., and the temperature of the latent heat of steam was assumed at Professor Johnson's calculation of 1,030 deg. In regard to the temperature of the feed water, it must be borne in mind that all these engines supplied the boilers by means of force pumps with plungers attached directly to the crossheads, and unless the heater provided to prevent freezing in cold weather was used, the water entered the boiler at about the same temperature as when it left the tender. Injectors had not at that time been applied to any engine on the Pennsylvania Railroad.

The coal was of uniform quality in each of the two kinds used



Number 210, Built in Oct., 1858.

in the tests, and the wood was an equal mixture of hard and soft varieties.

This interesting series of trials was made with six freight engines taken from the regular equipment of the company, and they will now be described in connection with the results of the tests, beginning with the least successful.

This was a 4-4-0 coal burner, No. 139, built by M. W. Baldwin & Co., in 1857, and taken from the regular service without any alteration to adapt it to smoke consumption. It had a long, deep firebox, and a "balloon" smoke-stack of the type in use on both the coal and wood burning engines of the company at that time. But a single firedoor was used with only one air-opening in it. A blower was also used and one ashpan damper.

This engine emitted the most smoke, especially heavy when Pittsburgh bituminous coal was used, but even with Broad Top coal a considerable amount passed from the stack and in either case the smoke and cinders would have been very annoying to passengers. When running with the firedoor open the smoke discharge was of much less density, showing that with a better provision for air admission than the single opening in the firedoor the smoke would have been greatly diminished. It is rather remarkable that although giving the poorest results of the six in smoke consumption, No. 139 was the most economical in consumption of fuel.

No. 51 was simply a Ross Winans "Camel" unchanged in most features from its advent on the road six years before; in fact, about the only alterations consisted in the closing of the "chutes" which Mr. Winans had placed on the top of the firebox to enable coal to be readily placed at the forward part of his 83-in. grate, and a damper arranged for covering the top of the stack at stations. This, however, does not appear to have been a part of the "outfit"

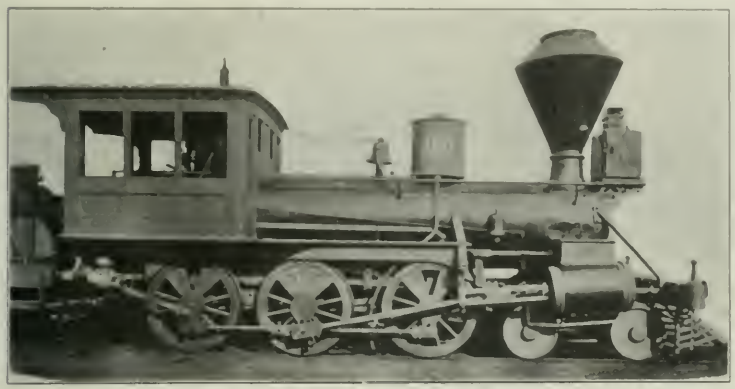
accompanying any other camels which the writer has ever seen or of which he has examined drawings. With these exceptions the open firebox end with its three large doors; the straight stack with its surmounting box-shaped top covered with coarse netting, and the dependent pipe, or dust receptacle; the Winans rocking grate and variable exhaust; no blower; no ashpan dampers; in fact, all the more striking features of this remarkable type of engine were retained, and No. 51, like No. 139, simply entered the trials "on her merits" for purposes of comparison only, and without additions of any sort. With its long firebox which subjected the gases for a longer time to the action of the fire, and the 14-in. deadplate next the flues, it showed much less smoke than 139. On Pittsburgh coal the discharge ceased a short time before the next charges were necessary. With Broad Top coal the results were very fair, the discharge from the chimney being only dark brown in color, and that but momentary after charging. This "Camel" engine proved the extent to which smoke consuming could be carried in locomotives with the largest practicable admission of air over the fire by jets through the firedoors, but without a combustion chamber or deflector. The air entering in this manner appears to drive the gases to the flues before a proper combination can be effected in the time and space afforded.

The next engine, 190, had a Dimpfel boiler similar to that shown in the *Railroad Gazette* of December 1, 1905, in the article referred to. It will be seen that this type of boiler is formed with a semi-circular water-space on the inner circumference of the sheets forming the barrel. This space is connected to the usual crown and side sheets at the back, and to a transverse water space closing the end next to the smoke arch, except where it is pierced vertically by a long, narrow opening for the passage of the smoke and gases to the chimney. Thus the interior portion of the barrel forms a

large combustion chamber which is filled with 1½ in. water tubes, 142 in number, instead of flues. These tubes are attached to the transverse space at the front and are then carried back into the firebox, at which point they are curved sharply upward and enter the crown sheet.

The chimney was straight and unobstructed by netting or cone, but wire gauze covered the opening from the combustion chamber to the smokebox. Due provision was made for controlled admission of air at various points on the boiler and firebox.

This engine emitted but little less smoke than 51, the difference being hardly discernible. On Pittsburgh coal, with full steam, the discharge soon vanished, but when engine was working light, it was of a deep color and continued for a long time. With Broad Top lump coal the results were better, but with fine coal from the [illegible] of smoke and gases especially on the [illegible] trips. Here with Broad Top coal the only [illegible] was a momentary whiff after each charge of fuel. It was necessary, however, to keep the door slightly ajar for a brief time after firing to produce this effect. On the trip between Altoona and Mifflin the results were not so good owing to the [illegible] being worked [illegible] on account of the very light grades. On this part of the road it emitted smoke during one-half to two-thirds of the trip. The successful results obtained on the mountain are ascribed to the long grate, the transverse bridges and the large combustion chamber, and the failure to attain even better results is attributed to the shallow firebox and its equally shallow ashpan which allowed the ashes to lie too close to the grate and thus cut off a proper amount of air, and also to the transverse bridges being formed of iron water spaces instead of firebrick, thereby cooling the gases and impeding their proper combustion.



Pennsylvania Engine Blue Ridge in 1868.

Cylinders, 19 in. x 22 in.; drivers, 49 in.; weight on drivers, 59,900 lbs.; total weight, 72,300 lbs. Worn out and scrapped in 1872. Engine originally had 30 in. dome on waist sheet, and small dome in cab on rear sheet, as some arrangement of boiler. Top as No. 206. It also had hook-motion with an independent variable cut-off. Built by M. W. Baldwin & Co., 1856; No. 679.

No. 120 was an engine which had been rebuilt at Altoona with a firebox somewhat differently arranged from that of 206, the next on our list. An arched deflector of firebrick extended from the front of the firebox for a distance of three and one-half feet toward the doors, rising from a height above the grate at the front of 32½ in. to 35 in. at the rear end. This arch was supported on eight hollow water plugs, four on each side of the firebox. The grate was composed of water tubes starting from the back sheet and extending to within about 18 in. of the front end of the fire-space, at which point they curved sharply upward and finally entered the crown-sheet. In front of the vertical portion of these tubes was thus formed a combustion chamber which extended 21 in. to the tubesheet. The firedoors were four in number, arranged in two tiers, and firing was done through these tiers alternately. These doors had 340 quarter-inch holes in their inner plates. A blower and an unobstructed straight chimney were used, but there were no dampers.

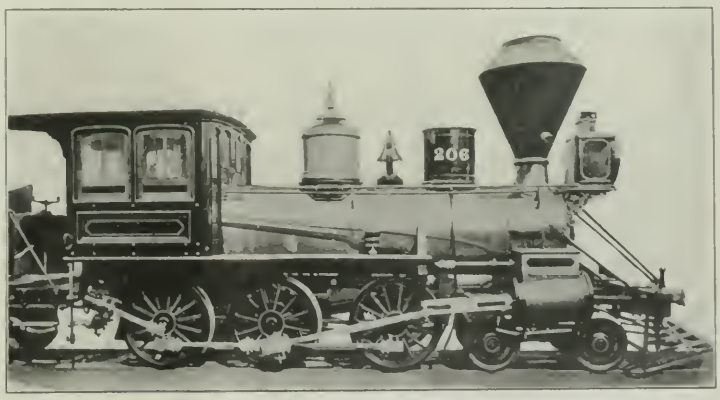
same mines the smoke amounted to a nuisance. The causes of unsatisfactory results in this engine were insufficient admission of air at the sides of the firebox, defective supply at the firedoor, and the position of the vertical air pipes leading to the long combustion chamber. The water tubes were also thought to cool the gases too much and thus retard their proper combustion.

No. 210 was a comparatively new engine from the shops of R. Norris & Son, and had a "Phleger" boiler. The barrel of this boiler was filled with 2-in. flues, and had an inverted semi-circular section attached to its top extending from the front of the wagon-top to within about 10 in. of the smoke arch. This communicated with the interior of the barrel and also contained the dry-pipe which terminated on the outside of the superstructure in the usual "T" and was there divided into two parts which were carried downwards on the outside of the boiler to the cylinders. The firebox was very shallow, and as it was set high it allowed the driving wheels to be placed closely together and further back than was customary on 10-wheel engines. This enabled the main rods to be attached to the first pair of wheels, the axle of which also carried the eccentrics and did away with the necessity of curved eccentric rods as on engines using the second pair of drivers as the main one.

The firebox contained two transverse water bridges set 10 or 12 in. apart in a horizontal position. One rose directly from the grate at the front of the firebox, and the other was suspended from the crown sheet in the combustion chamber to a depth of about 9 in. below the top of the other. A combustion chamber 30 in. long was placed immediately in front of the firebox and the flues, of course, were attached to the front of this space. The only air which entered the firebox, aside from that passing through the 78-in. grate, was admitted through a few small holes in the firedoors, and the efficiency of these was much impaired by an oversight in not connecting the inner and outer plates of the doors. These doors were double, the grate bars were hollow tubes 2 in. in diameter, through which water circulated, and the ashpan also was formed with a water-space surrounding it.

This engine showed a still greater improvement in consumption

No. 120 did much better than the preceding two engines, being better adapted to the desired objects on account of its large firebox, abundant admission of air at the four firedoors, and the high temperature which the firebrick arch soon attained and kept, thus ensuring a more thorough consumption of the gases. This engine showed no smoke with Broad Top coal except a momentary whiff of a light brown color just after charging, but never sufficient to annoy passengers if the engine were run in that service. With



Pennsylvania Engine No. 206 in 1868.

Originally built for Allegheny Portage Railroad Co., in 1865, by M. W. Baldwin & Co. (Construction No. 687) and bought by P. R. R. Co., with state improvements in 1857. Previous to this purchase it was known as "William Hopkins." Cylinders, 19 in. x 22 in., driving wheels, 49 in.; total weight, 63,300 lbs.; weight on drivers, 47,900 lbs. Cut up in 1872. This engine originally had hook-motion with an independent variable cut-off.

Pittsburgh coal the amount of smoke visible was little in excess of that from Broad Top.

Engine 206 was originally built in 1856 by M. W. Baldwin & Co. for the Allegheny Portage Railroad, and came into possession of the Pennsylvania Railroad Co. in 1857 with the other state improvements. It had been rebuilt at Altoona a short time previous to the experiments in smoke-consuming, and was fitted with the coal-burning firebox of Gill & Co., also illustrated in the preceding article. This device consisted of a water space forming a diaphragm or deflector extending with an upward slope from the

front of the firebox to within 16 in. of the firedoor, and thus forming an air chamber under the crownsheet. This deflector was formed of two sheets of copper placed 4 in. apart and stayed by means of 600 hollow stays with openings through them of three-sixteenths of an inch in diameter and a roof of firebrick two inches above it. In front of this, and extending from the front of the firebox a distance of 30 in. into the barrel of the boiler, was a combustion chamber and in this was placed a bridge at a distance of 24 in. from the flues and rising to within 10 in. of the top of the chamber. Two bridges also surmounted the diaphragm, both rising to a height of 8 in. The firedoor was double and contained 333 holes, each one-quarter of an inch in diameter in the inner plates, and a number of large holes in the outer plates. A blower and tight-fitting ash-pan dampers were used. The chimney was straight and unobstructed by any spark-arresting device whatever.

The Gill device on 206 proved best adapted to the purpose of all. With Broad Top coal only a tinge of smoke was visible at any time, and with Pittsburgh coal very little more appeared, and that no greater than shown from pine wood but without the acrid properties of the latter. With this engine the smoke would never have amounted to an annoyance to passengers if used in that service. This remark will also apply to engines 120 and 210 to a great extent.

With 206 the point is reached which is directly opposite to that shown in the first engine considered, No. 139. In this engine a large amount of air was necessary to reduce the smoke perceptibly, while with the 206 the reverse was found to be the case.

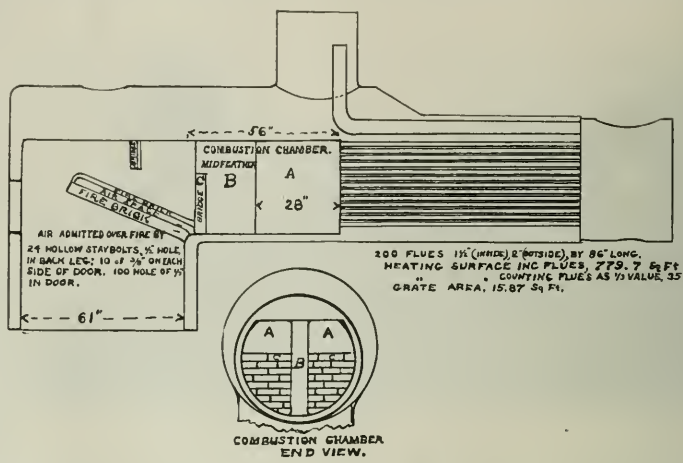
The information gained from these tests proved that the admission of air for the proper combustion of the gases must enter above the fire, and for the coke produced in combustion must enter under the grate bars.

The air to aid in the combustion of the gases must enter through small holes at a great velocity, and at the earliest possible moment after these gases are evolved to ensure a thorough combustion.

It was further developed that mechanical devices to properly admit air to the gases and mix it with them were very desirable, and that this mixture of gases and air should be afforded as large a "run" as possible before passing into the flues.

The general results of these experiments may be summed up as follows:

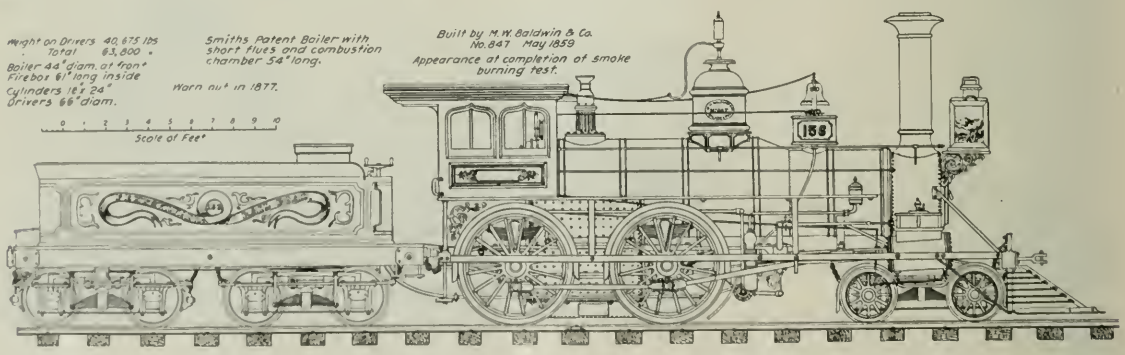
First.—In the order of comparative freedom from smoke, engine 206 is first; Phleger, 210, second; Blue Ridge, 120, third; Dimpfel, 190, fourth; Camel, 51, fifth, and Baldwin, 139, sixth.



Firebox and Boiler of No. 156.

three pounds of wood were equivalent to one pound of coal, and on the longer but less arduous Mifflin trip, two and one-half pounds of wood were equal to one pound of coal. A special experiment demonstrated that one pound of coal was equal to two and thirty-one one hundredths pounds of wood, but as the heat developed in kindling is necessarily left in the engine at the end of the trip, the ratios of one-third and two-fifths are believed to be more nearly the correct figures, both absolutely and for purposes of comparison between the engines used in the test. The quantity of wood used in kindling the fires was nearly the same for each engine, viz., from 300 to 500 lbs. No account was taken of the deposits left on the grates at the end of the trips. This varied from 100 to 500 lbs., but it would have been impossible to correctly estimate this mixture of coal, clinker and ashes.

In the railroad practice of that epoch each engine had its own engineman and fireman, and these men naturally became so accustomed to their respective machines that they could obtain better results from them than from others, even of the same type. In these trial runs the enginemen were not always on their own engines except in the case of three, and the firemen were also different except on the Gill and Dimpfel (206 and 190) engines. Some of these men were also unfamiliar with the portions of the line upon which they handled the experimental trains, and these facts in



No. 156, at Completion of Smoke Burning Test.

Secondly.—The first four, with some modifications to 210, could be used for passenger trains with Broad Top coal.

Thirdly.—The Gill plan, 206, is the only one which can be run as constructed for the trials, with Pittsburgh coal for fuel on passenger trains. Phleger, 210, however, might be brought up to this standard by arranging the openings in the firedoors and sides of the firebox to properly increase the admission of air.

In freedom from sparks and cinders the order was somewhat different, being: First, Phleger, 210; second, Blue Ridge, 120; third, Gill, 206, and Dimpfel, 190; fourth, Baldwin, 139, and last, Camel, 51.

It was also found that on the short but severe mountain trip connection with other conditions are stated in the report as somewhat against accepting the results as thoroughly reliable standards of the comparative heating value of the two coals, as the unfamiliarity of the men with some of the engines and with some parts of the line would naturally affect the economical use of fuel. The table compiled from data contained in the report and from other sources will convey a fair idea of the two parts of the road on which the trains were run, while another table collated from the report and from other Pennsylvania Railroad literature, furnishes the principal dimensions of the six engines participating in the trials.

It has been ascertained that on the Allegheny mountain trips

with six locomotives using Pittsburgh and Broad Top coals on alternate days, each engine consumed 148.25 lbs. of Pittsburgh coal per mile and evaporated 6.22 lbs. of water to each pound of coal, while with Broad Top coal the consumption was 143.83 lbs of coal per mile, with an evaporation of 6.02 lbs. of water to each pound of coal.

On the Mifflin trip the consumption of Pittsburgh coal averaged 48.67 lbs. to one mile, and one pound of this coal evaporated 8.01 lbs. of water, and 45.14 lbs of Broad Top coal were consumed to the mile, with an evaporation of 8.27 lbs. of water to each pound of coal

These tests having been made with Pittsburgh and Broad Top coals, the difference in heating values having been ascertained, and the cost of each coal varying considerably with the proximity of the different divisions of the road to the source of supply it was deemed best to confirm the results of these trials by separate tests with two engines of widely different characteristics and by a chemical analysis of the two kinds of coal.

This final test was made between Altoona and Mifflin with engines 206 and 139, the trips covering a period of eight days and using Pittsburgh and Broad Top coal on alternate days. The entire distance run was 660 miles; the road, train and engine crews were the same throughout, the same care as on the former tests was taken to accurately weigh the fuel and measure the water; the weather conditions and temperature continued uniform. The resulting general averages were 39.43 lbs. of Pittsburgh coal consumed to the mile, and 39.19 of Broad Top, with an evaporation on the former of 8.21 lbs. of water to 1 lb. of coal, and 8.29 lbs. of water to 1 lb. of Broad Top coal, a difference of three-fifths of 1 per cent. on consumption and ninety-seven one hundredths of 1 per cent. on evaporation in favor of the Broad Top coal, but really leaving the inference that practically no difference existed between the two coals in the two features named, as the different lots of the same coals often varied sufficiently to cause a greater variation either way.

The Pittsburgh coal used in the trials was taken from the railroad company's storage bins, being the same as was used for all engines, but the Broad Top on account of its greater susceptibility to deterioration under lengthened exposure to the air was mined for the experiments.

The feasibility of using bituminous coal in the fireboxes of passenger locomotives having been demonstrated, the problem which next presented itself was to ascertain the comparative economy in the use of wood and coal in such service. To estimate correctly the relative heating value of a ton of coal and a cord of wood, the relative cost of the same delivered on the tender, and the increased cost of engine repairs due to the substitution of coal for wood, a new passenger engine which was believed to be especially fitted for such a test was selected. It was No. 156, built in May, 1859, by M. W. Baldwin & Co., with a Smith, or "Hudson River" type of boiler. The peculiarities of this boiler were a large, deep firebox, a combustion chamber 4 ft. long, and a considerable admission of air through 24 hollow staybolts in the back leg of the firebox and about 100 perforations in the door. All these apertures were ½ in. in diameter, and in addition to these were 10 air openings on each side of the door. These were three-eighths of an inch in diameter. The combustion chamber was divided for half its length into two compartments by a longitudinal midfeather 6 in. wide, beginning at the firebox end of the chamber. The stack used at first was of the ordinary balloon type with cone and netting as used on most of the company's engines at that time. A variable exhaust was also used. The principal dimensions of 156 were as follows:

Cylinders	16 in. x 24 in.
Driving wheels (feet)	6.66
Heating surface, including flues	779.7 sq. ft.
Heating surface, counting flues as one-third value	259.7 "
Grate area	15.87 "
Flues, number	220
" length	86 in.
" diameter, inside	1¾ "
Weight on drivers	19,675 lbs.
Weight, ready for service	63,500 "

The trials of 156 were first made on the mountain grade already described, between Altoona and Gallitzin, 12 miles, and on account of its heavy grades being considered equal to an ordinary piece of railroad four times as long. Four loaded eight wheel box cars were used, and both train, enginemen and firemen were the same during all the tests. The weight of the train was:

Cars	34½ net tons
Load on cars	37 "
Total weight of train	71½ net tons
Total weight of train, engine and tender	118 net tons

The engine had shown itself to be an excellent wood-burner in a previous short service on the Philadelphia division, but was not satisfactory when tried with coal until a perforated firebrick deflector, a hanging bridge of firebrick immediately over the deflector, and another bridge of similar material in the firebox end of the combustion chamber had been added. The cone and netting were also removed from the stack, and after these alterations the

TABLE 2.—*Principal Dimensions of Freight Engines Used in Smoke-Burning Tests.*

Items.	Dimpfel, 190.	Phleger, 210.	Gill, 206.	"Blue Ridge," 120.	"Camel," 51.	"Baldwin," 139.
Cylinders, diameter and stroke	18 in. x 22 in.	16 in. x 24 in.	19 in. x 22 in.	19 in. x 22 in.	19 in. x 22 in.	17 in. x 22 in.
Driving wheels, No. and diameter	(4)—55 in.	(6)—48½ in.	(6)—48½ in.	(6)—48½ in.	(8)—42⅜ in.	(4)—54 in.
Truck wheels, No. and diameter	(4)—26 in.	(4)—24 in.	(4)—30 in.	(4)—28 in.	None.	(4)—30 in.
Type of cut-off	Link.	Link.	Independent, 15 in.	Independt. variable.	Independent, 11 in.	Independt. variable.
Exhaust pipes, No. and diameter	(1)—3⅝ in.	Var. (1)—4½ in.	(2)—3 in. each.	(2)—2⅝ in. each.	Var. (1) 2x3", 6x3"	(2)—3 in. each.
Exhaust pipes, total area	11 sq. in.	15.9 sq. in.	14.13 sq. in.	12.97 sq. in.	Var., 6 to 18 sq. in.	14.13 sq. in.
Boiler, inside diameter	48 in.	40 in.	45 in.	45 in.	42⅜ in.	45 in.
Firebox, length and width (inside)	63 in. x 39 in.	81⅝ in. x 36 in.	68 in. x 37 in.	80 x 33⅜ & 38 in.	83 x 40 & 42⅜ in.	69¾ x 35 & 39 in.
" depth, crown to grate	52 in.	34 in.	47 in.	Slop'g 38⅛x44¾".	Slop'g 27¼x47¼".	52 in.
" area for gases—smallest prt	.....	Crown to top of fuel, 720 sq. in.	Crown to deflector 370 sq. in.	Crown to deflector 266 sq. in.	Crown to top of fuel, 533 sq. in.	Crown to top of fuel, 1,406 sq. in.
Combustion chamber, length	Firebox to smoke-box.	34¾ in.	30 in.	22 in.	No combustion chamber.	
" " width	41 in.	38 in.	38 in.	36½ in.	No combustion chamber.	
" " height	30 in.	44 in.	28 in.	48 in.	No combustion chamber.	
" " area for gases.	625 sq in.	Bet. bridges, 378 sq. in.	Bet. brick wall and crown, 370 sq.in.	Bet. vertical tubes, 277 sq. in.	.....	.....
Flues, No. and inside diameter	Water tubes.	(176)—1¾ in.	(118)—2 in.	(120)—2 in.	(103)—2 & 2¼ in.	(115)—2 in.
" length and space between	.....	123 in.—⅝ in.	111¾ in.—¾ in.	138⅝ in.—⅝ in.	169 in.—½ in.	132 in.—¾ in.
" area for gases	.....	538 sq. in.	370½ sq. in.	377 sq. in.	364 sq. in.	561 sq. in.
Grates, length and width	64 in. x 36 in.	77½ in. x 34¼ in.	54 in. x 31½ in.	72 in. x 34½ in.	78¾ in. x 42¼ in.	69¾ in. x 35 in.
" length of dead plate	7½ in.	4⅛ in.	None.	4⅜ in. at back.	14 in.	28 in.
" area, without dead plate	14.5 sq. ft.	15.25 sq. ft.	12.9 sq. ft.	13.9 sq. ft.	19.11 sq. ft.	10.14 sq. ft.
" area, total	19 sq. ft.	18.4 sq. ft.	12.9 sq. ft.	17.25 sq. ft.	23.10 sq. ft.	16.95 sq. ft.
" space between bars	1 in.	1 in.	1 in.	1¾ in.	1 in.	1 5/16 in.
" width of bars	1¼ in.	2 in. diameter.	1½ in.	2¼ in. diameter	1¾ in.	1 5/16 in.
" type of bars	Cast-iron.	Water.	Cast iron.	Water.	Cast iron.	Cast iron.
Stacks, height abv. arch, and diam.	68 in.—13½ in.	ab. 68 in.—14½ in.	78½ in.—13 in.	76½ in.—14¼ in.	79 in.—16 in.	79 in.—17 in.
" type	Unobstructed str'ght	Unobstructed str'ght	Unobstructed str'ght	Unobstructed str'ght	"Winans."	"Balloon."
Heating surface, sq. ft.	929	1,121.6	765.9	961.3	1,030.8	837.8
Heat'g surf., flues, ⅓ value, sq. ft.	929	932.0	334.3	416.3	398.1	341.1
Builder	R. Norris & Son, Baldwin boiler	R. Norris & Son.	M.W. Baldwin & Co.	M.W. Baldwin & Co.	Ross Winans.	M.W. Baldwin & Co.
Weight, on drivers	37,400 lbs.	44,000 lbs.	47,900 lbs.	59,900 lbs.	61,900 lbs.	38,900 lbs.
Weight, total	61,100 lbs.	65,900 lbs.	64,300 lbs.	72,300 lbs.	61,900 lbs.	63,150 lbs.

engine had practically the Gill arrangement of firebox in an improved form.

The results obtained are embodied in the following table:

Fuel.	Miles.	Average—Consumption of fuel.	Average—Water evaporation.
Pittsburgh coal	12	1,073 lbs.	6,480.93 lbs.
Dry oak*	12	2,483 "	6,748.0 "

*Chiefly white oak, 3,500 lbs. to the cord.

From this data is shown, first, an average consumption of 81.92 lbs. of Pittsburgh coal per mile against an average of 206.92 lbs. of hard wood per mile, and from this was derived the estimate of 1 lb. of coal being equal to 2.31 lbs. of hard wood in heating power.

The second point established was that taking the weight of 128 cu. ft. of hard wood at 3,500 lbs. it follows that one net ton of coal is equal to 1½ cords of wood.

The third point was that taking the evaporation of water as a standard, we have for 1 lb. of Pittsburgh coal an average evaporation of 2.72 lbs. of water—which would make 1 lb. of coal equivalent to 2.22 lbs. of wood, and one net ton of coal equivalent to 1.27 cords of wood.

On account of this experiment with 156 being made on a short run, and on the 95-ft. grade which rendered the accuracy of measurements of water in the boiler by the gage cocks only, somewhat problematical, and from other reasons referred to in the report, it was deemed wise to "assume as a basis of our calculations that 1 lb. of Pittsburgh coal is equivalent in heating value to 2.31 lbs. of hard wood, and that one net ton of coal is equal to 1½ cords of hard wood."

It is also stated at this point of the report that the comparative value of good hard wood, in connection with experiments in the use of coal and wood on other railroads, had up to that time been

generally underrated, but various reasons are assigned for this, the chief of which is that the trials of the two fuels on those lines were made with different engines, of which those used with coal were new and possessed features giving a more perfect combustion of any fuel, and thus affording the coal burners the advantage among other things of a combustion chamber, which is equally adapted to improve the results obtained from a woodburner as from an engine fired with coal. The report states further that "as our result was obtained by the use of two kinds of fuel in the same engine (the combustion of both wood and coal being nearly perfect); the engineer and fireman, train, road, speed, condition of rail, weather, etc., being uniform, and the wood selected of one quality and carefully measured, I believe that it may be relied upon as practically correct." The relative cost of a cord of wood and a ton of coal varied on the different divisions of the road but was averaged at $3 per cord of 128 sq. ft. for hard wood, $1.84 per ton for Pittsburgh coal (2,000 lbs.) delivered on the tender; $2.22 for Broad Top coal, and $1.78 per ton where Pittsburgh coal was used on one part of the line and Broad Top on another.

Having by this test of 156 arrived at the comparative heating value of coal and wood in passenger locomotives, with the cost of each on the various divisions of the road, and having satisfactorily tested the practical working of a coal-burning passenger locomotive in all conditions of service, No. 156 was next run in both directions over the various divisions of the road on regular passenger trains. In these trips different enginemen ran the engine over the different divisions, but on account of the other passenger firemen being unaccustomed to the use of coal, her own fireman attended to her over the entire road.

The analyses of the Broad Top (semi-bituminous) and Pittsburgh (bituminous, or gas) coal made by Professor James C. Booth, of Philadelphia, Pa., at the time of the tests, are as follows:

General Analysis.

	A (Broad Top) Barrel vein.	B (Pittsburgh) Irwin, Pa.
Water	0.30	1.30
Bituminous matter	17.55	31.45
Fixed Carbon	74.65	61.45
Ash	7.50	5.80
	100.00	100.00

Organic Analysis.

Carbon	79.59	78.26
Nitrogen	1.39	1.67
Hydrogen	4.35	5.20
Oxygen	5.02	6.73
Water	0.30	1.30
Sulphur	1.85	1.04
Ash	7.50	5.80
	100.00	100.00

Heating Power.

1 lb. Broad Top coal heats 77.16 lbs. water from 32 to 212 deg. F.
1 lb. Pittsburgh coal heats 78.96 lbs. water from 32 to 212 deg. F.

Thus the results of the trials and of the analyses are found to agree quite closely.

As to which of the five smoke-consuming devices tried would be best adapted to apply to the rest of the company's equipment, the conclusion reached favored the modification of the Gill arrangement as was used in 156, as it could be applied for $660, if engine were taken out of service to make the change, or for $500 if deferred until coming in for new firebox. As the inventors of the Gill device were Pennsylvania Railroad employees they offered the company the free use of the patent during its continuance, hence the features retained in the plan used on 156 would incur no risk of infringement.

This arrangement was found by an experiment with a woodburning passenger engine 135, recently illustrated in the *Railroad Gazette*, to give very fair results on coal without the use of a combustion chamber, and therefore would enable the existing equipment to be quickly adapted to the use of coal with no especially annoying result to passengers, and to run until extensive repairs warranted adding the chamber.

The "Blue Ridge" arrangement also commended itself from a standpoint of economical application, and excellent work on semi-bituminous coal; and the Phleger and Dimpfel each from various features, but the results in their case did not appear to offset the high cost of changing old engines to such designs, nor was it probable that they would continue free from the need of costly and frequent repairs.

TABLE 3. *Average Cost of Hardwood and Coal Developed from Tests of Six Freight and One Passenger Locomotives.*

Fuel	Passenger.	Freight
Hard wood per cord of 128 cu. ft.	$3.00	
Pittsburgh coal per 2,000 lbs.	1.84	$2.30
Broad Top coal per 2,000 lbs.	2.22	3.03
Above coals mixed, per 2,000 lbs.	1.78	

These prices are delivered on engine tender at any point between Pittsburgh and Philadelphia.

One system of practice which afterward was adopted and followed by the company for a long time was suggested, viz., paying a premium to enginemen and firemen on all fuel saved over the maximum amount fixed for each engine's use within a certain time. Another suggestion which is just as pertinent to-day as then was that firemen use good judgment in firing as not only could a higher degree of perfection in burning the gases, etc., be attained, but also a greater economy in the use of fuel with better results in all types of engines.

The performances of 156 were so satisfactory that no new wood-burning passenger engines were afterward built for the company; and as rapidly as those already in service came in for general repairs or new fireboxes, they were changed to coal-burners with smoke-consuming devices, until by 1865 all except a very few had been so dealt with.

The trouble which arose from the use of the open straight stack allowing large cinders to be ejected at times with consequent frequent setting fire to property along the line, led to the use of the Laird stack about the middle of 1862. This stack having a cone, and a piece of netting extending downward for several inches below the opening above the cone, somewhat vitiated the perfect burning of the smoke and gases, but results were still fair, and passengers had also become accustomed to the fuel, so the coal-burning passenger engine had come to stay.

The writer has at no time found records of experiments in this line on any other road so carefully conducted as those which have been drawn on so freely for this article, and much yet remains embodied in the report which is interesting and profitable; indeed my efforts may be considered as but a superficial review of the whole matter, yet withal it is to be hoped that this reference to them may be of use to some railroad official who is desirous of solving the "smoke problem," and may also afford a pleasant satisfaction to General W. J. Palmer, who by his unflagging zeal and attention to their every detail, united with a careful recording of the same, has preserved them for the good of those who guide the performances of the iron horse to-day.

Controlling Earth Slides.*

BY H. ROHWER,
Consulting Engineer; Late Chief Engineer, Missouri Pacific Railway.

Earth slides are formed when masses become disconnected, and hang on a slope steeper than the plane of friction due to the character of the material and its resistance to movement. Water being one of the most influential elements in reducing this resistance to a minimum, it is well to provide for proper drainage before slides set in. The golden rule is to "keep the water away from the roadbed." It is well-known that the study of geology is frequently overlooked by the engineer in charge of location, and he often gives but little attention to the possibility of encountering slides caused by either the grade or location of line. Drainage is of so much importance that the line, circumstances permitting, should be located where drainage can be rendered most effective, allow sun and wind to act upon the roadbed, and pay close attention to the manner

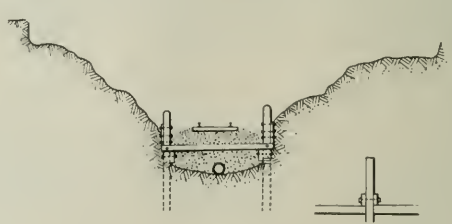


Fig. 1.

of building it. One very important factor is the selection of the material to be employed in making fills.

When investigating the cause of slides in an embankment of one of the main trunk lines in the Middle West, constructed about the year 1861, the writer found the slopes considerably deranged. The embankment, about a quarter of a mile long and over 22 ft. high in the middle, was continually settling, and notwithstanding the attention given it by the operating department, this settling continued. Trackmen, when called upon to remedy similar breaks, usually apply stone, which on account of the greater weight, increases rather than diminishes the evil and the cause of the slide is thereby not removed. The method employed not being effective, piles were driven and a bridge built along and over the fill for such distance as was deemed necessary. As the piles did not rest in original ground, they swayed to and fro, and the maintenance of the line and grade became a matter of great annoyance and cost. About the time this pile bridge required renewal, the writer was asked to make an investigation of the trouble and to recommend what should be done to improve the safety of the road, and, if possible, prevent the slides and dispense with the trestle.

In digging a trench on each side of the track along the foot

*Reprinted from *Bulletin No. 90* of the American Railway Engineering and Maintenance of Way Association.

of the slope and parallel with the track, considerable seepage from the bank poured forth, leading to the belief that the water was retained in the bank by some cause or other, and was seeking an outlet. The writer then had intercepting drains dug, extending towards the center of the embankment at intervals of 25 to 50 ft., according to the amount of water apparently confined in the embankment. The drains were then filled with stone—the heavier stone at bottom and the lighter stone on top—covered with cinders. This accomplished the draining of the embankment and rendered it stable so that the trestle could be removed, and no further difficulty at that point has been experienced.

In prosecuting this work, the drills were extended into the center of the embankment, and it was discovered that a number of partly decayed logs were embedded therein. Upon inquiry it was ascertained that the contractor at the time of construction had logs hauled in at night, and one of the farmers, residing in the

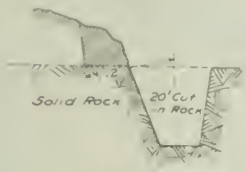


Fig. 2.

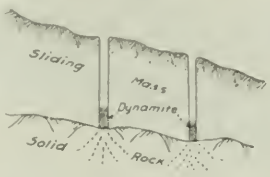


Fig. 4.

vicinity, informed the writer that he had been one of those employed to perform that work. The earth on the outside covered up this deception and the water was retained in the inside of the embankment, softening the material dropping into it. With the heavier material on top, the soft material was forced to the sides, and thus creating slips or slides. In the case above cited, the slide sounded a timely warning, so that the proper remedy could be employed. However, crevices formed *under* the roadbed are much more dangerous, the latter producing slides without giving notice. This is often the case where the roadbed rests on the debris hanging on the side of bluffs, especially when bordering on a treacherous stream like the Missouri river.

Water coming down ravines can be readily conducted across the roadbed by bridges or culverts, but in such cases care must be exercised as to outlet. However, water falling on the sidehill between ravines or creeks and dropping from bluffs into the debris where it cannot readily be intercepted, will enter the roadbed, penetrate the underlying loose strata and find its way over and along the harder strata, thus creating earth slides. This water keeps the

Fig. 3.

ground under the track in a constant moist state, which is a menace to the safe operation of the road. Oftentimes it will form crevices, and when once formed they will increase and may reach to the very surface, only to be discovered after a wreck has occurred, and are then usually termed "a washout." Again, the water may soften the material until it becomes slushy and will produce a slip at the foot of the lower slope. Borings made by the writer over a distance of seven miles on parts of tracks so situated developed the fact that the roadbed developing such defects was invariably located directly against a bluff or perhaps resting on material underlaid by slanting rock, which rock forming a part of the bluff had been eroded by the action of the water, either river or surface, or both combined.

If the water is collected at frequent intervals and conducted across the track either by means of small boxes (if pipe cannot be utilized) or conveyed in open ditches plastered with cement or rammed with small stone so as to prevent the water from penetrating into the roadway, the danger referred to can be greatly diminished.

Drainage is the most essential factor in creating and maintaining a good roadbed; and is most often neglected. After we have discovered the effect and are forced to face the consequences of a badly drained roadway we form [illegible] only to abandon them again as soon as dry weather sets in, for the temptation to make a good financial showing is often too strong to be overcome; we will not carry an umbrella while the sun shines nor prepare for war while living in peace, but rather charge it up to accidents or to an "act of nature," unavoidable and unforeseen, place it under that heading and foot the bill, taking credit for (false) economy.

Slides occurring in cuts during construction and later are oftentimes caused by surface ditches, giving the water an opportunity to enter the ground instead of draining it off to the sides. After the water once enters the slopes, it is very difficult to drain them, and every rain will have a tendency to increase the difficulty.

At the west entrance to the Oregon Short Line Tunnel in Idaho, where the sides broke off vertically and heaved the track at times to such an extent as to seriously interrupt and delay the handling of material from the tunnel, the writer applied with good results ordinary horizontal bracing, in the manner shown in Fig. 1.

The most remarkable slide coming to the notice of the writer was encountered on the White River Railway, at the entrance of tunnel No. 3, at Omaha Drive, Ark., its magnitude precluding all thought of removing it. The disturbance first manifested itself at what might be termed a sidehill cut. In removing the footing, the mass of clay seemed to lose its hold on the rock whereon it rested, and began breaking off, first showing cracks insignificant in size and confined to the right-of-way, but later reaching far out into the adjoining hills, bringing down trees and forming breaks in the surface 15 to 25 ft. in height and perpendicular in appearance.

The Omaha tunnel (2,650 ft. long) penetrates a sag in the Ozark mountains, consisting of a so-called boulder formation, lime and rock being found intermixed with clay, a hydrated silica of alumina of brownish color, due to the presence of iron oxide. This clay is very plastic, especially so in the approaches where action of water is not constant as in a tunnel. Here the layer of clay was from 5 to 100 ft. thick, underlaid with a strata of solid rock of smooth surface and slanting at an angle of from 5 to 10 deg. toward the creek along which the line had been located.

The grade of the roadbed entered the rock 20 ft. below the surface; in other words, the approach to the tunnel has a 20-ft. rock cut with clay in the overlying slope.

As soon as cracks appeared on the surface, extra precautions were taken against surface water. The surface ditches were given steeper grades, and, where possible, bottoms were cemented so that the water could drain off more quickly, thus reducing chances of penetration to a minimum.

In spite of this the ground continued to break and started to move toward the open cut, at first dropping into it little at a time, gradually increasing until after a rather heavy rain the entire cut filled up with this stuff, involving an expenditure of $1 per cubic yard for its removal. Though the moving masses had adopted a slope of nearly two horizontal to one vertical, the breaks continued, stretching for more than 150 ft. into the hill above the grade of the roadbed, and over 500 ft. distant from same.

To prevent similar occurrences during the time of operation, involving delay and expense, the writer had the rock cut arched over for a distance of 600 ft. from the portal of the tunnel. But an arch, framed of timber in order to furnish clearance, without protection against "side pressure," cannot be relied upon as a permanent safeguard against slides. To make it serve, however, should the mass continue to move, the clay bank was removed for a distance of 12 ft. from the edge of the rock cut (see Fig. 2) and holes were drilled into the rock 8 to 10 ft. deep, and from 10 to 15 ft. apart in a row along the foot of the new bank, shots being placed therein and fired simultaneously by means of an electric battery. The rock was broken but not scattered, a trenchlike crack appearing at the surface. The writer then had logs cut from the timber, of which an abundance was found in the immediate neighborhood, and these logs were placed alongside each other with the butt end in the rock crevices, the other end overhanging the timber arch, and resting upon its top (see Fig. 3).

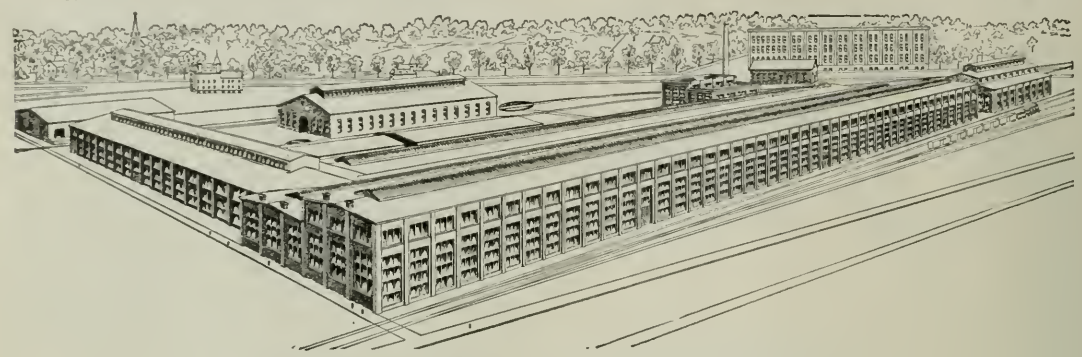
The material under the logs and between the logs and the arch was tamped, thus forming a solid flooring over which the material could slide, as was contemplated, distributing it over the entire arch and serving as weight instead of a thrust. The further object of cracking the rock was to permit the water coming through the clay to escape, thus leaving the footing dry and in better position to act as a support. The plan worked very satisfactorily. The first rain produced another slide, the logs carrying the material over the arch. With the drain in the rock at a distance of 12 ft. from the edge of the cut and over 30 ft. from the foot of the new slope, a good foothold had been created which served the purpose, for no further movement of the overhanging masses (estimated by the engineer in charge as reaching the enormous quantity of 130,000 cubic yards) has taken place since that time (1904), now three years ago. The few sticks of timber in the arch which had moved were displaced not more than an inch.

This experience has led the writer to the conclusion that many similar slides formed by masses moving along a rock surface might

be checked by boring holes down to rock, lowering dynamite and breaking the surface by means of blasts (see Fig. 4), and actual practice has confirmed this view.

The New Shops of the Grand Trunk at Stratford, Ontario.

The Grand Trunk is now building new shops at Stratford, Ont. The general layout is shown below in the accompanying engravings. In the foreground are the large machine and erecting shop, 616 ft. x 75 ft., and at right angles to it the boiler shop, 154 ft. x 135 ft. The construction of these is now being



General Layout of Proposed Grand Trunk Shops at Stratford, Ontario.

rushed as fast as possible, and it is hoped to have 15 bents under cover and in operation this winter. These two shops occupy nearly three acres of floor space. The small building at the extreme left is already built and is used for repairing locomotive tenders.

The buildings in the background are proposed additions to be made later. They are, from left to right: Storehouse, 60 ft. x 200 ft.; blacksmith shop, 100 ft. x 300 ft.; power-house, 90 ft. x 90 ft., and foundry, 110 ft. x 140 ft. These buildings will be put up in order of their importance after the machine and erecting shop is well under way. The old machine shop, which is being torn down in sections as fast as the new shop is erected, occupied part of the space covered by the new building.

The ground required some filling and levelling before beginning construction work. In the foundations of the new boiler shop and part of the new machine and erecting shop, concrete piles were used. These piles were driven from 15 ft. to 18 ft. below the average surface of the ground to provide sufficient bearing power for the foundations. The walls of the buildings are reinforced concrete with the outside surface finished.

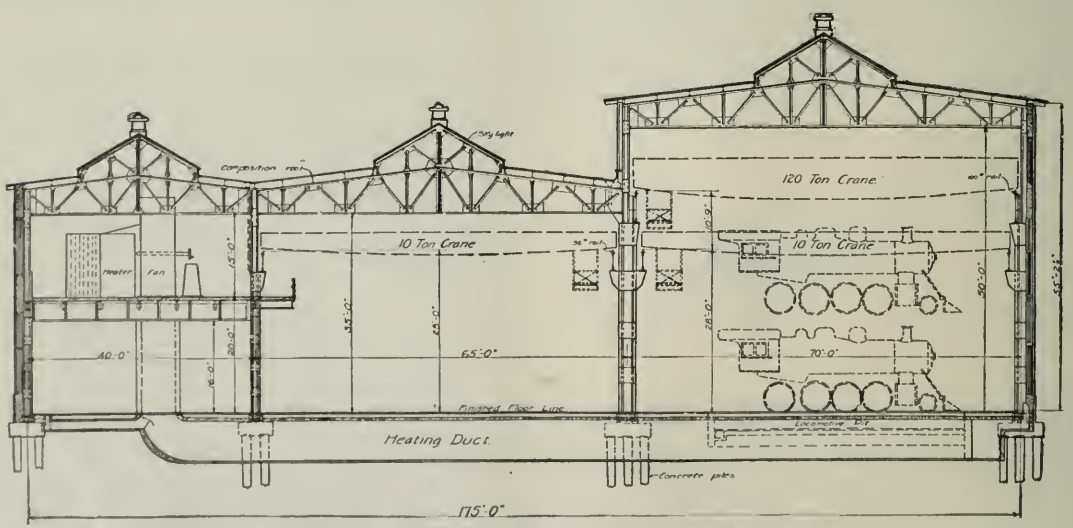
Individual electric drive is to be used for most of the large machine tools. Belt drive will be used for the smaller machine tools. Compressed air is to be used for driving the riveting machines, chisels, the turntable motor and for forge fires, blowing out engines and painting. The new shop will be able to repair 28 engines standing over pits at the same time. The layout is so arranged that the capacity can be increased if more space is needed in the future.

The heavy lifting work is to be done by a 120-ton electric traveling crane that spans the engine pit bay. In the cross section through the center of the machine and erecting shop, shown herewith, this is shown lifting a heavy consolidation locomotive and carrying it to a repair pit. In the same bay with the large crane and directly below it is a 10-ton electric crane for handling lighter work.

The heating ducts shown under the floor line distribute warm air from a heater on the balcony floor. Exhaust steam from the power house and from the fan engine is to be used in the heater coils.

Individual lockers for the shopmen are to be provided. In some cases these lockers will be portable so that men working on odd jobs around the shop can move the lockers near their work. There are to be drinking fountains with a continuous flow of artesian water throughout the shop. At night the shops will be lighted by mercury vapor lamps.

The engineering and construction work is under the supervision of the Arnold Company, Engineers and Constructors, Chicago, Ill. The work is under the authority of E. H. Fitzhugh, Third Vice-President of the Grand Trunk, and designs are subject to his approval as well as that of W. D. Robb, Superintendent of Motive Power. R. Patterson, Master Mechanic of the Grand Trunk at Stratford, has had a large share in helping along the construction work and has been notably successful in carrying on the necessary repair work on locomotive boilers while the new work was under way. He is also at present designing the machine tool layout. The concrete piles were furnished by Davidson & Von Auelberg of Montreal. The foundation concrete work is under the charge of George Mitchell, Master of the Bridges and Buildings Department of the Grand Trunk. The structural steel is being fabricated and erected by the Canadian Bridge Company, of Walkerville, Ont. B. V. Hole, of London, Ont., has the general building contract.



Section of Machine and Erecting Shop Now Building; Stratford Shops of the Grand Trunk.

GENERAL NEWS SECTION

NOTES.

The Alabama Railroad Commission has invited the railroad commissioners of the states around Alabama to meet with it and discuss the question of state regulation of railroad rates.

The Railroad Commission of Alabama has announced the suspension of all cases at issue before the board affecting railroad rates until the powers of the commission shall be more clearly defined.

The Western Union Telegraph Co. has declared a dividend of 1½ per cent., payable in stock. At the present market price, the dividend amounts to about 55 per cent. of what it would if paid in cash.

Officers of the Southern Pacific in Texas say that the double daily passenger train service between New Orleans and San Francisco, discontinued last spring, will not be resumed this month, as had been announced a few weeks ago.

Street cars with very large rear platforms, arranged to permit the collection of fares as passengers enter, are to be tried not only in New York City but also in Buffalo and in Chicago. In Chicago a number of these cars are already in use.

It is said that the order of the Chicago, Milwaukee & St. Paul, given about three weeks ago, dismissing some of its traveling freight and passenger agents in eastern states, has already been rescinded, and the men restored to their former places.

The State Railroad Commission of Missouri has announced that from January 15 it will require the express companies of the state to reduce their rates according to a tariff to be issued by the commission this week. This tariff makes reductions of 20 per cent. and more in the present rates.

The Atlantic Coast Line has agreed to put in effect the reduced passenger and freight rates ordered in Alabama on the same conditions under which the Southern and other companies adopted the reduced rates some weeks ago. Press despatches from Montgomery say that all of the injunction suits will be considered by the courts on January 6.

The indictment against Ira A. McCormick for manslaughter, in connection with the derailment at Williams Bridge last February, has been dismissed, the district attorney having asked the court to take this action in order to enable him to compel Mr. McCormick to testify against General Manager A. H. Smith, who was indicted at the same time. The trial of Mr. Smith began in New York City on Tuesday.

The Mexico-St. Louis Special has been put in service for its third season. This train, running over the Iron Mountain, the Texas & Pacific, the International & Great Northern and the National of Mexico, leaves St. Louis Tuesdays and Fridays and the city of Mexico Tuesdays and Saturdays. The time through is about 65 hours. The trains are vestibuled throughout and they have dining cars all throughout the journey.

On the Pennsylvania Railroad in October there were 2,215 surprise tests, with a record of 98.8 per cent. satisfactory. Fifteen divisions showed a percentage of 100 per cent. On the New York division out of 77 tests there was but one failure; out of 952 tests on the Schuylkill division there was but one; out of 102 on the Buffalo division there was none. All the failures were slight, the engines passing the signals only a few feet.

The St. Louis & San Francisco is to use the electric train staff on two block sections near Birmingham, Ala. Interlocking signals are being put up on this road near Kansas City, at the junction with the M., K. & T.; at four places in Louisiana, and at Beaumont, Tex. All home signals will be worked by rods and all distant signals by electric motors. Semaphore train-order signals have been put up at a large number of stations on the company's lines.

The Erie Railroad has given notice of withdrawal from the Central Passenger Association. The action of the Erie in reducing its second-class rate eastward from Chicago to New York to $10 which went into effect a few weeks ago, and which was followed by the Grand Trunk and the Wabash, is said to have been due to the belief on the part of the Erie that other lines were paying commissions; and commission payments are forbidden by a rule of the Central Passenger Association.

The New York State (Albany) Public Service Commission, in a decision affecting the Rockland Railroad Company, defines the understanding of the Commission relative to the law requiring a street railway to begin construction within a certain time after receiving from the state a certificate of convenience and necessity. Attempts to obtain local franchises are not a beginning of construction, neither are surveys and engineering work done before the granting of the certificate. It is said that this decision affects at the present time only street surface railroads, as all steam railroads have had their time extended by a special act of the legislature.

At a competitive exhibition of "First aid to the injured" recently given at Lekerman, Pa., "first aid" teams of the Hillside Coal & Iron Co. and the Pennsylvania Coal Co. exhibited their methods of removing a man from a live electric wire, of carrying a man over a fence on a stretcher; of a similar performance where there was a rock obstruction, and of carrying an injured man on a stretcher over a car of coal with limited head room. Each performance took from 1½ to three or four minutes. *Mines and Minerals* for December prints half tone photographs taken during these exhibitions.

The Supreme Court of the United States, deciding a case which arose in South Carolina, holds that the Atlantic Coast Line need not comply with the wishes of the citizens of Latta, S. C., who desired to have the privilege of flagging two fast mail trains which pass through that town daily. The State Railroad Commission ordered that stops be made whenever the flag was displayed, and the state Supreme Court sustained the commission. The railroad, however, took the case to the Supreme Court of the United States and now, in a decision by Justice Peckham, the railroad is sustained. The court holds that the proposed action would be an interference with interstate commerce.

According to a press despatch from St. Louis the Rock Island and the St. Louis & San Francisco roads on January 1 will abolish separate freight soliciting offices at Oklahoma City, Wichita, San Antonio, St. Louis, Chicago, Kansas City, Memphis, Dallas, Fort Worth and Houston and passenger offices at Kansas City, Wichita and Oklahoma City. One force at each of these cities will attend to the business of both roads. At St. Louis the 'Frisco employs four freight solicitors and the Rock Island three. The force will be reduced, probably to four, and it will represent both roads. It is said that few men will be dismissed, but several agents will be reduced in rank and salary and may be assigned to other work.

Following an informal hearing before the Interstate Commerce Commission at Washington last week, the New York, New Haven & Hartford has been requested by the Commission to postpone for at least 90 days the taking effect of its notice canceling through rates on freight from the Central of New Jersey and other western connections by way of New York City. The Commission makes this request with the purpose of enabling the communities, shippers and carriers affected by the proposed action to determine what course they will pursue with respect to the future movement of the traffic involved. President Mellen, of the New Haven road, has signified his willingness to make any reasonable postponement asked for by the Commission. The Central of New Jersey wanted the Commission to ask a Federal Court to enjoin the proposed action of the New Haven, but the Commission declined to do so.

The Chicago Association of Commerce, in its weekly paper, gives the records of some of the "through package cars" which are being run from Chicago to a number of southern cities, in response to a request of the association. As noted recently in the *Railroad Gazette*, the association has issued a pamphlet informing shippers how they may take advantage of these special freight cars in shipping to any town in the southeastern states. The records published in the last issue show that cars to Montgomery, Ala., ran through uniformly in three days; to Mobile, three days; to New Orleans, five, seven and eight days, and to Macon and Augusta, four days. The time is given, however, in even days, so that the reader is left in the dark as to whether the goods could be delivered on the third day. To Jacksonville, Fla., the time appears to average better than to New Orleans, six cars to Jacksonville arriving in an average of 5⅝ days.

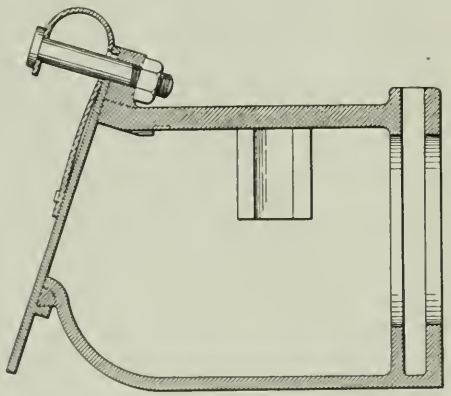
The New York Central announces that beginning next Sunday the Twentieth Century Limited Express trains will be scheduled at 19½ hours between New York and Chicago instead of 18 hours, the present schedule. Westbound the train will leave New York at 3 p.m., Eastern time, and arrive in Chicago at 9:30 a.m., Central time. Eastbound the train will leave Chicago at 1 p.m. and arrive in New York at 9.30 a.m. This is called a "winter schedule," which implies that in the spring the 18-hour schedule will be resumed. An officer of the Pennsylvania has said that that road will make no change in the schedules of its 18-hour trains. The Central's announcement says that the change is made in compliance with the wishes of patrons, "as expressed by petition and individual request." It is said that the object of the company is to avoid the disturbances of the schedules which are likely to be caused by snow storms in central New York. To run from New York to Chicago, 964 miles, in 19½ hours, the train will have to make an average of 49.4 miles an hour.

In about 558,000 records of freight car deliveries received on

junction card reports by railroads in the eastern states, in the month of May, the receiving roads found 14,000 errors and 21,000 omissions, or 6.3 per cent. of defects. The largest numbers of errors were made in the cases of roads the initials of which are the same as those of other roads, or so nearly like them as to lead to errors. These figures are published in the *Railway Equipment Register* as a part of the report of the last meeting of the Eastern Association of Car Service Officers. In the cards received by the Boston & Albany the percentage of errors to the total number of items was 19.6; on the Intercolonial, 25.1 per cent.; Maine Central, 17 per cent.; Pennsylvania, 5.8 per cent. In the same report a number of roads include statements of junction reports received by them not properly addressed and reforwarded by them to the proper addressee. The Pennsylvania, for example, received 3,468 reports which did not belong to it, and received 4,301 of its own which had first been sent to some other road and reforwarded. This last statement seems to refer to the number of cards, while the one first mentioned refers to the number of items on cards.

An Improved Journal Box.

An improved design of journal box on which patent has recently been granted is shown herewith. Its special feature is a lid of the swinging or pivoted type, arranged to remain in any position when open, and when closed to be secured in position to prevent accidental opening. The lid is flat, with an upper lug or extension for pivoting to a corresponding lug on the journal box, and a lower lug or handle by which to swing it. The lower under side of the lid has a curved rib which engages a circular ledge or lip under the lower edge of



The Sorensen Journal Box.

the box opening concentric with the lid pivot pin. The adjacent surfaces are slightly dove-tailed, and on the ledge of the box, at the center, is a small lug which engages a corresponding recess in the rib of the lid for locking in the closed position.

The lid is held to position, and caused to lock, by the usual U-shaped spring on the pivot pin. The pivot hole of the lid and the corresponding hole in the spring are elongated vertically to permit the lid to latch when closed and to be held secure. A modification of the design provides for pivoting the lid at the side of the box. The inventor is Frederick C. Sorensen, who is in the Chicago shops of the Armour Car Lines. Some of the lids have been applied to cars of this company.

Private Siding Ordered.

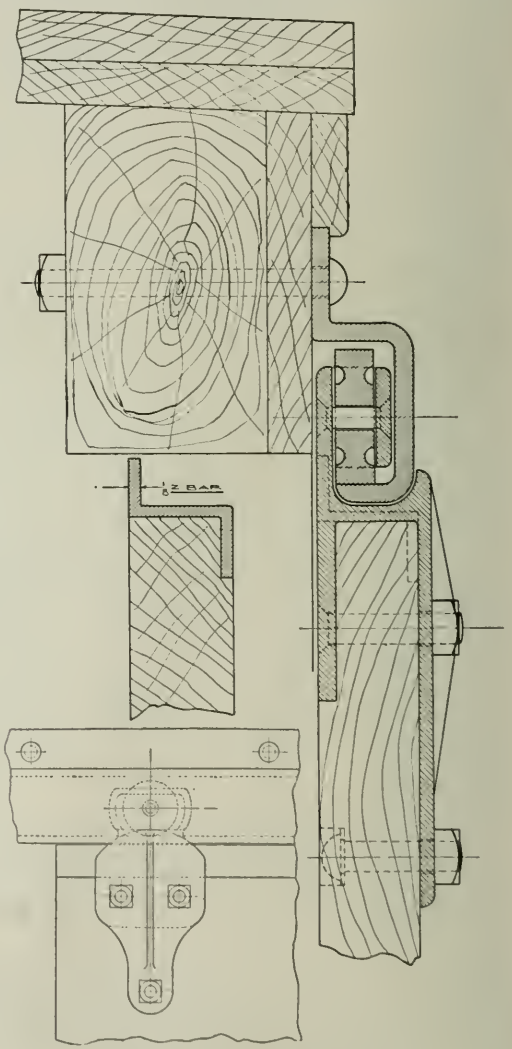
In an opinion by Commissioner Harlan the Commission has announced its decision in the case of the Weleetka Light & Water Company against the Fort Smith & Western. Complainant asked for an order requiring the carrier to put in a track connecting its main line at Weeletka, Indian Territory, with the plant of complainant. The Commission held that while retaining the right to control the location of tracks to private industries in accordance with the evidence, it is disposed, in recognition of the risk that arises from such interruptions of main line rails, to leave the location of such tracks largely to the discretion and wisdom of the carrier.

The practice among the carriers of repaying advances made by shippers for the construction of tracks by making an allowance of a definite amount on each carload of freight is disapproved by the Commission on the ground that it presents too much the appearance of a purchase of property by the carrier with transportation, this being contrary to law. While settlements may be based on the number of carload shipments, repayments must not be made out of the rate but of available funds at the end of definite intervals. A copy of such contracts ought to be filed with the Commission and when the transaction is complete a verified statement of it, by a responsible officer of the company, ought also to be filed with the Commission.

The Commission holds that a connection should be afforded to the complainant, but in recognition of the risk as before mentioned decided to enter no order; expecting the parties to confer and arrive at an agreement. Unless such an agreement be reached within 30 days the Commission will enter an order as to the location of the track.

A New Car Door Hanger.

A simple and efficient freight car door hanger and track is illustrated in the accompanying drawing. The track and cap are made in a single channel-shaped piece. As the drawing shows, the roller and track are thoroughly protected from the weather, so that it and the track are always dry, while a Z bar along the top of the door



Bundy Car Door Track and Hanger.

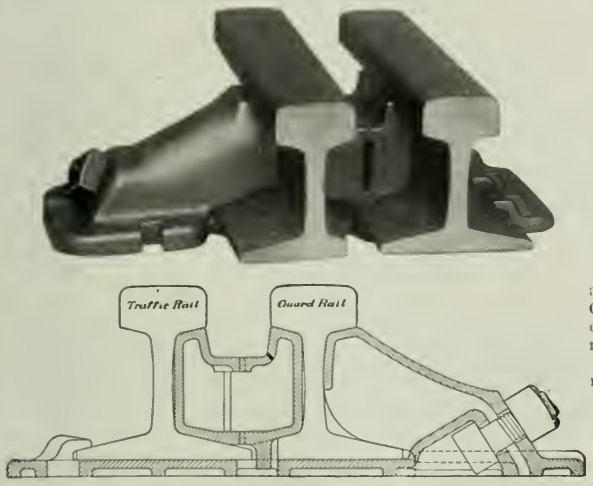
protects it, and keeps water from getting into the car. A slight lifting of the door brings the roller in contact with the upper shoulder or flange of the track, and, with suitable end stops, it is impossible for the door to drop off. The construction is simple and the device should give good service. It was invented by C. L. Bundy, Superintendent of the coach department of the Hicks Locomotive and Car Works, Chicago Heights, Ill. F. L. Holmes, until recently Advertising Manager of the company, has charge of the sale of the hanger at 277 Dearborn street, Chicago.

New Line Into San Francisco.

On Sunday last the Bay Shore cut-off of the Southern Pacific's Coast Line route was opened, doubling the available industrial area of San Francisco. This line pierces the five ranges of hills which have heretofore formed a barrier against the expansion of the city southward. In traversing this 10 miles of road passengers will pass through two miles of tunnels with the ground surface 300 ft. above their heads; over two miles of trestle with the water 50 ft. below them, through a cut 95 ft. deep, and under six streets supported by iron overhead bridge. Nineteen towns from San Francisco to San Jose will have the advantage of a gain of 17 minutes in time to and from San Francisco. At Visitacion Point the Southern Pacific is making a hump yard to distribute the freight handled here.

Combination Guard-Rail Clamp and Tie Plate.

The combination guard-rail clamp and tie plate illustrated herewith was invented by George L. Mansfield, mechanical engineer in the engineering department of the Chicago & Alton. As its name indicates, it combines a tie plate with the rail clamp and brace, the whole being secured and bound together by a single bolt, $\frac{7}{8}$ in. in diameter, which has a lock nut. The filler block, which is made



Mansfield Guard-Rail Clamp and Tie Plate.

either solid or adjustable, is locked to the tie plate by a downwardly-projecting lug to prevent slipping. One design has braces on each side so as to brace both rails. The simplicity of the device and the few parts are its chief advantages. All parts are on top of the tie, and adjustments are easily and quickly made. It is already in use on the Southern and the Indianapolis Union and has been made standard on the Alton. It is made and sold by the Otto Gas Engine Works, Chicago.

The Constitution of Oklahoma.

The railroads of Oklahoma are not so helpless under the two-cent fare prescribed by the constitution of the new state as has been supposed.

The framers of the constitution of Oklahoma appear to have been without a copy of the Constitution of the United States for their guidance.

This antiquated document has not yet been repealed. Article XIV. of the amendments, ratified July 28, 1868, provides that "no state shall make or enforce any law which shall abridge the privilege or immunities of citizens of the United States; nor shall any state deprive any person of life, liberty or property without due process of law."

Article VI. of the Constitution adopted in 1787 follows: "This Constitution, and the law of the United States which shall be made in pursuance thereof, and all treaties made, or which shall be made under the authority of the United States, shall be the supreme law of the land; and the judges in every state shall be bound thereby, anything in the constitution or laws of any state to the contrary notwithstanding."

A state enactment prohibiting railroads from charging more than two cents a mile passenger fare, if it results in confiscation of property, is no less void, as contrary to the Constitution of the United States, when embodied in the constitution of a state, than it is when contained in a law enacted by a state legislature.—*Wall Street Journal.*

Locomotive and Rail Exports for October.

The *Wall Street Journal* gives the following information about exports of locomotives and of rails for October, and for the first ten months of the calendar year.

The value of locomotives exported in October showed a gain of more than $500,000 from October of 1906, which reflects most favorably the condition of the foreign markets. A satisfactory increase is also shown by the figures for the 10 months.

The exports of locomotives for October follow:

Exported to:	1907.	1906.
Europe	$10,307	.....
British North America	72,501	$89,084
Central American States and British Honduras	47,550	33,314
Mexico	6,150	143,625
Cuba	249,794	85,376
Argentina	.....	12,610
Brazil	54,345	8,159
Other South America	468,286	3,484
Chinese Empire	6,310	.....
Japan	.....	481,807
British Australia	20,440	8,716
Philippine Islands	50,010	.....
Other Asia and Oceania	401,850	.....
Total	$1,387,403	$886,775

The exports for 10 months follow:

	1907.	1906.
Europe	$592,332	$353,850
British North America	1,386,215	527,550
Central American States and British Honduras	824,542	1,095,445
Mexico	358,808	641,335
Cuba	509,132	425,010
Other West Indies and Bermuda	12,688	14,000
Argentina	206,491	208,355
Brazil	616,056	559,529
Other South America	1,022,903	497,090
Chinese Empire	12,235	22,207
Japan	406,918	635,456
British Australasia	104,603	40,158
Philippine Islands	60,148	.....
Other Asia and Oceania	1,420,319	106,500
All other Africa	.....	30,119
British Africa	.....	.....
Total	$7,623,390	$5,062,605

Several striking facts appear in the statement for October, chief among which is the absence of record of a single purchase by Japan. On the other hand, a large gain is recorded by Cuba, and the railroad development of South America continues to make increasing demands on American manufacturers.

The exports of steel rails for railroads for October and the 10 months, in tons, were as follows:

Exported to:	1907.	1906.
Europe	.....	$320
British North America	$225,884	10,544
Central American States and British Honduras	7,537	2,570
Mexico	38,811	48,254
West Indies and Bermuda	149,039	30,093
South America	82,423	226,790
Japan	268,877	211,810
Other Asia and Oceania	358,529	101,060
All other Africa	2,322	.....
Total	$1,133,362	$632,041

The exports for 10 months were as follows:

	1907.	1906.
Europe	$1,778	$11,681
British North America	915,860	1,832,399
Central American States and British Honduras	585,166	491,938
Mexico	919,371	607,166
West Indies and Bermuda	780,446	765,876
South America	2,148,203	2,441,876
Japan	850,901	606,880
Other Asia and Oceania	2,550,682	514,957
British Africa	7,741	514,957
All other Africa	23,004	7,628
Total	$8,783,153	$7,290,259

The increase was about $500,000 for the month and $1,500,000 for the 10 months. Much of the gain in October was made in shipments to British North America. The West Indian demand also increased heavily.

Lower Price for English Coal.

The Western Railway of France is reported to have ordered for 1908 delivery 65,000 tons of best Monmouthshire semi-bituminous coal, delivered in cars at $5 a ton. This is about 50 cents below the previous price, f. o. b., at Newport harbor.

The Alabama Extra Session.

The second extraordinary session of Extra Session Comer has adjourned sine die. It better had died before a-bornin'. It leaves but a legacy of vengeful deeds, which we believe will fortunately be wiped out and their baleful influences neutralized by the courts of the country. But the stigma of the attempt at vengeance, of vicious resentment against the greatest benefactor Alabama ever had, remains.

The legislation of this extraordinary session in its attempt to

injure and thus punish the Louisville & Nashville Railroad Company, for the sole reason of its appealing to the proper courts of the land to have properly and constitutionally construed prior acts of this Legislature, is a disgrace to American civilization. The attempt to enact legislation grossly discriminating against the Louisville & Nashville and favoring other lines, is something unique in American history.

"Vengeance is mine, saith the Lord." Oh, no! Vengeance is mine, said Extra Session Comer and his following.

We hope that we shall see a thing or two, and we believe that we will. We want to see the L. & N. enjoin every act of this so-called legislation affecting its interests, and the United States Supreme Court determine the question if a vindictive official and his retinue can use the powers of his office to oppress citizens or to discriminate to the prejudice of some, while favoring others. What else has this extraordinary session to its credit or discredit? It passed a state prohibition act. In a matter of so vital importance to individuals and communities, should not the establishment of prohibition be a matter of local option, and not be forced upon an unwilling people or community? This Legislature thus previously legislated. Then, what possible credit to this extraordinary session in this stultification of its membership and discrediting its previous commendable action by now vitiating it? If there is glory in Comer legislation, it will take a shrewd historian to discover it, and if there is profit in it, the people will essay in vain to realize it. The Comer administration will be the synonym of hard times in Alabama.—*Bessemer, Ala., Weekly.*

Collapse of a Bridge Over the Susquehanna River.

A bridge which was being built by the state of Pennsylvania across the north branch of the Susquehanna river in the eastern part of Columbia county, near Berwick, Pa., was carried away by a flood on the afternoon of December 10 and eleven workmen were drowned. The bridge was being built by the York Bridge Company, of York, Pa. The substructure was finished, the superstructure in position and the flooring half completed. The flood, which followed the melting of snow by warm rains, undermined the piers. On the same day there was much damage by floods at Scranton, Carbondale, Hazleton and all along the Delaware, Schuylkill and Susquehanna rivers. Many small bridges were destroyed.

M. C. B. Association Circular of Inquiry.

The standing committee on tests of M. C. B. couplers has sent out the following list of questions to members, the answers of which will be used in designing a standard uncoupling rod rigging:

1. Cause of broken links and clevises?
2. Causes of bent uncoupling rods?
3. Are these failures more prominent on wooden or steel cars?
4. Are these failures more prominent on cars equipped with spring or friction draft gear, and if so, on what specific type?
5. Style and description of uncoupling arrangement with which most trouble is experienced and wherein the specific troubles lie?
6. To what extent is freight equipment used in passenger service and what provision is made to prevent the buffer of the passenger car interfering with the uncoupling arrangement on the freight car?
7. Which form of release is preferred by the trainmen?
8. What form of universal release rigging is recommended to suit all types of M. C. B. standard couplers? (Send sketch.)
9. Send prints or sketches of your present standards of uncoupling arrangements.
10. Give any additional information not covered by the above questions which would further the solution of this subject.

Replies should be forwarded to R. N. Durborow, Chairman Committee on Tests of M. C. B. Couplers, Altoona, Pa., not later than January 15, 1908.

The committee on tests of M. C. B. couplers has been instructed:

(a) To recommend a standard maximum capacity for friction draft gear.

(b) To recommend the most desirable resistance during each ¼-in. compression.

(c) To report on the value of friction draft gear in reducing damage to cars and their contents.

To further the committee's investigation the following questions are asked:

1. Considering conditions which your road may have, such as locomotives with large tractive force, double-heading of trains, mixed trains of steel and wooden cars, low capacity cars, etc., what is considered a desirable maximum capacity for friction draft gear?
2. How should this be distributed through each ¼-in. travel of the gear to meet the special condition outlined with least damage to equipment?
3. In general has the value of friction or other improved draft gear had the effect of reducing damage to cars and contents in the yards and on the road?
4. To what extent has increased capacity of motive power, introduction of gravity yards, etc., influenced the use of improved draft gears on your road?
5. Have you noted any wide variation in cost of maintenance in the draft gear itself, comparing the older spring gears with the recent large capacity spring and friction gears?
6. From your experience with friction gears on tenders and cars, is it found that the gears require any considerable attention to keep them to their original capacity, and are many gears found jammed and failing to release in freight cars?
7. On cars and engine tenders built since January 1, 1900, what form of draft gear is your road using? Give number built, kind and capacity of cars for each type of gear used.

Replies should be sent to R. N. Durborow, Chairman Committee on Tests of M. C. B. Couplers, Altoona, Pa., not later than January 15, 1908.

Automobile Speed Records.

At Weybridge, England, December 10, on the cup-shaped track where Mr. Edge made his 24-hour record, a 60-h.p. motor was run 50 miles in 39 minutes, 10 seconds. This record, made by Clifford-Earp, is said to beat all previous records. On the same day a distance of 150 miles was made in one hour, 58 minutes, 34 seconds. He also broke the world's one-hour record, running in that time 76 miles, 1,359 feet.

Two-Cent Fares on the Burlington.

Two-cent fares have been in effect in a few states since last spring, but in most of them since the summer. Up to the middle of November we found that in spite of the reduction in the revenue per passenger per mile, the passenger revenue was no worse than before. The passenger departments of the railroads never did pay, and they do not pay any better since the rates have been reduced, but we have succeeded in equalizing the reductions pretty well. The average passenger rates in Illinois, Iowa and Missouri, on the Burlington, in July, 1906, was 2.11 cents, whereas last July it was 1.96 cents.—*P. S. Eustis.*

A Half-Million-Dollar Cargo.

The 605-ft. steel steamer "Legrand S. DeGraff" of the Western Transit Company arrived in Buffalo December 8 from Superior with 421,000 bushels of wheat, the largest cargo ever loaded on the Great Lakes. The rate paid for transportation was 2½ cents a bushel (or about one-half mill per ton per mile), making the gross income of the vessel for the trip $10,525.

INTERSTATE COMMERCE COMMISSION RULINGS.

Cotton Seed Rates Reduced.

In the case of Pressley against the Gulf, Colorado & Santa Fe et al. it is held that the rates of 27 and 29 cents on cotton seed from Marietta and Berwyn, Okla., to Cleburne, Tex., are unreasonable, and should not exceed 16 and 18 cents; that the rate of 45 cents on cotton seed from Marietta, Okla., to Plano, Tex., is unreasonable and should not exceed 25 cents.

Transfer Charges Must be Published.

In the case of Schwager & Nettleton against the Great Northern the Commission held that the act to regulate commerce does not bar a carrier from providing for costs of transfer in making delivery to a certain carrier, but if it so provides, it must publish and file a tariff showing the conditions, etc. A carrier cannot excuse the collection of an unpublished and unknown drayage and transfer charge by proof that it had a rule which forbade the sending of its own cars beyond its own line during a period of car shortage.

Chicago Live Stock Delivery Charge Again Condemned.

In an opinion rendered by Commissioner Prouty, the Commission has again taken up the case of the Cattle Raisers' Association of Texas and the Chicago Live Stock Exchange against the Chicago, Burlington & Quincy and others; and it again declares the two dollar rate unjust. The so-called terminal charge of $2 per car is imposed by the carriers for the delivery of carloads of live stock at the Union Stock Yards in Chicago. This matter has been before the Commission for ten years, and four reports have been prepared.

The Commission decides, as before, that the terminal charge of $2 per car is unduly discriminatory, and that the charge should not exceed $1 per car. The Commission holds that the decree of a court dismissing a bill brought to enforce an order of the Commis-

sion made previous to the amendment of June 29, 1906, is not a bar to the right of the Commission to examine with respect to a date subsequent to June 29 the same rate involved in that proceeding. Commissioners Clark and Harlan dissent.

TRADE CATALOGUES.

Industrial and Mine Cars and Railways.—Catalogue No. 5 of the Kilgore Peteler Co., Minneapolis, Minn., describes industrial and mine cars, narrow-gage industrial railways and kindred products of the company. The types include all kinds for handling material on railways in mines, shops, sawmills, power plants, plantations, docks, warehouses, quarries and jobbing and manufacturing plants. Industrial railways are furnished complete with all equipment. A line of contractors' buckets is also shown. The book is 6 in. x 9 in. and has 56 pages.

The Obermayer Bulletin.—The current number of this bulletin on foundry information is a special edition devoted exclusively to the core room. The leading articles are "The Core Room—A Few Suggestions," which is a plea for better conditions and better appliances in the core room, and "The Selection of Core Sands," a discussion of the various grades and their uses. "Ovens for Drying Cores" and a description of a new Chicago foundry are other shorter articles. There are also miscellaneous items of interest.

Cyclopedia of Engineering.—The American School of Correspondence, Chicago, has issued a circular describing its holiday offer of the six volumes of the Cyclopedia of Engineering for $14.80. The same offer was made last year. As this is a large reduction from the list price and is payable in monthly installments, it is an unusual opportunity. The offer expires December 25.

Graphite.—The December number of *Graphite*, published in the interests of the Joseph Dixon Crucible Co., Jersey City, N. J., devotes a large part of its space to photographs and descriptions of that company's exhibit at the Atlantic City convention of the American Street & Interurban Railway Association.

MANUFACTURING AND BUSINESS.

All the Boston offices of Stone & Webster are now at 147 Milk street.

The Northern Engineering Works, Detroit, Mich., have installed in the power station of the St. Clair Tunnel Co., Port Huron, Mich., one 15-ton, 43-ft. span traveling crane.

The Pullman Company's large paint shop at Buffalo, N. Y., was burned on the evening of December 2. Twenty-one Pullman cars were destroyed and the total loss was about $400,000.

Alfred Lovell, who resigned in October as Superintendent of Motive Power of the Atchison, Topeka & Santa Fe, is now a Consulting Engineer, with office at 819 Harrison Building, Philadelphia, Pa. He is making a specialty of inspecting railroad materials, equipment, supplies, tools and machinery.

The Wyckoff Pipe & Creosoting Co., of Stamford, Conn., has an order from the New York Central & Hudson River for creosoted paving blocks 3 in. x 8 in. x 3½ in., to be used in the roundhouse at Gardenville, N. Y. The Pennsylvania has ordered, from the same company, creosoted piles, timbers and bridge ties for use in construction work at Larabee, Pa.

The American Car & Foundry Co., Berwick, Pa., has declared its regular quarterly dividend of 1 per cent. on the common stock. The net earnings for the quarter ended October 31, 1907, out of which this dividend is paid, were $2,775,643, the largest in the history of the company, being $186,000 more than the largest previous quarterly net earnings and nearly $1,000,000 greater than the figure for the corresponding period of 1906.

OBITUARY NOTICES.

Charles E. Lambert, formerly General Passenger Agent of the West Shore, died last Tuesday at his home at Thiells, N. Y.

Charles S. Horton, President of the Susquehanna & New York, died on December 4 at Williamsport, Pa. Mr. Morton was 44 years old.

Captain Spencer Eakin, General Agent at Nashville, Tenn., of the Nashville, Chattanooga & St. Louis, died of paralysis recently at his home near Shelbyville, Tenn.

Robert Angst, the late Chief Engineer of the Duluth & Iron Range, was widely known as an authority on ore dock construction. He was born in Switzerland in 1847 and educated in his native country. He came to the United States when he was 22 years old, and began railroad work on the Jackson, Lansing & Saginaw, now part of the Michigan Central. After serving on several other roads he was made Chief Engineer of the Duluth & Iron Range in 1887.

Charles P. Matthews, Professor of Electrical Engineering at Purdue, died at Phoenix, Ariz., on Saturday, November 23, 1907. He was born on September 18, 1867, and was graduated at the St. Johnsbury (Vt.) Academy and at Stanford University, where he graduated in 1892 as Mechanical Engineer. In 1901 he was given the degree of Ph. D. by Cornell. For four years after his graduation he was instructor in physics and applied electricity at Cornell, then he went to Purdue as Assistant Professor of Electrical Engineering. In 1905 he succeeded Professor Goldsborough as head of the School of Electrical Engineering. During his connection with the school it has grown to be the largest in the country in point of numbers. His most valuable contribution to science was an investigation of photometric standards for arc lamps, a work done in connection with the National Electric Light Association.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad conventions and engineering societies, etc., see advertising page 24.)

Central Railway Club.

At the annual meeting of this club to be held at Buffalo, N. Y., January 10, 1908, Dexter C. Buell, of Chicago, formerly with the Missouri Pacific Railroad, will read a paper on some joint problems of the mechanical and operating departments. At the annual banquet to be held in the evening of the same day the programme will include addresses by W. G. Besler, B. D. Caldwell and George A. Post.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Durham & Charlotte.—John L. Tull, Chief Engineer, has been elected Vice-President and Traffic Manager, with office at Hemp, N. C.

El Paso & Southwestern.—W. C. Crane has been appointed Comptroller, with office at New York, and A. L. Hawley, General Auditor, with office at El Paso, Tex.

Massachusetts Railroad Commission.—Walter P. Hall, of Fitchburg, has been nominated by Gov. Guild as a Member and Chairman of the Commission, succeeding James F. Jackson, resigned.

Raritan River.—W. G. Bumsted, Vice-President and Treasurer, has been elected President, succeeding F. H. Earle, deceased. E. W. Harrison succeeds Mr. Bumsted as Vice-President, and C. H. Sisson, Secretary and Purchasing Agent, succeeds him as Treasurer.

Santa Fe, Raton & Eastern.—C. W. Barden has been elected President, with office at New York. E. F. Morrow is General Manager, with office at Raton, N. Mex.

Tehuantepec National.—E. M. Dillon has been appointed Auditor and Car Accountant, succeeding H. O'Connor, resigned.

Western Pacific.—W. J. Bartnett, Vice-President and General Attorney, has resigned. Warren Olney, Jr., a Director, has been appointed General Counsel. W. A. Magee succeeds Mr. Bartnett as a Director. Mariel Cerf, Assistant General Attorney, has resigned.

Wisconsin & Northern.—H. F. Whitcomb has been elected President.

Wisconsin Central.—The general offices have been moved from Milwaukee to the new International Harvester building, Michigan avenue, Chicago.

Operating Officers.

Ann Arbor.—See Detroit, Toledo & Ironton.

Canadian Pacific.—James Oborne, General Superintendent of the Ontario division, has been appointed General Superintendent of the Eastern division, with headquarters at Montreal, succeeding H. P. Timmerman, resigned. F. T. Brady, General Superintendent of the Lake Superior division, succeeds Mr. Oborne, with headquarters at Toronto, Ont. C. Murphy, Superintendent at London, Ont., has been appointed General Superintendent of the Lake Superior division, with headquarters at North Bay, Ont., succeeding Mr. Brady. The eastern boundaries of the Western division are now Portal, Sask., Arcola and Broadview, but the division does not include the Arcola and Broadview terminals.

Chicago, Rock Island & Pacific.—F. J. Easley, formerly Superintendent of the Atchison, Topeka & Santa Fe at Newton, Kan., is now Superintendent of the Chicago, Rock Island & Pacific at Little Rock, Ark.

Denver & Rio Grande.—C. L. Eaton has been appointed Assistant Superintendent at Alamosa, Colo.

Des Moines, Iowa Falls & Northern.—F. C. MacMillan has been appointed General Manager, with office at Des Moines, Iowa.

Detroit, Toledo & Ironton.—J. H. Jones has been appointed Trainmaster of this road and of the Ann Arbor, with office at Napoleon, Ohio, succeeding D. J. Hardy.

El Paso & Southwestern.—The office of L. U. Morris, Superintendent of the Eastern division, has been moved from El Paso, Tex., to Tucumcari, N. Mex.

Lake Shore & Michigan Southern.—D. C. Moon, Assistant General Manager, has been appointed General Manager, succeeding E. A. Handy, deceased.

Mexican Central.—J. J. Lewis, formerly Superintendent of Terminals of the Tehuantepec National at Coatzacoalcos, Mex., has been appointed Superintendent of Terminals of the Mexican Central at Tampico, succeeding R. N. Elliott, transferred. W. T. East, Assistant Superintendent of Terminals at Tampico, has been appointed Trainmaster of the San Luis division.

Mexican Southern.—J. H. Chisholm has been appointed General Manager, succeeding W. L. Morkill, who resigned last fall. Vernon Cooper has been appointed Assistant to the General Manager.

Missouri Pacific.—J. T. Nedwideck, Trainmaster at De Soto, Mo., has been appointed Trainmaster at Poplar Bluff, succeeding R. E. Ryan. Mr. Ryan has been appointed Trainmaster at Little Rock, Ark., succeeding H. J. Scheuing, who takes Mr. Nedwideck's place at De Soto.

New Jersey, Indiana & Illinois.—W. A. Ballard has been appointed Acting Superintendent, with office at South Bend, Ind.

Northern Pacific.—Newman Kline, Assistant Superintendent of the Middle division, has resigned.

Oregon Short Line.—C. L. Elared, Trainmaster of the Montreal division, has been appointed Trainmaster of the Third, Fourth, Fifth and Boise districts, and of the Menidoka & Southwestern and the Malheur Valley railroads, with headquarters at Pocatello, Idaho, succeeding C. M. Hunt, resigned. The position of Trainmaster of the Montreal division is now vacant and probably will be for some time.

Pittsburgh & Lake Erie.—F. M. Brown, chief train despatcher, has been appointed to the re-established office of Superintendent of Telegraph.

Portland & Seattle.—F. S. Forest, formerly General Superintendent of the western district of the Great Northern, has been appointed Superintendent of the Portland & Seattle.

Southern.—A. Ramseur, Superintendent at Asheville, N. C., and W. G. Fortune, Trainmaster at that place, have resigned, effective December 15.

Traffic Officers.

Chicago & North-Western.—C. F. Miley has been appointed General Agent at Des Moines, Iowa, succeeding L. F. Berry, transferred.

Chicago, Burlington & Quincy.—W. H. Hill, division freight agent of the lines in Iowa, has been appointed Assistant General Freight Agent at Kansas City, Mo.

E. F. Bisbee, General Agent of the freight department at Kansas City, Mo., has resigned.

Chicago, Lake Shore & Eastern.—See Elgin, Joliet & Eastern.

Chicago, Peoria & St. Louis.—P. S. Easterbrook has been appointed General Eastern Agent at New York.

Des Moines, Iowa Falls & Northern.—W. R. Sterritt has been appointed General Freight and Passenger Agent, with office at Des Moines, Iowa.

Elgin, Joliet & Eastern.—F. L. Koontz has been appointed Freight Claim Agent of the Elgin, Joliet & Eastern and the Chicago, Lake Shore & Eastern, with headquarters at Chicago, Ill.

Great Northern.—M. J. Costello, General Industrial Agent, has been appointed Assistant Traffic Manager at Seattle, Wash., succeeding H. M. Adams. See Portland & Seattle.

Louisville & Nashville.—D. B. Briggs has been appointed Master Mechanic at Mobile, Ala., succeeding C. B. Gifford, resigned.

Louisiana Railway & Navigation.—W. E. Scott has been appointed Trainmaster of the Western division, with office at Shreveport, La. A. L. Day has been appointed Trainmaster of the Eastern division, with office at Baton Rouge, La.

Mexican Northern.—J. Deemer has been appointed Passenger Traffic Manager.

Minneapolis, St. Paul & Sault Ste. Marie.—E. L. Cardie, Contracting Freight Agent at St. Paul, Minn., has been appointed General Agent at Portland, Ore.

Missouri Pacific.—John Mitchell Johnson, who has been elected Vice-President of the Missouri Pacific and the St. Louis, Iron Mountain & Southern in charge of traffic, was born in Cincinnati, Ohio, on May 31, 1845. He was educated in the public schools of that city and entered railroad service when he was 25 years old as station agent at Franklin, Ind., on the Indianapolis, Cincinnati & Lafayette, now part of the Cleveland, Cincinnati, Chicago & St. Louis. Three years later, in 1873, he became General Freight and Passenger Agent of the Cincinnati & Martinsville, which was taken over by the Indianapolis, Cincinnati & Lafayette in the fall of 1875. Mr. Johnson then became traveling auditor for the larger company. In 1879 he was appointed Assistant General Freight Agent of the road. On February 20, 1884, he went to the Chicago, Rock Island & Pacific as First Assistant General Freight Agent. Four years later he was appointed General Freight Agent and eight years after that Freight Traffic Manager. In 1899 he was elected Third Vice-President of the Rock Island. He resigned on April 1, 1903, to become Assistant to the Vice-President of the Gould lines. On December 1, 1907, he was elected Vice-President of the Missouri Pacific system in general charge of the traffic department.

J. M. Johnson.

A. T. Stewart, Assistant General Freight Agent at St. Louis, Mo., has been appointed also Assistant to Vice-President Johnson.

W. C. Staley has been appointed General Agent at Chicago, succeeding J. N. Githens, promoted.

Portland & Seattle.—H. M. Adams, Assistant Traffic Manager of the Great Northern at Seattle, Wash., has been appointed General Freight and Passenger Agent of the Portland & Seattle.

St. Joseph & Grand Island.—W. H. Brying has been appointed Assistant General Freight Agent.

Seaboard Air Line.—R. E. Boswell has been appointed Assistant Superintendent of Transportation.

South & Western.—J. A. Muse has been appointed Acting General Freight and Passenger Agent, with office at Johnson City, Pa., succeeding to the duties of Lewis Walker.

Engineering and Rolling Stock Officers.

Boston & Albany.—L. H. Muzzy has been appointed Assistant Engineer. E. McCabe has been appointed Supervisor of Bridges and Buildings, with headquarters at Springfield, Mass.

Buffalo, Rochester & Pittsburgh.—W. H. Williams has been appointed Master Mechanic of the Buffalo & Rochester division, with headquarters at East Salamanca, N. Y., succeeding H. C. Woodbridge, transferred.

Butte County Railroad.—F. G. Somner has been appointed Chief Engineer, with office at Chico, Cal.

Chicago, Indiana & Southern.—R. B. Seymour has been appointed Chief Engineer, with office at Gibson, Ind., succeeding B. C. Rich.

Chicago Junction.—O. F. Cole, Principal Assistant Engineer, has been appointed Chief Engineer, succeeding J. B. Cox.

Chicago, Rock Island & Pacific.—The office of S. W. Mullinix, Superintendent of Motive Power of the Southwestern district, has been moved from Topeka, Kan., to Horton.

Des Moines, Iowa Falls & Northern.—F. R. Doxey has been appointed Master Mechanic, with office at Iowa Falls, Iowa.

Missouri Pacific.—F. W. Schultz has been appointed Master Mechanic at McGehee, Ark., succeeding I. T. Johns, resigned.

LOCOMOTIVE BUILDING.

The Northwestern Pacific has ordered two mogul locomotives, cylinders 18 in. x 24 in., from the American Locomotive Co.

The Western of Havana has ordered three consolidation locomotives, cylinders 20 in. x 24 in., from the American Locomotive Co.

L. J. Smith, Kansas City, Mo., has ordered five ten-wheel loco-

motives, cylinders 19 in. x 28 in. from the American Locomotive Co. for immediate delivery.

The Peoria & Pekin Union advises that it has ordered three switching locomotives from the American Locomotive Co., as reported in the *Railroad Gazette* of December 6.

The Great Northern has ordered four 100-ton three-phase electric locomotives from the General Electric Company. Each will have four 325 h.p. motors and the driving wheels will be 60 in. in diameter.

CAR BUILDING.

The Boston & Maine has ordered 20 passenger cars from the Laconia Car Co., and is considering 20 more.

The Missouri, Kansas & Texas is understood to have replaced with the American Car & Foundry Co. the order for 500 freight cars canceled in November.

RAILROAD STRUCTURES.

EAST CAMBRIDGE, MASS.—The Boston & Maine shops have been almost entirely destroyed by fire; loss $150,000.

MEMPHIS, TENN.—The Memphis Railroad Terminal Company has submitted plans for a proposed passenger station, also a round-house and power house to be built here.

MEXICO CITY, MEX.—On the extension of the Mexican Central from Mexico City to Tampico, a high bridge will be built over the Panuco river.

Plans will be taken up for consideration about February 1 next for building a large union passenger station here.

MINNEAPOLIS, MINN.—The Minneapolis, St. Paul & Sault Ste. Marie has begun work on additions to its shops here, to cost about $200,000.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

ATCHISON, TOPEKA & SANTA FE.—An officer writes that surveys are being made for the proposed line from Texico, N. Mex., south to Brownwood, Tex., about 250 miles.

ATLANTA & ST. ANDREWS BAY.—This road has been extended from Cottondale, Fla., south to Youngstown, 31 miles. (Aug. 23, p. 215.)

ATLANTA, BIRMINGHAM & ATLANTIC.—It is reported that this company is planning to buy the South Georgia-West Coast Railway, operating a line from Adel, Ga., about 15 miles from the A., B. & A., south to Perry, Fla., 77 miles, as soon as its two lines now being built to Birmingham and Atlanta are finished. At Perry connection is to be made with the Tampa Northern, projected north to Perry, which will give the A., B. & A. a direct route to Tampa and the west coast of Florida.

BEAUMONT & SARATOGA TRANSPORTATION.—An officer writes that this road proposes to extend its line from the present end of track to Saratoga, Tex., 13 miles. (March 15, p. 380.)

BIG FORK & INTERNATIONAL.—See Great Northern.

BROOKVILLE & MAHONING.—See Pittsburg, Shawmut & Northern.

CANADIAN PACIFIC.—Bids, it is said, are being asked for by this company for clearing 65 miles of the right-of-way across Vancouver island, B. C., from Wellington to New Alberni, on the Esquimalt & Nanaimo. (Nov. 22, p. 636.)

CENTRAL RAILWAY OF OREGON.—An officer writes that this company's road will extend from Union, Ore., southeast to Cornucopia, 60 miles; and from Con to La Grande, 20 miles. Last year the company built 6.75 miles between Union Junction and Con, to which point the line has been extended this year.

CHARLOTTE HARBOR & NORTHERN.—The Liverpool branch, a new line, has been opened for business from Fort Ogden, Fla., to Liverpool, four miles.

CHERRY TREE & DIXONVILLE.—See Pennsylvania.

CHICAGO & NORTH-WESTERN.—On the Ashland division, a new branch has been opened for business from Marathon City, Wis., to Rib Forks, 5.8 miles. (Sept. 27, p. 370.)

CHICAGO, BURLINGTON & QUINCY.—On the Sheridan division, the line from Toluca, Wyo., to Worland has been extended from Worland south to Kirby, 20.45 miles. (Nov. 1, p. 540.)

CHICAGO, INDIANA & SOUTHERN.—The Indiana Harbor Belt has projected an extension from Dune Park, Ind., east to Michigan City, about 20 miles.

DULUTH, RAINY LAKE & WINNIPEG.—See Great Northern.

EAST CAROLINA.—This road has been extended from Farmville N. C., south to Hookerton 13 miles.

ESQUIMALT & NANAIMO.—See Canadian Pacific.

GALVESTON, HARRISBURG & SAN ANTONIO.—See Southern Pacific.

GRAND TRUNK PACIFIC.—At a recent meeting of this company President Charles M. Hays submitted a report showing that the total length of all the lines to be built by this company will be 7,900 miles. A length of 988 miles is under contract in charge of the Grand Trunk Pacific Company from Winnipeg, Man., west to Edmonton, including the 210 miles Lake Superior branch. The National Transcontinental Commissioners, building the eastern section of the line from Winnipeg east to Moncton, N. B., 1,800 miles have let contracts for 852 miles. Of this a length of 112 miles is in New Brunswick, 417 in Quebec, 213 in Ontario, and 81 in Manitoba, making a total of 1,840 miles under contract. The Transcontinental Commission report shows up to March 31, 1907, a total expenditure of $6,117,494, of which $5,537,807 is for the fiscal year ending March last. This has been spent on the east end of the line as follows: Cost of headquarters staff, $166,191; location of lines, $355,896; transportation service, $225,920, and actual construction, $4,569,859.

Bids, it is said, are wanted December 23 for building a 120-mile section of this line from Edmonton, Alb., west, and contracts are soon to be let for an additional 125 miles, which will bring the line to the summit of the Yellow Head Pass in the Rocky mountains.

GREAT NORTHERN.—Regular train service was recently started from Duluth, Minn., via Bemidji over the Minnesota & International, and the new extension built under the name of the Big Fork & International north to International Falls. A more direct service will shortly be started from Duluth over the Duluth, Rainy Lake & Winnipeg to the Canadian boundary.

ILLINOIS CENTRAL.—On the Yazoo & Mississippi Valley a new line called the Charleston district has been opened for business on the Memphis division from Philipp, Miss., north to Charleston, 26 miles.

KANSAS CITY, MEXICO & ORIENT.—The International Construction Company, of Kansas City, Mo., is building this road from Dill City, Okla., to the North Fork of the Red river, 12 miles; from Elmer, Okla., to Benjamin, Tex., 73 miles, and from Stillwater, Tex., to a point 11 miles north of San Angelo, 67 miles.

Train service has been started between Blair, Okla., and the Red river, 22 miles.

KEWEENAW CENTRAL.—Contract has been let by this company to J. J. Byer & Co., of Houghton, Mich., for extending this road from Mohawk, Mich., southwest to Calumet, six miles.

LONG ISLAND.—This company has work under way on subsidiary lines as follows: Huntington extension (electric) from Huntington, N. Y., south to Amityville, 15.75 miles; Jamaica & South Shore branch from Springfield Junction south to Cedarhurst, 3½ miles. Surveys are also being made on the Babylon extension (electric) from Babylon west to Amityville, 5.82 miles.

MINNESOTA & INTERNATIONAL.—See Great Northern.

MISSOURI, OKLAHOMA & GULF.—This company has extended its main line from Dustin, Okla., south to Rose, 25.6 miles. The line from Dewar, Okla., north to McDonald has been extended north 4.5 miles to Walters. A new branch has been opened for business from Muskogee, Okla., east to Loweree, five miles.

NEW YORK CENTRAL & HUDSON RIVER.—Announcement is made that after January 1 local Yonkers trains will be run by electric power through between the Grand Central station, New York, and Yonkers, 15 miles. At present the electric operation extends only from the Grand Central Station to High bridge, about six miles.

NIAGARA, ST. CATHARINES & TORONTO.—Contract let to D. R. Campbell for extending this road from Fonthill, Ont., south to Welland, 4½ miles.

NORTHWESTERN PACIFIC.—This company has given a contract to the Warren Improvement Company, of San Francisco, for extending its line from Willits, Cal., north three miles. Surveys made from Willits north to Shively, 108 miles, on the main line, and from Elodgate, south 63 miles, on the branch from Albion to a junction with the main line at Healdsburg.

PENNSYLVANIA.—On the Cambria & Clearfield division of this road the Cherry Tree & Dixonville has been extended from Dixonville, Pa., to Idamar, .8 miles.

PITTSBURGH, SHAWMUT & NORTHERN.—On the Brookville & Mahoning train service has been started from Brookville, which is 20 miles southwest from Brockwayville, on the main line, to Ramseytown, five miles. (Nov. 8, p. 573.)

St. Louis Southwestern.—This company has under construction a terminal extension, about three miles long at Argenta, Ark., and the St. Louis Southwestern of Texas is planning to make a similar terminal extension about 2.75 miles long into Fort Worth, Tex.

Announcement is made that an extension of the Lufkin division of the St. Louis Southwestern of Texas has been opened for freight and passenger service from Warsaw, Tex., east to Broaddus, 5.6 miles.

St. Louis Southwestern of Texas.—See St. Louis Southwestern.

Santa Fe, Liberal & Englewood.—Construction work, suspended during the recent financial depression, has been resumed on the Oklahoma portion of this line projected from Raton, N. Mex., east to Liberal, Kan. It is stated that the line will be finished as rapidly as possible. (March 15, p. 391.)

South Dakota Central.—This road has been extended from Nunda, S. Dak., north to Arlington, 16 miles. (Aug. 9, p. 164.)

Southern.—The Jasper-French Lick extension from Jasper, Ind., northeast to French Lick, 24.7 miles, has been opened for traffic. (Oct. 18, p. 473.)

Southern Pacific.—Surveys have been made for extending the Texas & New Orleans from Gallatin, Tex., south to Rusk, eight miles.

The Galveston, Harrisburg & San Antonio is building an extension from Alleyton, Tex., west to Columbus, about two miles.

South Georgia-West Coast Railway.—See Atlanta, Birmingham & Atlantic.

Temiskaming & Northern Ontario.—Contracts have been given by this company to A. N. McDonald, of New Liskeard; McRae, Chandler & McNeil, of Dufiwood City; McQuigge & Hunt, of Cobalt, and to the Canadian Construction Company, of Englehart, for work as follows: On the main line from mile post 208 at the Wataybeag river to mile post 251 near the transcontinental junction, 43 miles; on spurs from Englehart to Charlton, eight miles, and from Cobalt to Kerr Lake, four miles. Surveys are also being made from Sudbury to Cobalt, about 110 miles.

Tennessee Railway.—This company has 10 miles of grading finished on its line in Tennessee and will begin track laying shortly. Walton Wilson, Rodes & Co., of Knoxville, Tenn., have contracts for some work on the line. Surveys are being made for spurs from Straight Fork, Tenn., to coal mines, about four miles.

Texas & New Orleans.—See Southern Pacific.

Texas & Pacific.—The Weatherford, Mineral Wells & North-Western has been extended from Mineral Wells, Tex., north to Oran, 16 miles (March 15, p. 393.)

Toledo, St. Louis & Western.—Plans, it is said, are being made by this company to secure an air line from the intersection of this road and the Cincinnati, Hamilton & Dayton at Metcalf, Ill., west to Springfield, about 100 miles. Such a line would provide a short and direct line from Toledo west via the Iles-Murrayville line, which the Alton recently finished to Kansas City. From Metcalf to Springfield the Cincinnati, Hamilton & Dayton has a line. It is understood that the plans call for buying and reconstructing this line or building a new one next spring.

Vancouver, Victoria & Eastern.—Contract is reported let to Fred. Lane, of Spokane, Wash., and Grand Forks, B. C., for grading five miles on the extension of this road from Keremeos, B. C.

Wisconsin Central.—An officer writes that on this road there remains about 28 miles to be built to finish the line from Ladysmith, Wis., north to Superior. In Duluth the company is building about 4½ miles of road. Contracts are let to H. F. Balch, of Rice Lake, Wis., and to the Lantry Construction Company, of Duluth, Minn., for the work.

Weatherford, Mineral Wells & North-Western.—See Texas & Pacific.

Wisconsin & Northern.—This company has opened for traffic an extension of its road from Neopit, Wis., north to Van Ostrand, 16 miles.

Yazoo & Mississippi Valley.—See Illinois Central.

RAILROAD CORPORATION NEWS.

Ashland & Western.—It is said that this road has been bought by Joseph Ramsey, Jr., and associates, who are building the Lorain & Ashland. The latter runs from Lorain, Ohio, south to Wellington, 22 miles, and it is planned to build from that point south to Londonville, on the Pennsylvania Lines West, 39 miles, and eventually to the Ohio river. The Ashland & Western runs from Ashland, Ohio, to Custeloga, 23 miles, and most of it could be used in the Lorain & Ashland proposed extension south from Wellington.

Baltimore & Ohio.—It is said that this company will take over the operation of the Little Kanawha Railroad, which runs from Parkersburg, W. Va., on the Baltimore & Ohio, to Creston, 50 miles. The road is owned by New York Central interests.

Chicago Great Western.—The regular semi-annual dividend on the outstanding $28,127,089 4 per cent. cumulative debenture stock, usually paid January 15, has been withdrawn. It is not announced whether it is passed or simply postponed.

Chicago Union Traction.—Over two-thirds of the outstanding bonds and over 60 per cent. of the receivers' certificates and other indebtedness of the Chicago street railways have been deposited in accordance with the modified plan for reorganization.

Illinois Central.—In a circular sent to stockholders last week, Stuyvesant Fish declares that he never assumed for himself authority as sole trustee for the stockholders, but always laid everything before the directors. He emphasizes the point that the present issue is simply whether or not Harriman policies shall be put in force in the Illinois Central management.

Little Kanawha.—See Baltimore & Ohio.

Lorain & Ashland.—See Ashland & Western.

Midland Valley.—The Cherokee Construction Company's $5,000,000 three-year 6 per cent. notes, which matured December 1, 1907, are to be exchanged for 70 per cent., par value, in Midland Valley first mortgage 5 per cent. bonds at 80 and 30 per cent. in new five-year 6 per cent. notes of the construction company. The old notes were secured by all the $5,980,000 outstanding stock and the $5,854,000 first mortgage 5 per cent. bonds of the Midland Valley, as well as by mortgage on 18,500 acres of coal lands. The new notes of the construction company are secured by mortgage on the coal property and on its railroad construction equipment. Over four-fifths of the holders of the old notes have agreed to the exchange on the above terms, and a syndicate, of which Drexel & Co., Philadelphia, Pa., is Treasurer, has agreed to buy from the construction company all the bonds of the railroad and also all the new notes.

New Orleans, Fort Jackson & Grand Isle.—Control of this company has been acquired by a syndicate headed by Charles D. Haines, of New York. The road runs from New Orleans, down the west bank of the Mississippi to Buras, 60 miles, and a branch is to be built to Grand Isle. It has $236,500 capital stock outstanding.

New York Central Lines.—Gross earnings for the month of October, 1907, are shown in the following table. For the first time in over a year, at least, every road's earnings increased as compared with the figures for the corresponding period of the previous year. The Lake Erie & Western and the Peoria & Eastern have most frequently, heretofore, reported decreases in the monthly statements.

	1907.	Change	
New York Central & Hudson River	$9,059,633	Inc.	$467,174
Lake Shore & Michigan Southern	4,315,713	"	554,049
Lake Erie & Western	512,330	"	61,557
Chicago, Indiana & Southern	261,576	"	49,975
New York, Chicago & St. Louis	990,378	"	141,769
Michigan Central	2,837,509	"	416,184
Cleve., Cin., Chic. & St. Louis	2,587,212	"	317,116
Peoria & Eastern	336,691	"	54,050
Cincinnati Northern	104,524	"	19,794
Pittsburgh & Lake Erie	1,508,390	"	236,222
Rutland	307,188	"	40,392
Total	$22,821,144	Inc.	$2,358,262

New York, New Haven & Hartford.—A cash offer has been made by an interest competitive to the New Haven to buy the New Haven's ownership in the Boston & Maine. This offer probably comes from the Canadian Pacific. If the sale should be carried out, the New Haven's interests will be safeguarded by contract. The New Haven owns about $10,900,000 of the $28,291,790 Boston & Maine common stock.

Pere Marquette.—At a meeting of the stockholders held on December 9 the reorganization plan was approved. The plan includes the cancellation of the lease of the road by the Cincinnati, Hamilton & Dayton, the issue of $5,000,000 debentures and the issue of new first and second preferred stock in exchange for present preferred stock. (Aug. 23, p. 216.)

Warren & Corsicana Pacific.—The district court at Austin, Tex., December 4, handed down a decision declaring forfeited the charter of this company for failure to provide cars and engines as ordered by the State Railroad Commission. The road made no defense. This road is 15 miles long, running from Warren, on the Texas & New Orleans, westward to Big Kimbrel, and has been in the hands of a receiver since 1905. On June 30, 1906, it had three locomotives, one passenger car, one box car, three platform cars and 40 log cars. The gage of the track is 3 ft.

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS.

THE BRITISH AND EASTERN CONTINENTS edition of the Railroad Gazette is published each Friday at Queen Anne's Chambers, Westminster, London. It contains selected reading pages from the Railroad Gazette, together with additional British and foreign matter, and is issued under the name Railway Gazette.

CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.

ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

OFFICERS.—In accordance with the law of the state of New York, the following announcement is made of the office of publication, at 83 Fulton St., New York, N. Y., and the names of the officers and editors of The Railroad Gazette:

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W. H. BOARDMAN, *Pres't. and Editor.*	RAY MORRIS, *Secretary*
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CONTENTS

VOL. XLIII., No. 25. FRIDAY, DECEMBER 20, 1907.

The rumors piled on rumors, combined with admissions of President Mellen that two large railroad interests have been seeking the New Haven's holdings in the Boston & Maine, allow a good deal to be read between the printed lines. One of the interests referred to undoubtedly is the Canadian Pacific, which touches the Boston & Maine at several points, the other the Delaware & Hudson, which reaches the Boston & Maine at Troy, N. Y. Transfer to either corporation would shift the Boston & Maine to a foreign control not directly hit by Massachusetts politics; and, by an exchange of the Boston & Maine stock for new shares of the Delaware & Hudson the New Haven could acquire an interest which, in alliance with others in the D. & H., might still control the Boston & Maine after receiving its price. A sale to the Canadian Pacific, on the other hand, would only have the protection of traffic contracts and, spite of such international analogies as the Grand Trunk and Great Northern, would be viewed with federal disfavor. Sale to any interest, however, is very unlikely and remote. Not lightly, even for a great price, will the New Haven split the monopoly of New England so carefully built up, so strategic in its relations with connecting railroad systems, and just beginning to demonstrate its powers. It will be surrendered only in extremity and under the spur of legislative acts akin to persecution. Meanwhile the outside offers supply the New Haven with the metaphorical "big stick" which, raised in menace of a sale, keeps the Massachusetts politician at bay.

We learn as we go to press that the case against A. H. Smith, Vice-President and General Manager of the New York Central & Hudson River, whose trial for manslaughter began December 10, in New York, has been dismissed by Judge Kellogg, following the summing up of the prosecution. Criminal negligence was alleged, and the district attorney endeavored to show that the Williamsbridge derailment was due to the inexperience of the motorman in charge of the double-headed electric train; that he exceeded safe speed on the curve, and that the general manager of the road was responsible for the selection of the motorman, and for not prescribing adequate rules for safety. But it should be noted that there have been several opinions on the moving cause of the derailment, each backed with sufficient plausibility so that a jury might be expected to disagree if asked to decide categorically whether or not the derailment was caused by the incompetence of the motorman. Even if definite proof of this point had been brought forward, it is difficult for a layman to see how a criminal charge would lie against a general manager who had selected a division superintendent with care and impartiality from a number of highly-trained candidates, and had detailed to that division superintendent the power to make minor appointments either directly or through an assistant superintendent—especially when all parties concerned were continuously engaged in the performance of their regular duties as they best understood them. The case appears quite different from that of a steamer captain who is absent from the bridge or pilot house at a time when special danger is to be anticipated, as in a narrow channel, or during a fog. In such a contingency the captain is able actually to use his training and ability in directing the helmsman, while the railroad manager can by no possibility actually supervise the routine work performed by all his subordinates. It seems entirely right, since this is the case, that a general manager should be held strictly to accountability in the selection of these subordinates, and if it can be shown that he has made the best selections in his power, and then supervised their work in accordance with the best standards of supervision, we cannot see that justice can require more. If a manager lacks capacity or initiative to do these things, it ought not to take long for his president to find it out and to supersede him. But criminal law is singularly ill adapted as an instrument with which to reform bad railroad practice; the suspension of a sea captain's license is a better kind of remedy, because it reflects on the captain's efficiency rather than on his integrity. The nearest approach to license suspension in the railroad business is the kind of supervision by the highest officers of the road that makes every lesser officer and employee realize that somebody knows what he is doing, whether good or ill, and that his career is going to be determined accordingly.

RAIL SPECIFICATIONS.

The Proceedings of the October meeting of the American Railway Association have just been issued, containing the report of the Committee on Standard Rail and Wheel Sections. This report consists of a majority report on rail sections and on specifications for Bessemer steel rails, and a minority report by Mr. Kruttschnitt on specifications for Bessemer steel rails. Several members of the committee also dissent from certain clauses in the majority report relating to rail section, discard and chemical composition.

The subject of rail sections was discussed in the *Railroad Gazette*, Nov. 22, and the proposed new sections were also presented. In order that the reader may be fully advised as to the latest developments in the important matter of rail specifications, we reprint

below in full the majority report on specifications, following the same with extracts from other specifications, covering all points of difference.

The committee prefaces its report by an introductory statement, from which we quote such parts only as have an important bearing on specifications:

Chemical Composition.—In the matter of chemistry specification for Bessemer rails, there was a strong desire on the part of the railroad members to specify a lower phosphorus content than has been generally accepted in recent years; but the testimony of the manufacturers was to the effect that the available supply of low-phosphorus ores would make it impossible to manufacture more than a small percentage of the total rail requirements of the country to a maximum phosphorus limit less than 0.10, and the manufacturers, on this account, unanimously object to the incorporation in the Bessemer rail specifications of anything suggesting the adoption of .085 phosphorus.

Discard.—In the matter of discard, there was a desire on the part of the railroad members to arrange for a greater discard, and a strong disposition to insist upon a uniform minimum percentage. The manufacturers, however, presented considerable evidence which tended to show that a fixed minimum percentage requirement would be not only unfair but unscientific, claiming that the extent of piping and segregation is influenced by the size of the ingot, the rate of pouring into the mold, and other details of mill practice.

The committee desires further time to investigate these matters, and in the meantime arrangements have been made for comparative tests in service of a large number of rails rolled under each of the suggested specifications, so that more definite knowledge may be had of the effect on the actual life of the rail.

SPECIFICATION FOR BESSEMER STEEL RAILS.

Process of Manufacture.

1. (*a*) The entire process of manufacture and testing shall be in accordance with the best current state of the art, and special care shall be taken to conform to the following instructions:

(*b*) Ingots shall be kept in a vertical position in the pit heating furnaces until ready to be rolled, or until the metal in the interior has time to solidify.

(*c*) Bled ingots shall not be used.

(*d*) There shall be sheared from the end of the bloom formed from the top of the ingot sufficient discard to ensure sound rails, and if after the first cut the steel is not solid, the shearing shall continue until it is.*

Chemical Composition for Rails Designed According to Cardinal Principles.

2. Rails of the various weights per yard specified below shall conform to the following limits in chemical composition:†

(*a*) For Bessemer Steel with Maximum Phos., 0.085.

	80 lbs.	90 lbs.	100 lbs.	110 lbs.	120 lbs.
Carbon	0.50 to 0.60	0.53 to 0.63	0.55 to 0.65	0.55 to 0.65	0.55 to 0.65
Manganese	0.80 to 1.10	0.84 to 1.14	0.86 to 1.16	0.88 to 1.18	0.90 to 1.20
Phosphorus, not to exceed	0.085	0.085	0.085	0.085	0.085
Silicon, not to exceed	0.20	0.20	0.20	0.20	0.20
Sulphur, not to exceed	0.075	0.075	0.075	0.075	0.075

(*b*) For Bessemer Steel with Maximum Phos., 0.10.

	80 lbs.	90 lbs.	100 lbs.	110 lbs.	120 lbs.
Carbon	0.43 to 0.53	0.45 to 0.55	0.46 to 0.56	0.48 to 0.58	0.50 to 0.60
Manganese	0.80 to 1.10	0.84 to 1.14	0.86 to 1.16	0.88 to 1.18	0.90 to 1.20
Phosphorus, not to exceed	0.10	0.10	0.10	0.10	0.10
Silicon, not to exceed	0.20	0.20	0.20	0.20	0.20
Sulphur not to exceed	0.075	0.075	0.075	0.075	0.075

3. The number of passes and speed of train shall be so regulated that on leaving the rolls at the final pass the temperature of the rail will not exceed that which requires a shrinkage allowance at the hot saws, for a 33-ft. rail of 100-lb. section, of 6¼ in. and 1/16 in. above or below for each 5-lb. increase or decrease of section. No artificial means of cooling the steel shall be used after the rails leave the rolls, nor shall they be held before sawing for the purpose of reducing their temperature.

4. *Drop Test.*—One drop test shall be made on a piece of rail rolled from the top of the ingot and be not less than 4 ft. and not more than 6 ft. long, selected from each blow of steel. The rails shall be placed head upward on the supports and the various sections shall be subjected to the following impact tests under a free falling weight:

80-lb. rail	20 ft.
90-lb. rail	21 ft.
100-lb. rail	22 ft.
110-lb. rail	24 ft.
120-lb. rail	25 ft.

If any rail breaks when subjected to the drop test, two additional tests may be made of other rails from the same blow of steel, also taken from the top of the ingots, and if either of these latter rails fail, all the rails of the blow which they represent will be rejected, but if both of these additional test pieces meet the requirements, all the rails of the blow which they represent will be accepted.

The drop-testing machine shall have a tup of 2,000 lb. weight, the striking face of which shall have a radius of not more than 5 in. and the test rail shall be placed head upward on solid supports 3 ft. apart. The anvil block shall weigh at least 20,000 lbs., and the supports shall be part of, or firmly secured to, the anvil. The report of the drop test shall state the atmospheric temperature at the time the test was made. The testing shall proceed concurrently with operation of the mill.

5. *Section.*—The section of rail shall conform, as accurately as possible, to the templet furnished by the railroad company, consistent with the paragraph relative to specified weight. A variation in height of 1/64 in. less, or 1/32 in. greater than the specified height, and 1/16 in. in width will be permitted. The section of rail shall conform to the finishing dimensions.

6. *Weight.*—The weight of the rails shall be maintained as nearly as possible, after complying with the preceding paragraph, to that specified in contract. A variation of ½ of 1 per cent. for an entire order will be allowed. Rails will be accepted and paid for according to actual weights.

7. *Length.*—The standard length of rails shall be 33 ft. Ten per cent. of the entire order will be accepted in shorter lengths, varying as follows: 30 ft., 28 ft., 26 ft., 24 ft., and all No. 1 rails less than 33 ft. long shall be painted green on the ends. A variation of ¼ in. in length from that specified will be allowed.

8. *Drilling.*—The holes for splice bars shall be drilled circular and in accordance with the specifications of the purchaser. The holes shall conform accurately to the drawing and dimensions furnished, in every respect, and must be free from burrs.

9. *Straightening.*—Care must be taken in hot straightening the rails, and it must result in their being left in such condition that they shall not vary throughout their entire length more than 4 in. from a straight line in any direction when delivered to the cold straightening presses. Those which vary beyond that amount or have short kinks shall be classed as second quality rails and be so stamped. The distance between supports of rails in the gagging press shall not be less than 42 in. Rails shall be straight in line and surface when finished—the straightening being done while cold—smooth on head, sawed square at ends, variations to be not more than 1/32 in., and, prior to shipment, shall have the burr occasioned by the saw cutting removed and the ends made clean. No. 1 rails shall be free from injurious defects and flaws of all kinds. Rails whilst on the cooling beds shall be protected from coming in contact with water or snow.

10. *No. 2 Rails.*—A No. 2 rail is a first quality rail with some imperfections, and shall be accepted up to 5 per cent. of the entire order. They shall not have flaws in their heads of more than ¼ in., or in the flange of more than ½ in. in depth, and, in the judgment of the inspector, these shall not be so numerous or of such a character as to render them unfit for recognized second quality rail uses. The ends of No. 2 rails shall be painted white and shall have two prick-punch marks on the side of the web near the heat number brand, and placed so as not to be covered by the splice bars. Rails from heats which failed under the drop test shall not be accepted as No. 2 rails.

11. *Branding.*—The name of the maker, the weight of the rail, and the month and year of manufacture shall be rolled in raised letters on the side of the web, and the number of the blow shall be plainly stamped on each rail where it will not subsequently be covered by the splice bars. Where practicable, a figure or letter shall be stamped on the web to indicate the portion of the ingot from which the rail was rolled.

12. *Inspection.*—(*a*). The inspector representing the purchaser shall have free entry to the works of the manufacturer at all times when the contract is being filled, and shall have all reasonable facilities afforded him by the manufacturer to satisfy him that the finished material is furnished in accordance with the terms of these specifications. All tests and inspection shall be made at the place of manufacture prior to shipment and so conducted as not to unnecessarily interfere with the operation of the mill. On request of the inspector, the manufacturer shall furnish drillings for check analysis.

(*b*) The manufacturer shall furnish the inspector daily with carbon determinations for each blow and a complete chemical analysis every 24 hours representing the average of the other elements contained in the steel for each day and night turn. These analyses shall be made on drillings taken from small test ingots. The drillings for analyses shall be taken from the ladle test at a distance of ¼ in. beneath the surface.

Note.—In view of the necessity of rails being ordered and furnished at once, before the new sections embodying the cardinal principles are designed, the sub-committee recommends that the specification herewith recommended be used, modified as to the following clauses:

2 (*b*).	Wt. per yd. 75-lb.—80-lb.	Wt. per yd. 85-lb.—90-lb.	Wt. per yd. 100-lb.
Carbon	0.40 to 0.50	0.43 to 0.53	0.45 to 0.55
Manganese	0.75 to 1.05	0.80 to 1.10	0.84 to 1.14
Phosphorus, not to exceed	0.10	0.10	0.10
Silicon, not to exceed	0.20	0.20	0.20
Sulphur, not to exceed	0.075	0.075	0.075

3. The amount of shrinkage shall be fixed at 6¾ in. at the hot saws for a 33-ft. 100-lb. rail, with a decrease of 1/16 in. for each 5-lb. decrease in weight of section.

4. Height of drop:

75-lb. per yd.	17 ft.
80-lb. "	18 ft.
85-lb. "	18 ft.
90-lb. "	19 ft.
100-lb. "	19 ft.

5. The maximum amount of camber to be 5 in.

In order that the above specifications, recommended by a majority of the committee, may be conveniently compared with those embodied in the minority report and the specifications of other leading engineering associations, we give below extracts covering all points of difference.

The various specifications will be referred to by the letters (a), (b), (c) and (d). The side numerals refer to parts designated by like numerals in the majority report. For convenience of comparison we have further italicised all matter at variance with the majority report.

(a) American Railway Association—Minority Report.

(b) American Society of Civil Engineers—Specifications recommended for Bessemer Steel Rails.

(c) American Railway Engineering and Maintenance of Way Association—Specifications for Bessemer Steel Rails.

(d) American Society for Testing Materials—Standard Specifications for Steel Rails.

*Mr. John D. Isaacs and Mr. Joseph T. Richards favor "a discard of 20 per cent., with a further stipulation that should this discard not provide a sound ingot, additional cropping must be done until such ingot results."

†Mr. John D. Isaacs does not favor specifying a phosphorus content exceeding 0.085

1 (a) *With the present temperature and speeds used in pouring ingots there shall be sheared from the top of ingots approximately 17 x 19 in. in cross section not less than twenty (20) per cent, and if from any cause the* steel does not then appear to be solid, the shearing shall continue until it does. *If by reduction of temperature and speed of pouring or the use of any improvements in the process of making ingots, the defect known as piping shall be prevented, the above shearing requirements may be modified by the purchaser.*

(b) and (c) There shall be sheared from the end of the blooms formed from the top of the ingots *not less than 25 per cent*, and if, from any cause, the steel does not then appear to be solid, the shearing shall continue until it does. *If, by the use of any improvements in the process of making ingots, the defect known as piping shall be prevented, the above shearing requirements may be modified.*

(d) There shall be sheared from the end of the blooms formed from the top of the ingots *not less than* *per cent*,‡ and if, from any cause, the steel does not then appear to be solid, the shearing shall continue until it does.

2 (a) For Bessemer steel with maximum phosphorous 0.085.

	80 lbs.	90 lbs.	100 lbs.
Carbon	0.50 to 0.60	0.53 to 0.63	0.55 to 0.65
Manganese	0.80 to 1.10	0.84 to 1.14	0.86 to 1.16
Phosphorus, not to exceed	0.085	0.085	0.085
Silicon, not to exceed	0.20	0.20	0.20
Sulphur, not to exceed	0.075	0.075	0.075

Does not consider 110-lb. and 120-lb rails.

(b)	70 to 79 lb. Percentage.	80 to 89 lb. Percentage.	90 to 100-lb. Percentage.
Carbon	0.50 to 0.60	0.53 to 0.63	0.55 to 0.65
Phosphorus shall not exceed	0.085	0.085	0.085
Silicon shall not exceed	0.20	0.20	0.20
Sulphur shall not exceed	0.075	0.075	0.075
Manganese	0.75 to 1.00	0.80 to 1.05	0.80 to 1.05

Does not consider 110-lb. and 120-lb. rails.

(c)	70 to 79-lb. Percentage.	80 to 89-lb. Percentage.	90 to 100 lb. Percentage.
*Carbon	0.50 to 0.60	0.53 to 0.63	0.55 to 0.65
Phosphorus shall not exceed	0.085	0.085	0.085
Silicon shall not exceed	0.20	0.20	0.20
Sulphur shall not exceed	0.075	0.075	0.075
Manganese	0.75 to 1.00	0.80 to 1.05	0.80 to 1.05

**Carbon may be reduced to suit local conditions.*

Does not consider 110-lb. and 120-lb. rails.

(d) Does not consider maximum phosphorus 0.085.

Does not consider 110-lb. and 120-lb. rails.

(a) Does not consider maximum phosphorus 0.10.

(b) Does not consider maximum phosphorus 0.10.

(c) Does not consider maximum phosphorus 0.10.

(d)	*50 to 59-lb. Percentage.*	*60 to 69-lb. Percentage.*	*70 to 79-lb. Percentage.*	80 to 89-lb. Percentage.	90 to 100-lb. Percentage.
Carbon	0.35 to 0.45	0.38 to 0.48	0.40 to 0.50	0.43 to 0.53	0.45 to 0.55
Phosphorus shall not exceed	0.10	0.10	0.10	0.10	0.10
Silicon shall not exceed	0.20	0.20	0.20	0.20	0.20
*Manganese	0.70 to 1.00	0.70 to 1.00	0.75 to 1.05	0.80 to 1.10	0.80 to 1.10

*Manganese content, 90 to 100-lb. rails, also differs from majority report.

Considers 50-lb. to 80-lb. rails, but not 110-lb. and 120-lb. rails.

3. (a) Same as majority report.

(b) and (c) The number of passes and speed of train shall be so regulated that on leaving the rolls at the final pass, the temperature of the rail will not exceed that which requires a shrinkage allowance at the hot saws, for a 33 ft. rail of 100-lb. section, *of $6^7/_{16}$ in., and $^1/_{16}$ in.* less for each 5-lb. decrease of section. *These allowances to be decreased at the rate of $^1/_{00}$ in. for each second of time elapsed between the rail leaving the finishing rolls and being sawn.* No artificial means of cooling the steel shall be used after the rails leave the rolls, nor shall they be held before sawing for the purpose of reducing their temperature.

(d) The number of passes and speed of train shall be so regulated that on leaving the rolls at the final pass the temperature of the rail will not exceed that which requires a shrinkage allowance at the hot saws, for a 33-ft. rail of 100-lb. section, *of $7^8/_{16}$ in.*, and $^1/_{10}$ in. less for each 5-lb. decrease of section. *These allowances to be decreased at the rate of .01 in. for each second of time elapsed between the rail leaving the finishing rolls and being sawn.* No artificial means of cooling the rails shall be used between the finishing pass and the hot saws.

Omits: "Nor shall they be held before sawing for the purpose of reducing their temperature."

4. (a) Does not cover 110-lb. and 120-lb. rails.

(b) and (c) *Drop Test.*—One drop test shall be made on a piece of rail, not less than 4 ft. and not more than 6 ft. long, selected from each blow of steel. The test piece shall be taken from the top of the ingot. The rails shall be placed head upward on the supports, and the various sections shall be subjected to the following impact tests under a free falling weight:

70 to 79-lb. rails	18 *ft.*
80 to 89-lb. rails	20 *ft.*
90 to 100-lb. rails	22 *ft.*

Does not cover 110-lb. and 120-lb. rails.

(d) One drop test shall be made on a piece of rail not less than 4 ft. and not more than 6 ft. long, selected from every fifth blow of steel. The test shall be taken from the top of the ingot. The rail shall be placed head upward on the supports, and the various sections shall be subjected to the following impact tests under a free falling weight:

	Weight of rail, Pounds per yard.			*Height of drop.*
	45	*to and including*	55	15 *ft.*
More than	55	" "	65	16 *ft.*
More than	65	" "	75	17 *ft.*
More than	75	" "	85	18 *ft.*
More than	85	" "	100	19 *ft.*

Does not cover 110-lb. and 120-lb. rails.

‡*The percentage of minimum discard in any case to be subject to agreement, and it should be recognized that the higher this percentage the greater will be the cost.*

(b), (c) and (d) Do not state

"The testing shall proceed concurrently with operation of mill."

5. (c) *Unless otherwise specified the section of rail shall be the American Standard, recommended by the American Society of Civil Engineers,* and shall conform as accurately as possible, to the templet furnished by the railroad company, consistent with paragraph No. 8 relative to specified weight. A variation in height of one sixty-fourth ($^1/_{64}$) inch less or one thirty-second ($^1/_{32}$) inch greater than the specified height, and one-sixteenth ($^1/_{16}$) inch in width, will be permitted. The section of rail shall conform *perfectly* to the finishing dimension.

(d) *Unless otherwise specified, the section of rail shall be the American Standard, recommended by the American Society of Civil Engineers,* and shall conform, as accurately as possible, to the templet furnished by the railroad company, consistent with Paragraph No. 8, relative to specified weight. A variation in height of $^1/_{64}$ in. less, or $^1/_{32}$ in. greater than the specified height, and $^1/_{16}$ in. in width will be permitted.

Omits: "The section of rail shall conform to the finishing dimensions.

7. (b), (c) and (d) "*Length.*—The standard length of rails shall be 33 ft. Ten per cent. of the entire order will be accepted in shorter lengths varying *by even feet to 27 ft.*, and all No. 1 rails less than 33 ft. long shall be painted green on the ends. A variation of $^1/_4$ in. in length from that specified will be allowed.

(b) "*Straightening.*—Care must be taken in hot straightening the rails, and it must result in their being left in such condition that they shall not vary throughout their entire length more than 5 *in.* from a straight line in any direction, when delivered to the cold straightening presses. Those which vary beyond that amount, or have short kinks, shall be classed as second-class rails and be so stamped.

"Rails shall be straight in line and surface when finished, the straightening being done while cold, smooth on head, sawed square at ends, variation to be not more than $^1/_{32}$ in., and, prior to shipment shall have the burr occasioned by the saw cutting removed and the ends made clean. No. 1 rails shall be free from injurious defects and flaws of all kinds.

Omits: Distance between supports in gagging press.

(c) Rails shall be straight in line and surface when finished—the straightening being done while cold—smooth on head, sawed square at ends, variation to be not more than $^1/_{32}$ in., and, prior to shipment shall have the burr occasioned by the saw cutting removed and the ends made clean. No. 1 rails shall be free from injurious defects and flaws of all kinds.

Care must be taken in hot straightening the rails, and it must result in their being left in such a condition that they shall not vary throughout their entire length of 33 ft. more than 3 *in.* from a straight line in any direction, when delivered to the cold-straightening presses. Those which vary beyond that amount, or have short kinks, shall be classed as second quality rails and be so stamped. The distance between supports of rails in the gagging press shall not be less than 42 in.

(d) Care must be taken in hot-straightening the rails, and it must result in their being left in such a condition that they shall not vary throughout their entire length more than 5 in. from a straight line in any direction when delivered to the cold-straightening presses. Those which vary beyond that amount, or have short kinks, shall be classed as second quality rails and be so stamped. The distance between supports of rails in the gagging press shall not be less than 42 in. Rails shall be straight in line and surface when finished—the straightening being done while cold—smooth on head, sawed square at ends, variations to be not more than $^1/_{32}$ in., and, prior to shipment, shall have the burr occasioned by the saw cutting removed, and the ends made clean. No. 1 rails shall be free from injurious defects and flaws of all kinds.

(b), (c) and (d) *Omit*: "Rails whilst on the cooling beds shall be protected from coming in contact with water or snow."

10. (c) No. 2 rails will be accepted up to to five (5) per cent. of the whole order. *Rails that possess any injurious defects, or which for any other cause are not suitable for first quality, or No. 1 rails, shall be considered as No. 2 rails; provided, however, that rails which contain any physical defects which impair their strength shall be rejected.* The ends of all No. 2 rails shall be painted white in order to distinguish them. Rails rejected under the drop test will not be accepted as No. 2 rails.

(d) No. 2 rails will be accepted up to 10 per cent. of the whole order. *Rails which possess any injurious defects, or which for any other cause are not suitable for first quality, or No. 1 rails, shall be considered as No. 2 rails; provided, however, that rails which contain any physical defects which impair their strength shall be rejected.* The ends of all No. 2 rails shall be painted white in order to distinguish them.

Omits: Rails rejected under the drop test not acceptable.

12. (b) Does not specify:

"The drillings for analyses shall be taken from the ladle test at a distance of ¼ in. beneath the surface."

(c) and (d) Do not specify:

(1) On request of the inspector, the manufacturer shall furnish drillings for check analysis.

(2) The drillings for analyses shall be taken from the ladle test at at distance of ¼ in. beneath the surface.

In an editorial appearing in the *Railroad Gazette*, Sept. 6, we printed in parallel columns the specifications (b), (c) and (d), following the same with a discussion of their principal features. The subject of rail specifications was also discussed editorially Oct. 18 and Nov. 15. We shall now summarize the situation in the light of the report of the committee of the American Railway Association. Before doing so, however, we shall quote in full the introductory statement of the minority report prepared by Mr. Kruttschnitt, in which he endeavors to present the position both of the railroads and the manufacturers on the principal points at issue.

To the Members of the American Railway Association:

I respectfully present my views on rails, with sections and specifications as a minority report of the Committee on Standard Rail and Wheel Sections.

Rail breakages, which lately have been increasing at an alarming rate, seem to be due to three principal causes:

1. *Improper Chemical Composition*, due either to improper specifications or to segregation.

2. *Insufficient Discard*, causing concealed defects, which result in breaks in service, sometimes with, but frequently without warning.

3. *Too Great Haste in Manufacture of Rails*, which are finished at too high temperatures, due partly to faulty distribution of material in cross-sections and partly to improper manipulation or work on the head in the rolls.

Improper Chemical Composition.

The position of the manufacturers and the railroads is summed up as follows:

The Manufacturers Claim:

(*a*) Insufficient ore supply for phosphorus below 0.10.

(*b*) Safe rails can be made with 0.10 phosphorus.

Railroads Claim:

(*a*) Admitting that ore supply to make rails with phosphorus below 0.10 is limited, yet as the United States mills make rails for export with phosphorus below 0.10 and Canadian mills using ores imported from the United States are making rails with 0.085 phosphorus for Canadian roads, it is not unreasonable for the railroads of the United States to want all 0.085 rails that can be made, and unless specifications call for them they will never get any. Foreigners should not be favored with the highest grade of rail produced in our mills.

(*b*) Not denied that safe rails can be made with 0.10 phosphorus, but as carbon has to be reduced 7.5 points for the increase of 1.5 points in phosphorus, the resultant rail is softer, deficient in wearing qualities, and not nearly so desirable and efficient as one with less phosphorus and more carbon.

It is not expected that with the recommended specifications all of the Bessemer rail made in the United States can be furnished with a phosphorus content as low as 0.085, but as this committee is expected to recommend specifications that will give the best rail obtainable, we are convinced that prescribing a phosphorus content that shall not exceed 0.085 will result in securing for domestic lines the highest grade of product, leaving the lower for export. Under the specifications of 0.10 phosphorus heretofore forced on the railroads by the manufacturers, the reverse has been the case. The committee should not lend itself to a perpetuation of this condition. Prescribing 0.085 phosphorus does not condemn a rail, with higher phosphorus content, but it operates as a constant caution to the purchaser against raising phosphorus and lowering carbon, thereby getting a less desirable and efficient rail.

Insufficient Discard.

A sub-committee, as well as the entire committee, has devoted a great deal of time in the past year and a half conferring with manufacturers trying to obtain promises for safer and better rails. The position of the railroads and manufacturers is outlined as follows:

The Manufacturers Claim:

(*a*) That many breaks are improperly attributed to piping, and all except one claim that no fixed percentage of discard will insure sound rails.

(*b*) That the increased number of broken rails is caused by greater speeds and wheel loads.

The Railroads Claim:

(*a*) That this may be a question of nomenclature, but the fact is the breaks do occur more frequently than formerly, especially in the heavier sections. * * * * * Segregation and piping take place in the top of the ingot, and whilst impossible to locate them definitely so that we may be certain in discarding a particular fraction of the ingot that we have done away with all danger from their presence, it seems to be conceded beyond reasonable doubt that as we increase the discard we eliminate more and more of the trouble; just what the per cent. should be is doubtful, but it may be inferred from the following evidence:

1. The president of one of the largest steel works in the United States states that the depth to which piping extends in a 17 x 19 ingot (and this is the size of ingot most commonly used in rolling mills) is about 18 per cent. of the depth of the ingot.

2. The same works are selling premium carbon rails, which they claim are of the highest grade they are able to make on specifications of their own, which prescribe 20 per cent. discard.

3. The recommended specifications of the American Society of Civil Engineers prescribe 25 per cent. discard.

4. The recommended specifications of the American Railway Engineers and Maintenance of Way Association prescribe 25 per cent. discard.

5. The head of an eminent firm of inspecting engineers, which does the inspecting for many large systems of railroads, recommends 25 per cent.

6. One of the largest railroad systems in the United States, which seems to have been singularly and suggestively exempt from rail breakages, has been prescribing and obtaining a discard of 25 per cent. A Canadian mill whose output has been singularly free from breakages used a discard of 16 per cent.

7. Mr. H. M. Howe in an article on "How May Quality of Steel Rails Be Improved," in the *Engineering and Mining Journal*, says: "The richest of the segregate lies near the top of the ingot, usually in the upper 20 per cent."

(*b*) The alarming increase in breakages is not due to increase of speeds and loads, but to poorer quality due to careless manufacture. Rails of 70, 60 and even 50 lbs. per yd. are to-day safely carrying the same loads at the same speeds under which 80, 90 and 100 lb. rails are breaking in large numbers.

The proposal of the manufacturers that the percentage of discard should be left open to agreement with the purchaser in each case, recognizing at the same time the principle that the higher the discard the greater the price, would leave matters just as they stand and would perpetuate conditions that have caused the increased breakages and the feelings of alarm and insecurity shared by the railroad managers and the public. We think it is the duty of the committee to make some recommendation based on the best evidence obtainable, to serve as a guide to the purchaser, who should understand that whilst it seems impossible to fix a percentage that will guarantee the absence of internal flaws, it seems nevertheless reasonably certain from the evidence before us that the present practice of discarding 10 per cent., as the manufacturers claim to be doing, is insufficient, and that an increase to about 20 per cent. on ingots of the size most commonly used would practically eliminate breaks from piping and segregation and give a safe rail.

Too Great Haste in the Manufacture of Rails.

The Manufacturers Claim:

(*a*) Faulty distribution of metal in sections, forcing them to stop rolling the head when the base has cooled, and whilst the head is still hot enough to be worked.

(*b*) No greater speed of rolls than formerly used.

The Railroads Claim:

(*a*) The present sections of A. S. C. E. were approved by the rail makers. They admit reasonableness of manufacturers' claim, and concede that a change of sections is desirable.

(*b*) Whilst speed of rolls may be no greater, the number of passes has been reduced, and the manipulation of work done on the metal has been cut down so that closeness of texture or fineness of grain, on which wear depends, has been correspondingly reduced and sacrificed.

Your committee has been convinced by the manufacturers that a change in the sections whereby the metal would be more equally distributed between the base and the head, thereby allowing rolling to be done at a lower temperature, would be beneficial.

Two sets of sections[1] are submitted herewith and recommended for adoption, our preference being strongly for those marked A, in designing which great weight was given to the consideration of the rail as a girder and its function to distribute a load over a number of supports. To do this efficiently it must be stiff, that is, deep. These A sections have high moments of inertia, and for the same weights are much stiffer, admit of very much stiffer splice bars, and will, therefore, make smoother riding track than the sections marked B.

Respectfully submitted,

J. Kruttschnitt.

The specifications embodied in the minority report are substantially the same as those recommended by the committee of the American Society of Civil Engineers and those adopted by the American Railway Engineering and Maintenance of Way Association, except that the percentage of discard is reduced from 25 to 20 per cent.

The specifications contained in the majority report follow more closely the lines of those of the American Society for Testing Materials, so far as present rail sections and the use of steel with a phosphorus content not exceeding 0.10 per cent. are concerned. They make provision also, however, for revised sections with increased heights of drop, and for steel with a phosphorus content not exceeding 0.085 per cent.

In the matter of discard these specifications are disappointing, in that they stipulate "sufficient discard to insure sound rails," as against fixed minimum percentages in specifications (a), (b) and (c), and a blank percentage, subject to agreement, in the Specifications of the American Society for Testing Materials. It is true that the American Railway Association has not adopted these specifications, and that they have been referred back to the committee with instructions to make further investigation.[2] The proper percentage of discard may in time be determined by an extensive series of tests, but pending the results of such tests, it is to be regretted that the more conservative policy of specifying a definite minimum percentage of discard was not recommended.

It is pertinent in this connection to quote from the report of the committee of the American Society of Civil Engineers, presented some two years ago, a statement made in connection with the discussion of the question of discard: "* * * it is well known that one of the frequent causes of failure of steel rails is due to piping, and that this comes from unsound ingots. Unfortunately, such failures often cause accidents, which result in large material damage, and, what is worse, the loss of life. Frequently such interior defects cannot be detected until after the rails have been subjected to traffic, hence it is of the greatest importance that care should be exercised in the manufacture with a view of reducing the danger to a minimum."

Since the usual mill practice involves a discard of from 7 to 10 per cent., it would have been more satisfactory if the committee had specified at least a moderate increase, say to 12½ per cent., which would not impose a hardship on the manufacturers, and which might reasonably be expected to lessen the danger from de-

[1] Shown in the *Railroad Gazette* Nov. 22.

[2] Two reports have been presented to the Association by the Committee on Standard Rail and Wheel Sections, a majority and a minority report, and the chairman requests further time. Your executive committee is of the opinion, therefore, that action on both of these should be deferred, on the ground that no benefit to the members of the Association can be derived from the discussion on the floor of the convention at this time of a subject which is so full of undetermined technical points.

Your committee further recommends that the Committee on Rail and Wheel Sections be requested to continue its investigations, to employ competent experts, and to expend such sums necessary for this purpose as may be authorized by the executive committee.

The attention of the members, however, is called to the fact that the members of the Committee on Rail and Wheel Sections are unanimous in all of their recommendations, except as to chemical composition and discard, among others concerning better rail sections and an improved form of report of rails, and that any member may avail itself at once of these recommendations. *Report of Executive Committee.*

festive rails. It is, of course, recognized that the percentage of discard depends somewhat on the size of the ingot and other circumstances. The moderate fixed percentage suggested is, however, believed to be sufficiently conservative for all prevailing conditions. Moreover, the railroads would doubtless be entirely willing to bear the slightly increased cost due to added discard. It is, of course, to be understood that such percentage should be subject to change in the light of further information obtained either by tests or by experience in service.

In the matter of height of drop, it is to be noted that the heights specified by the committee for the present rail sections are practically the same as those in the specifications of the American Society for Testing Materials. For the proposed new sections the height of drop is increased 3 ft. for a 100-lb. section and 2 ft. for weights of 90 lbs. and under.

Conceding the validity of the claim of the manufacturers that the ore supply permits of only a limited supply of Bessemer steel rails with a phosphorus content not exceeding 0.085, recourse must be had either to Bessemer rails of sufficiently increased section to meet safely the requirements of modern traffic conditions, or to the use of open-hearth steel rails, which may be obtained to a limited extent to-day, with a phosphorus content ranging from 0.03 to 0.06 per cent. and with discard from 15 to 25 per cent.

The committee embodies in its report "cardinal principles" governing the design of rail sections. It is to be hoped that the further investigation of the committee will lead to the establishment also of cardinal principles governing the manufacture of steel rails, especially in the matter of lighter reductions in rolling, from the ingot to the finished section, with due regard to the influence of the finishing temperature. The specifications in the majority report are in the right direction, in that they provide for a drop test on every heat of steel on rails made from the top of the ingot, and in that the permissible percentage of No. 2 rails is limited to 5 per cent.

It is especially reassuring to find that these changes were accepted by the representatives of the leading manufacturing interests who were invited to confer with the committee. It is not to be doubted that the work of the committee of the Railway Association has considerably advanced the harmonization of the conflicting specifications, and it is to be hoped that at no distant date a specification will be evolved which will be acceptable to all parties in interest, and which will be generally adopted by the various engineering societies. With this end in view, it is greatly to be desired that the committee of the Railway Association will prosecute the further investigation of the subject vigorously, and that the results of their study will be laid before the profession at the earliest possible date.

Train Accidents in November.[1]

Our record of train accidents occurring on the railroads of the United States in November includes 20 collisions and four derailments, 24 accidents in all. This record is not published in full except in the cases of the few accidents which are especially prominent—in the present instance two collisions. The record of "ordinary" accidents—which term includes, for our present purpose, only those which result in fatal injury to a passenger or an employee or which are of special interest to operating officers—is given at the end in the shape of a one-line item for each accident, showing date, location, class and number of deaths and injuries. The items of which details are given are indicated in the tabular statement by the use of italics. This record is based on accounts published in local daily newspapers, except in the cases of accidents of such magnitude that it seems proper to send a letter of inquiry to the railroad manager.

The collision at Larimer, Pa., on the 12th, occurred about 1:30 a.m. Passenger train No. 28 eastbound, the 18-hour Chicago-New York train, was turned through a crossover to the westbound track and ran into a westbound freight train which was standing near the tower. Both engines were badly damaged, as were the first car of the passenger train and six cars of the freight. One freight train trainman and four other employees and six passengers were injured, none of them badly hurt. The signalman had orders to send the passenger train out to the next station on the westbound track, after that track should have been cleared, but he appears to have forgotten that the westbound freight was standing near the tower.

The rear collision of freight trains at Towanda, Pa., on the 10th would not have been unusually disastrous so far as the destruction of property is concerned, had it not been for a fire which immediately broke out and which destroyed everything combustible about the wrecked cars and engine. Indeed, the colliding train—a regular freight train—was running slowly, under a permissive signal; but the case is of interest as one in which an inquest brought out the real cause. As reported in a local paper, the engineman who was at fault frankly testified that he saw the train ahead, knew about how far it was from him, and yet instead of keeping a close watch on its movements he turned his eyes away and assisted the fireman. Because of the poor quality of the coal or the inexperience of the fireman, the engineman deemed it necessary to attend to the fireman's work instead of to his own immediate duty, a plain case of trying to do two things at once and not putting the first duty first. But as is usual in such cases the jury tried to exonerate the engineman, declaring that the collision was caused by "the engineer and others not being in position to see signals given by the flagman and through escaping steam through defective packing of the piston valve."

TRAIN ACCIDENTS IN THE UNITED STATES IN NOVEMBER 1907

Collisions.

Date	Road.	Place.	Kind of Accident	Train.	No. persons reported Kl'd.	Inj'd.
*3.	Atl., Gulf & Southern	Morganville	bc.	P. & Ft.	2	6
3.	Baltimore & Ohio.	McMillan.	rc.	Ft. & Ft.	3	1
3.	St. Louis & Iron Mt.	Little Rock.	bc.	P. & Ft.	4	2
5.	New York Central.	Grimesville.	rc.	Ft. & Ft.	1	1
6.	Southern Pacific	Portland.	bc.	P. & P.	1	0
9.	Boston & Albany	W. Brookfield.	xc.	P. & Ft.	1	3
9.	Wabash	Fort Wayne.	xc.	P. & Ft.	0	10
*10.	*Lehigh Valley*	Towanda.	rc.	Ft. & Ft.	1	0
12.	*Pennsylvania*	Larimer.	xc.	P. & Ft.	0	6
13.	Wabash	N. Alexandria.	rc.	Ft. & Ft.	1	5
14.	New York Central	Buffalo.	rc.	Ft. & Ft.	1	4
16.	Pennsylvania	Howard's.	xc.	Ft. & Ft.	3	0
18.	Oregon Sh. Line.	American Falls	rc.	P. & Ft.	2	1
18.	Wh. & Lake Erie.	Steubenville.	bc.	Ft. & Ft.	3	0
18.	Yazoo & M. Val.	Melton.	bc.	Ft. & Ft.	2	1
19.	Vandalia	Vevay Park.	bc.	P. & P.	1	2
19.	Washington Terminal.	Washington.	bc.	P. & P.	0	17
20.	Vandalia	Farmdale.	bc.	P. & Ft.	1	7
24.	Central N. England.	St. Elmo.	xc.	Ft. & Ft.	1	0
26.	Phila. & Reading.	Philadelphia.	rc.	Ft. & Ft.	3	1

Derailments.

Date.	Road.	Place.	Kind of train.	Cause of derlmt.	No. persons —reported— Kl'd.	Inj'd.
3.	Central of N. J.	Pittston.	Pass.	d. road.	1	1
8.	Del., Lack. & Westn.	Fargo.	Pass.	acc. obst.	1	4
15.	Wabash.	Dillon.	Pass.	unx.	0	7
25.	Mobile, J. & K. C.	Laurel.	Pass.	b. flange.	0	8

Of the nine serious electric-car accidents reported in the newspaper in the month of November, five resulted in fatal injury to one or more persons, namely, Indianapolis, Ind.; Woonsocket, R. I.; Chicago, Ill.; Fort Worth, Tex., and Waterbury, Conn. In the last named case, which occurred on the 29th, a street car stalled on a railroad crossing was struck by a freight train and five persons were killed.

Two collisions on elevated lines in New York City, while not particularly disastrous in their results, are noticeable by reason of the circumstances attending them. On the 11th, at Thirty-fourth street, on the Sixth avenue line, a northbound train, just starting away from the station, ran into the rear of a preceding train which had been stopped, and the momentum of the moving train was such that its leading car was lifted about 7 ft. and pushed to one side so that it barely escaped falling into the street. The explanation—common in cases where trains are required to run under control—is that the motorman thought that the preceding train would start before he got to it. A collision of loaded passenger trains on the Manhattan elevated lines is noticeable by reason of the remarkable infrequency of such collisions on these lines throughout a period of 25 years and more.

The other collision, which occurred on the 25th, was on the Subway line, but on that portion of it which is on an elevated structure. In this case a northbound train, leaving the last station before reaching the terminus, ran at unchecked speed into the rear of a preceding standing train, and the motorman was killed. There were few passengers in the trains, however, and only four were injured. The motorman, although a faithful and sober employee, who had been several years in the service, proceeded on his way without even noticing the preceding train, although it was in broad daylight and there was nothing in the way to prevent him from clearly seeing it, the rear car being only about 300 ft. away. As the physicians who examined the motorman's body found no evidence of heart disease or apoplexy, and as he had not had time to fall asleep after starting, this would seem to be a simple case of absent mindedness. The man must have allowed his attention to be distracted by something at the side of the road.

[1] Abbreviations and marks used in Accident List:
rc.....Rear collision.
bc.....Butting collision.
xc.....Other collisions; as at crossings or in yards. Where only one train is mentioned, it is usually a case of a train running into a standing car or cars, or a collision due to a train breaking in two on a descending grade.
b.....Broken.
d.....Defective.
dr.....Defect of roadway.
eq.....Defect in car or engine.
n.....Negligence.
unf.....Unforeseen obstruction.
unx.....Unexplained.
derailt....Open derailing switch (negligence of engineman or signalman).
ma.....Misplaced switch.
acc. obst..Accidental obstruction.
malice....Malicious obstruction of track or misplacement of switch.
boiler....Explosion of boiler of locomotive on road.
fire.....Cars burned while running.
Pass.....Passenger train.
Ft.....Freight train (includes empty, engines, work trains, etc.).
*Wreck wholly or partly destroyed by fire.
†One or more passengers killed.

Lehigh & Hudson River.

This is the road over which President Mellen wishes the Central of New Jersey, the Philadelphia & Reading and the Baltimore & Ohio to send all their traffic for the New York, New Haven & Hartford, which would receive it over the Poughkeepsie bridge and the Highland division, now double tracked from Hopewell as far as Danbury, Conn., and soon to be double tracked and improved as far as Waterbury. For over two years now the Lackawanna has been sending its shipments for New Haven territory by this route with apparent satisfaction to all concerned. The Central of New Jersey is at present also sending some traffic over the Lehigh & Hudson River. This route, however, would give, in most cases, to the roads in the Reading system a shorter proportion of the haul on New England shipments. The corresponding advantage would go mostly to the Lehigh & Hudson River.

This railroad is not controlled by the New York, New Haven & Hartford. Of the 13 directors of the Lehigh & Hudson River, the presidents of the Lackawanna, the Ontario & Western, the Erie and the Lehigh Valley and the fourth vice-president of the Pennsylvania make up five. The other eight include George F. Baer, President of the Reading and of the Central of New Jersey; Joseph S. Harris, a director of the Reading Company, the Philadelphia & Reading Railway, the Philadelphia & Reading Coal & Iron Company and the Lehigh Coal & Navigation Company; J. Rogers Maxwell, Chairman of the Executive Committee of the Central of New Jersey; Robert W. de Forest, Vice-President, General Counsel and a director of the Central of New Jersey; Lewis A. Riley, President, who is also President of the Lehigh Coal & Navigation Company, which leases 192 miles of railroad to the Central of New Jersey; Morris Rutherfurd, Vice-President and General Manager, and James M. Duane, a member of the banking firm of Brown Bros. & Co., and a director of the Lehigh Coal & Navigation Company. The remaining member of the board is Alfred Ely.

Thus, four directors are closely associated with the Reading-Central of New Jersey interests and three others with the Lehigh Coal & Navigation. At the recent hearing before the Interstate Commerce Commission at Washington in regard to the New Haven's proposed cancellation of through tariffs with his companies via New York harbor, President Baer was quoted as saying in reply to a suggestion of President Mellen that the Lehigh & Hudson River was available for moving such shipments, that "I do not control one-tenth of it." This seems a remarkable statement, for judging by the directorate of the Lehigh & Hudson River, the Reading-Central of New Jersey interests and the Lehigh Coal & Navigation together have actual control, with the other anthracite coal railroads owning the rest of the stock. More important still, on the official map in the last annual report of the Reading Company, issued October 14, 1907, the Lehigh & Hudson River is shown as a line "controlled through ownership of majority interest." Why then is President Baer so loath to have it used?

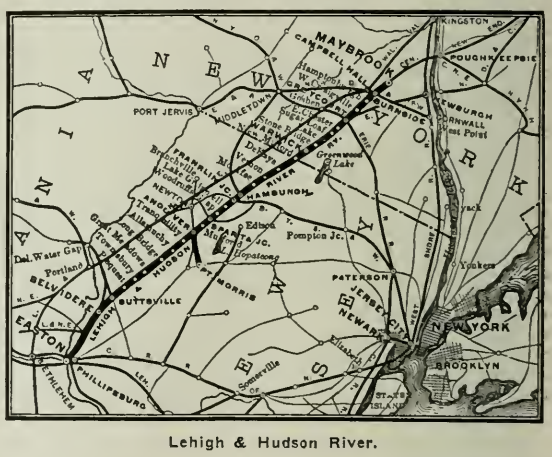
The beginning of the present interchange traffic between the Lackawanna and the New Haven marked a new era in the history of the Lehigh & Hudson River. From that time it began to take shape as a through modern railroad, instead of being a local line moving enough traffic to keep itself alive. Gross earnings, which were $482,000 in 1905, rose to $844,000 last year. Net earnings were $167,000 in 1905 and $304,000 last year. The increase of 1907 over 1906 in gross earnings was 30 per cent., and in net, 19 per cent.

Last year there was an increase of 93 per cent. in tax payments, owing to the new law in New Jersey, and a considerable increase in fixed charges because of the issue of $239,000 of debenture bonds and $400,000 of equipment trust certificates; so that net income was not much larger than in the previous year. As over twice as much was charged off for depreciation and adjustments, the year's surplus was only about half as much as in 1906. The year, however, has been a prosperous and favorable one, for the business of the road and its capabilities for handling it have grown.

The cost of additions and betterments made during the year was $993,893, which is an expenditure of over $10,000 a mile for each of the 99 miles operated and of $13,250 for each of the 75 miles owned. This is probably a larger expenditure per mile for additions and betterments, especially since it includes no increase in mileage, than was made last year on any other railroad in the United States. The largest items under this head are $414,000 for new freight cars and $100,000 for new locomotives. The bridge over the Delaware river at Easton, Pa., which is 1,034 ft. long and was built partly of second-hand material in 1899, is being rebuilt. This bridge forms the link between the connecting railroads south of the Delaware river and the southern terminal yard of the Lehigh & Hudson River at Phillipsburg, N. J. The bridge is to be made strong enough to carry the heaviest locomotives in use on any of the connecting roads. Masonry for the new piers has been finished and the new bridge is being erected. The cost will be about $125,000, part of which was advanced during the year. There was also $38,000 spent out of capital for part of the cost of new passing sidings and switches at 11 different points along the line.

Many other improvements were charged to maintenance of way and structures under operating expenses. This expense increased 19 per cent. over the previous year and amounted to $989 per mile, against $821 in 1906. There were 21 miles of 80-lb. rails laid during the year, and since June 30 enough more 80-lb. rail has been received to lay the entire line with that weight. Most of this has already been laid. Although there were less than 2,000 more ties placed in track than in the previous year, the cost of tie renewals increased 50 per cent., due to the fact that formerly the supply of ties was cut along the line but last year yellow pine ties from other regions had to be bought.

There was a large decrease in maintenance of equipment expenses, which were 44 per cent. less than in the previous year. Repairs and renewals of locomotives cost $595 per locomotive, against $1,838 in 1906; of passenger cars $239 per car, against $176 in 1906, and of freight cars $13 per car, against $30 in 1906. The 1907 figures are in each case the lowest of those for any railroad whose report has been reviewed in the *Railroad Gazette*. There is a reason for this. Under the equipment trust for $400,000, dated May 10, 1906, there were put into service last year 250 hopper bottom gondola cars; 10 low-side gondolas and 25 steel ore cars, all of 80,000 lbs. capacity; 75 box cars of 60,000 lbs. capacity, and six locomotives. Six more locomotives were bought on locomotive rental notes for $68,594, payable quarterly over a period of three years, a cash payment of $15,742 having been made when the locomotives were received. On June 30, 1906, the company owned only 18 locomotives, so that this increase of 12 was an increase of two-thirds in the total



Lehigh & Hudson River.

locomotive equipment. The number of freight cars rose from 790 in 1906 to 1,088, an increase of 38 per cent. Considering that two-fifths of the locomotives were new, the small amount spent on locomotive repairs can be explained. The same argument does not apply to the passenger cars; their maintenance charge in each year is very low. One-third of the freight cars were new, but even so, the average repair cost of $13 per car is low, particularly after a year when, with no new cars whatever to bring down the average, the freight car repair cost was only $30. One explanation of these low charges is probably that almost all of the road's high grade traffic is carried in cars of other companies. New shops are now under construction.

Conducting transportation expenses increased 53 per cent. over the previous year, and general expenses 55 per cent. Conducting transportation amounted to 43 per cent. of gross earnings, against 36 per cent. in 1906. This was due both to the increased volume of traffic, the greater cost of labor and material and a further special cause. The increase in traffic is shown by the increase of 50 per cent. in the freight-train mileage and of 45 per cent. in the ton mileage. There were large increases in cost of fuel for locomotives and in all accounts involving wage payments. Hire of equipment, which appears to include per diem payments, rose from $90 in 1906 to $2,305 last year, an increase of 2,460 per cent. During November and December, 1906, and January, February and March, 1907, the conducting transportation costs were particularly high in proportion to the amount of traffic. This was due to the hacking up of traffic on the line, with consequent congestion and added expense, by the inability of the New York, New Haven & Hartford to promptly move the through traffic to the east.

Ores were the largest single item of tonnage, amounting to 22 per cent., most of which originated on the line. Limestone, which also originated mostly on the line, furnished 10 per cent. of the tonnage. Merchandise amounted to 8 per cent., and miscellaneous to 9 per cent., both of these groups of high grade tonnage being almost

entirely received from other carriers. The traffic in grain, flour, other mill products, cotton, other packing house products; wool; hides and leather, anthracite coal, bituminous coal, iron products, and cement, brick and lime, which were the most important of the other tonnage groups, was all or nearly all received from other carriers. The total tonnage originating on the road was 735,000 tons, of which 561,000 tons were ores and limestone. Outside of these two commodities, the tonnage of no commodity originating on the line amounted to as much as 25,000 tons. The interchange tonnage amounted to 1,240,000 tons, or 63 per cent of the total. The Lehigh & Hudson River has one advantage which counts for much in the economical operation of the road: the traffic is almost evenly balanced. Last year 52 per cent of the total was carried eastward and 48 per cent. westward.

The future of this small property is a matter of great interest. There is no doubt that the transfer by car floats from the New Jersey side of the Hudson river around the south end of Manhattan Island and up the East river to the Harlem river terminal of the New Haven is a costly, slow and dangerous method of interchange. It is also true that the New York division of the New Haven is overburdened with traffic and that the interchange traffic with the Pennsylvania and Lehigh Valley, the most important of the New Jersey connections of the New Haven, is likely to be all that can be conveniently handled on that division. Also, the Poughkeepsie bridge route is being steadily improved. If President Mellen is successful in his contention that the roads in the Reading system shall follow the example of the Lackawanna and send their traffic for New England by this route, the importance of the Lehigh & Hudson River will necessarily be greatly increased, particularly as on this traffic it will secure a haul over the whole length of its line, while on the Lackawanna's business, which is received at Port Morris, it gets a haul of little more than half its length. If in this way the Lehigh & Hudson River is to be a main gateway for traffic between points west of the Hudson river and New England, there is a possibility that the Lehigh & New England, which parallels it for its whole length on the west and is owned by the Lehigh Coal & Navigation Company, in spite of its worse grades and curves, may also be used as a through connection.

The results of operation of the Lehigh & Hudson River for the last two years are shown below:

	1907.	1906.
Mileage worked	99	99
Passenger earnings	$44,414	$40,429
Freight earnings	781,866	601,891
Gross earnings	844,335	662,386
Maint. way and structures	97,951	82,015
Maint. of equipment	45,199	65,240
Conducting transportation	362,485	237,454
General expenses	34,417	22,437
Operating expenses	540,051	407,145
Net earnings	304,283	255,241
Net income	125,177	108,132
Depreciation and adjustments	81,790	35,641
Year's surplus	43,387	72,492

NEW PUBLICATIONS.

The Car Wheel. Giving the results of a series of investigations by George L. Fowler, M.E. Published for private distribution by the Schoen Steel Wheel Co., Pittsburgh, Pa., 1907. Boards, 5 in. x 9 in.; 161 pages, and numerous illustrations.

It is seldom that the results of such an exhaustive series of investigations, primarily carried out for the sole purpose of determining the standards of quality and workmanship which must be met by a new product in competition with old and well tried products, are given to the public in such complete detail. Mr. Fowler in the beginning was confronted with an almost total lack of published data as to many of the properties of car wheels which were later investigated, and practically the whole of the contents of this book is original data here made public for the first time. One chapter on the lateral thrust of wheels against the rail has already been reprinted by special permission of the Schoen Co. in the *Railroad Gazette* of Nov. 15, 1907, and another on the areas of contact between wheel and rail is reprinted in another column in this issue. These will give a better idea of the character of the investigations made than any extended review. Other chapters consider the design of the solid rolled and forged steel wheel; comparative physical and chemical properties of solid rolled and forged steel wheels, steel tires and cast-iron wheels; studies of heat treatment and penetration of physical work in rolling from the micro-structure of the metal; co-efficients of friction between wheel and rail. The last chapter is a presentation of advantages claimed for the Schoen solid rolled and forged steel wheel based on the tests recorded in previous chapters, together with the results of a number of actual service tests.

The investigations which were made covered a period of over two years. Perhaps the most striking thing about them is the fact that they reveal how completely unexplored as yet is the field of railroad dynamics. Wellington and Forney touched on the edges and Fowler has here gone somewhat deeper into some of the unsolved problems, but there yet remains a vast and profitable field of investigation. While the book is intended to promote more extended knowledge of the properties of the Schoen wheel, at the same time one is struck by the impartial presentation of the results of the various investigations and the value of the data given is by so much increased.

As a piece of book making the volume is a work of art. It is printed on heavy vellum paper with illuminated chapter headings, and the illustrations are printed on loose leaves of cream-colored plate paper, pasted to blank pages. The binding is plain board with embossed gold letters. The book is intended for private distribution among railroad officers interested in the service requirements of car wheels.

Railway Shop Up to Date. A reference book of up-to-date American railway shop practice. Compiled by the Editorial Staff of the *Railway Master Mechanic*. Chicago: Crandall Publishing Co. 243 pages, 9 in. x 12 in. Cloth. Price, $4.

The purpose of the compilers of this volume was to present a record of the best existing practice in railroad shop design, construction and equipment. It has been about three years since any comprehensive work of this character has appeared and in that time there has been material progress. There was need, therefore, of bringing the record up to date, and this has been well done in the present volume. Data has been selected with care and logically arranged, the idea being to make it equally serviceable in designing new plants or improving existing ones. This book contains some good features not found in earlier volumes, particularly in the matter of tool and electrical equipment. For the former, tables are prepared for machine and erecting shops on a pit basis. The proportion of different machine tools for a single pit is worked out and figures then derived for shops of 12, 15, 24 and 48 pits, simply by multiplying the pit figure by these numbers. The tabulation also includes the total of each kind, and the number of each size, or class, of tool for shops of a given number of pits. The basis on which the tables have been worked out is stated to be more liberal in its allowance of tools than is the general practice. Lists of the machine tool equipment for several representative shops are given, also for blacksmith and woodworking shops. For the power plants there is a table of data of 15 representative power houses, and diagrams of the power distribution at four large electrically-driven plants. The illustrations for each chapter are grouped at the end of the chapter instead of being scattered through the discussion. They are all line engravings, except for a number of storehouse photographs. The compilers of the volume were assisted by an advisory committee consisting of C. A. Schroyer, Superintendent Car Department, C. & N.-W.; M. K. Barnum, General Inspector Machinery and Equipment, C., B. & Q., and R. D. Smith, Assistant Superintendent Motive Power, B. & A.

CONTRIBUTIONS

Rail Specifications—the Discard from the Ingot.

Altoona, Pa., Dec. 12, 1907.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I do not know which of my many utterances in regard to steel rails your correspondent, "Railroad Officer," has chosen to base his statement on in your issue of November 22d, that I with others "assert that the railroads cannot afford to do otherwise than unite on the requirement of a definite discard." It is quite probable that something which I have said would give color to such a view, but it is fair to say at the present time that the more the question of discard is studied, the more difficult it becomes to have a positive and definite view in regard to it.

It would hardly be wise, at this time, to go into the whole question of discard. There is too much lack of positive information as to how the majority of rails fail, to tie up these failures satisfactorily with the discard. This lack of positive information on the part of the railroads was, as we understand it, the principal cause of the inability of the committee of the American Railway Association to make a more satisfactory report at the recent meeting of that body. It is hoped and believed that by means of a careful study within the next year or two, of rails which fail in track, a good deal more definite information will be obtained. At the present time we hardly feel willing to say more than that probably the poorest steel for rails in the ingot is somewhere from 15 to 18 per cent. down from the top. Also that there are two points involved in this poor steel, namely, segregation and physical defects in the metal. Under the head of physical defects are embraced all that is commonly known as the "pipe," and bubbles or cavities or sponginess which does not weld up under the rolling. We have fairly positive evidence that a rail having internal physical defects is almost always a segregated rail. We do not have as definite information that a segregated rail, free from internal physical defects, will fail in service. The great need to-day in rail manufacture is

some test by which internal physical defects in the rail can be detected. Many rails fail in the middle of the length of the rail, and an examination of these failures shows almost without exception that there was an unwelded up portion in the rail, which, under the pounding of the traffic, gave way. If now we had some means of telling whether there was an unwelded portion in any part of a rail, the whole question of discard could, we think, be ignored. It is believed with good reason that the drop test as at present conducted, is not sufficient for this purpose although this point needs further study.

Our ideas at the present time are: (1) that a test should be made from every blow; (2) that the inspector should be entitled to select a crop end, or a portion of a rail which shall be used for the test; (3) that he should choose for test steel that came from 15 to 18 per cent. down from the top of the ingot. At present it will be necessary, of course, to use the drop test or some modification of it. (4) In case the sample fails, the whole heat should be rejected, or at least the top rail from each ingot in that heat; and, (5) and, perhaps most important of all, no retests should be made. If this scheme could be carried out, we think the whole pestiferous question of discard could wisely be left in the hands of the manufacturers.

It may not be amiss to add that this proposed method of testing commercial steel products, without any reference whatever in the specifications to discard, has worked charmingly for a number of years now. Driving axles, car axles, crank pins, billet steel, etc., are and have been for years tested and accepted, or rejected in accordance with the methods outlined above, with no reference whatever in the specifications to discard.

In the matter of rails it is a fair question, I think, whether in the past, the railroads have not made a mistake in that they have specified too much. It is, of course, difficult to draw the line and say positively how much should be specified and how much left to the manufacturer, but I think it hard to refute the statement that the assumption by the consumer of the right to specify a discard has resulted in relieving the manufacturer of a responsibility which he should bear. It is the function of the manufacturer to make rails and offer them for acceptance. It is the function of the consumer to apply such tests and inspection as will prevent the acceptance of inferior or hazardous material, and properly safeguard the interests for which he is responsible. If a portion of the energy that has been spent in contending over discard had been spent in devising proper tests and methods of making these tests efficient in excluding rails that are piped or otherwise inferior, I am confident that so many poor rails would not now be in track, and that, as already stated, the question of discard could safely be left entirely to the manufacturers.

CHAS. B. DUDLEY.

William Cotter.

Foreign Railroad Notes.

The Traffic Commission of the city of Berlin has decided to build a subway running northwest and southeast through the heart of the city from Charlottenburg to Rixdorf. The estimated cost is $15,000,000. Five new surface lines are also projected.

The people of the village of Simplon, on the famous Simplon road, have trouble in communicating with their Swiss fellow-countrymen in the winter. The highway is no longer kept open in the winter, but can be traveled down the Italian slope, and thence by the tunnel the way is open to Switzerland, but if any goods are taken, they have to pass through the custom houses of both countries, and cattle are subject to veterinary inspection as exports from Switzerland to Italy, and then in two or three hours as exports from Italy to Switzerland. The highway is closed from Oct. 1 to May 1.

William Cotter.

William Cotter, General Manager of the Pere Marquette, was elected President of the company on December 14, succeeding President Underwood, of the Erie, who was elected President of the Pere Marquette in the fall of 1905, succeeding Eugene Zimmerman, but whose resignation has been merely a formal one, as Judson Harmon, Receiver, has been in charge of the road. The stockholders recently approved the reorganization plan. This provides for the cancellation of the Cincinnati, Hamilton & Dayton's lease of the property and the issue to stockholders of $5,000,000 in debentures, the proceeds of which will retire receiver's certificates and other indebtedness and so put the company on its feet. It is expected that the receivership will be wound up early in 1908. All of Mr. Cotter's railroad experience has been in the operating department, and in this work he has developed marked ability in handling men. In his direct relations with employees, he is a rigid and dispassionate disciplinarian. He followed Russell Harding to the Pere Marquette from the Missouri Pacific. On that road he had been Manager, while Mr. Harding as General Manager was his immediate superior. In this position Mr. Cotter spent his time dealing directly with the operating forces and thus encountering all labor troubles. He was born in 1858 at Bloomington, Ill., and began railroad work when 16 years old as a telegraph operator on the Chicago & Alton. From 1878 to 1880 he worked as operator on the St. Louis, Iron Mountain & Southern and was then appointed train despatcher and later Trainmaster of the same road at Little Rock, Ark. He served for a year as despatcher on the Chicago, Milwaukee & St. Paul and then went to the Wabash, St. Louis & Pacific, serving as train despatcher on that road and its successor, the Wabash, until 1890. He was then appointed Trainmaster of the St. Louis division. Six years later he went to the Grand Trunk as Superintendent of the Eastern division and in 1899 was made Superintendent of the Western division of that road. In 1901 he was appointed General Superintendent of the St. Louis, Iron Mountain & Southern and the next year was promoted to the position of Manager of the Missouri Pacific system. He went to the Pere Marquette as General Manager in 1904 and has continued in that position since that time.

Car Accountants' Meeting.

The regular meeting of the Association of Transportation and Car Accounting officers was held at Chicago, December 10. At the opening session Hon. W. J. Calhoun gave an interesting address on the relations of the transportation department to the commercial world.

The Committee on Car Service recommended that Per Diem Agreement Rules No. 5 be eliminated from the code of per diem rules, and that all terminal expenses be included and adjusted in the switching tariff. The rule has been in force five years and has had the desired effect of inducing the switching roads to become parties to the Per Diem Rules Agreement.

The Committee on Office Methods and Accounting has in preparation a complete set of abbreviations to be used in reporting all freight cars, and proposes that every box car shall have at the lower left-hand corner of the side of the car the number of the car with these reporting initials immediately above it. If it is desired to show the name of the road in a less abbreviated form, the right-hand end of the car may be used.

The association approved the committee's proposal, but other associations will be conferred with before final action is taken.

The committee recommends that tracers for carload shipments be indexed according to the two ending figures of the car number. Each item thus indexed can be given a consecutive file number, and thus it will always be easy to quickly find all the papers relating to a certain tracer. This the association approved.

Regarding average miles per car per day, this committee reaffirms the recommendation adopted at St. Louis in 1905 that in such

statistics all cars be included, except those in use by the maintenance of way department. Bad order cars should be included, but may be entered as a separate item. This subject was referred back to the committee, as was its recommendation to charge interest on per diem not promptly reported. Unreported per diem is constantly increasing, and the committee recommends therefore that on amounts not reported within 30 days, interest be charged at one-half of 1 per cent. a month, to continue until the end of the month in which the per diem is reported.

The committee offered a resolution providing for having daily junction reports covering receipts as well as deliveries, also that junction card reports be always sent by United States mail. This was adopted.

The Committee on Conducting Freight Transportation, reporting on weight marks on freight cars, recommended a better compliance with the rules of the American Railway Association and the Master Car Builders' Association. Where a number of new cars are turned out of a shop together, the weight of one or a few is frequently taken to indicate the true weight of each car in the entire series.

The [illegible] by the United States Post Office Department of the practice of stamping the day and hour of arrival on letters has caused some inconvenience in railroad offices where it has been necessary to fix the responsibility for delays, and the committee suggests that large railroad offices use a hand stamp to "back-stamp" United States mail immediately on receiving it from the Post Office carrier. Both of these recommendations were concurred in.

Seven Years' Progress on the Wheeling & Lake Erie.

The following charts graphically show the changes during the past seven years in several important factors affecting the operation of Wheeling & Lake Erie. Figure 1 shows the tons of freight hauled per locomotive mile. The locomotive mile is generally considered to be one of the most valuable units by which to judge railroad operations. Beginning with 1905 there has been a striking increase in the amount of work done per locomotive per mile, partly due to the acquisition of 80 large consolidation locomotives, 50 of which were put in service in 1904.

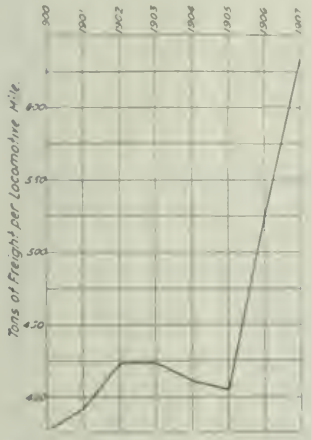


Fig. 1.—Tons of Freight Per Locomotive Mile.

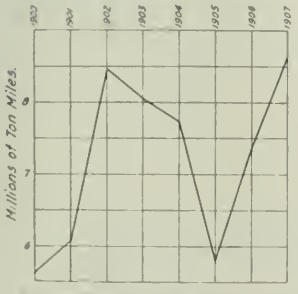


Fig. 2.—Ton Miles of Freight Handled per Locomotive per Year.

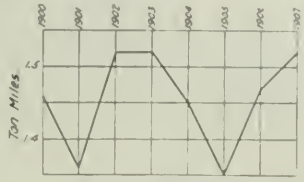


Fig. 3.—Ton Miles of Commercial and Company Freight Handled per Pound of Coal Consumed.

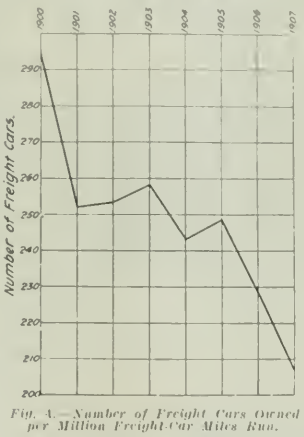


Fig. 4.—Number of Freight Cars Owned per Million Freight-Car Miles Run.

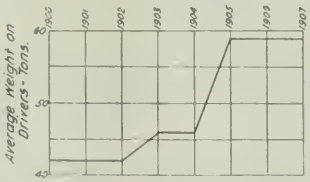


Fig. 7.—Average Weight on Drivers of Locomotives.

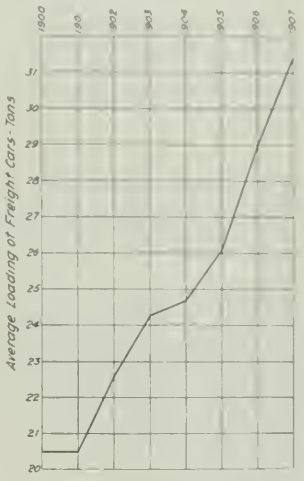


Fig. 5.—Average Loading of Freight Cars.

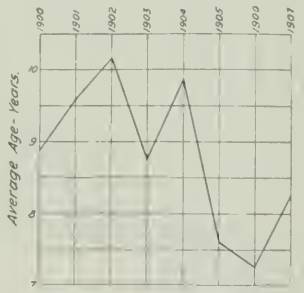


Fig. 6.—Average Age of Locomotives.

Graphic Records of Seven Years' Results on Wheeling & Lake Erie.

The committee recommends that the scales used to weigh new cars be tested by the railroad company's inspector; that wooden cars be reweighed after one year and a star be marked upon the car; after two years to be again weighed and the weight figures to be followed by two stars; and after three years the final weight put on, with three stars. Steel cars should be reweighed after one year and marked with three stars, indicating final weight.

The association adopted the committee's recommendation.

The Committee on Railroad Business Mail finds that labels designed to secure the registration of valuable packages are used for many articles which should not be classed as valuable, and this leads to delay in delivery. The committee recommends that this irregular use of the labels be stopped, and thinks it will reduce the number of registered packages 50 per cent. Where registration is asked for simply for the purpose of securing a receipt from the consignee, the better way would be to enclose with the package a receipt, to be returned as a letter.

Figure 2 shows the ton miles of freight handled per locomotive per year. This record is also based on the locomotive mile, and beginning with 1905 shows a marked increase in the trainload.

Figure 3 shows the ton miles of commercial and company freight per pound of coal consumed and discloses that the amount of work gained from each pound of fuel has since 1905 greatly increased.

Figure 4 shows the number of freight cars owned per million freight-car miles run, and brings out the fact that the volume of business has in general increased much faster than the car equipment.

Figure 5 shows the average freight car loading, which shows a steady increase since 1901, particularly in the last two years, a result due partly to the use of 1,000 new large capacity cars.

Figure 6 shows average age of locomotives and Figure 7 average weight on drivers. In 1904, 50 new consolidation engines were bought, and in 1905, 38 more, as well as 12 new switching engines, making 100 new locomotives in those two years. These purchases

are reflected in the decrease in the average age of the locomotives. As these new engines were large modern locomotives, the average weight on drivers of the locomotive power has greatly increased.

In all of these charts the great progress which has been made during the last three years is noticeable. This is the period during which the present management, headed by B. A. Worthington as First Vice-President and General Manager, has been in charge of the property.

Single Phase in Switzerland.

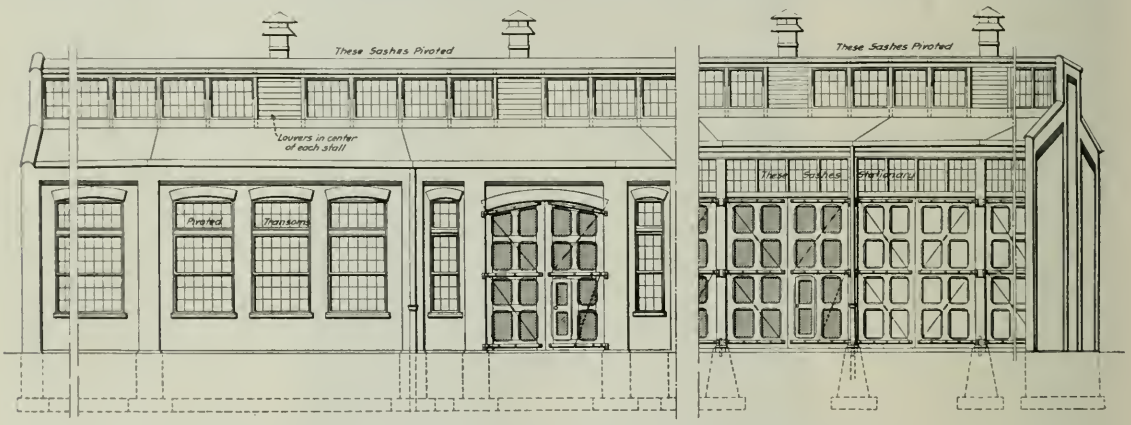
The Oerlikon Machine Works in Switzerland have for several years been conducting experiments with electrical trains on 14 miles of railroad assigned for that purpose, intended to ascertain the best methods and appliances for heavy railroad work. The experiments are now closed, and the line will be regularly worked hereafter with a single-phase alternating current of 15,000 volts, and 15 current periods per second, with overhead conductors. The experiments are said to have determined that there is no danger in the high currents.

The New Locomotive Terminal of the Chicago Junction.

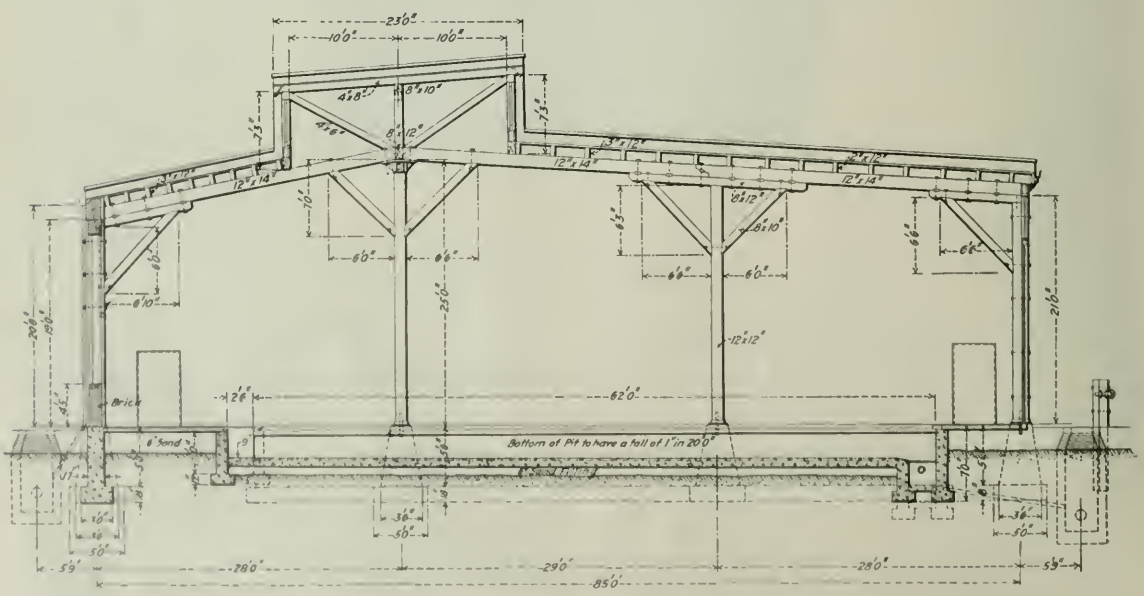
The Chicago Junction Railway is building a new locomotive terminal at 43d and Robey streets, Chicago, to replace the one at 49th and Halsted streets. The Chicago Junction is Chicago's inner belt road and does all of the switching for the Union Stockyards as well as for a large industrial section of the city. It has 45 locomotives. The facilities at 49th and Halsted had been outgrown; also changes were necessitated by the track elevation work. It was therefore decided to abandon the old terminal and build a complete new one in a more convenient location.

The new plant includes terminal and shop facilities to care for all of the locomotives. The roundhouse is planned for a full circle of 34 stalls. Twelve of the stalls were built last year and are being used. Construction is now under way on 12 more, and the remaining 10 will be added when needed. The radius of the inside circle is 80 ft. 3¾ in. and the stall depth is 85 ft. There is an 80-ft., 150-ton turntable at the center of the circle, built by the American Bridge Co. It works so smoothly that one man can turn an engine on it. It is intended to run it with an air motor later. The building foundations and the turntable and locomotive pits are concrete. The outer walls of the roundhouse are brick and the columns and roof framing are timber. The roof covering is four-ply "Roofrite," made by The Lehon Co., Chicago. The roof monitor is 20 ft. wide and has pivoted sash in both sides, except opposite the smoke jacks, where there are louvres. Each stall has three windows in the outer wall and the inner circles is glass for a height of 42 in. above the doors. Ample provision is thus made for admitting daylight. The smoke jacks are "Transite," made by the H. W. Johns-Manville Co. They are 14 ft. long at the bottom and 3 ft. 6 in. wide. The clearance above the rail is 16 ft.

The doors are wood. Their general features may be noted in the elevations included in the illustrations. They are 16 ft. 6 in.

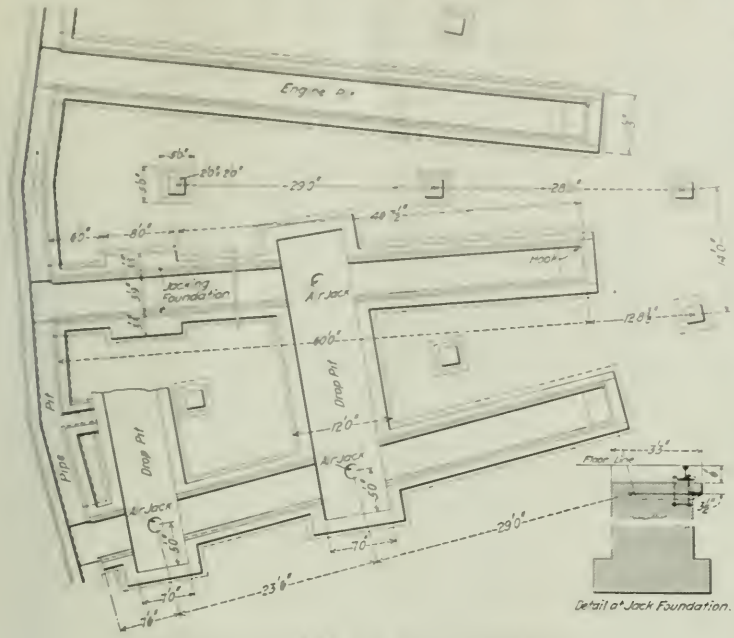


Elevations of Thirty-Four-Stall Round House for Chicago Junction Railway.

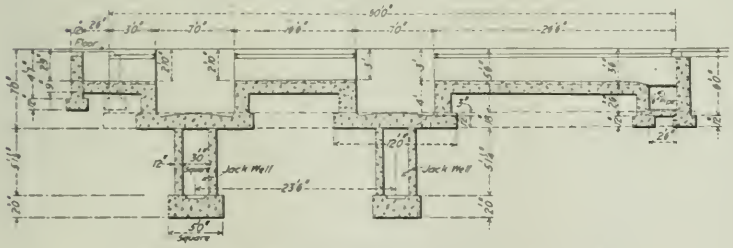


Cross Section Through Round House; Chicago Junction Railway.

high and 6 ft. 6 in. wide. The frame pieces are all 8 in. x 1⅝ in. material, except the top and bottom, which are respectively 10 in. x 1⅝ in. and 12 in. x 1⅝ in. The brace rods are ⅝ in. round, and the hinge straps to which they are secured are ⅝ in. x 3 in. One door in every other stall contains one of the small doors as shown, and in each end and fire wall are two sliding doors, 4 ft. x 7 ft., made of iron. These are adjacent to the inner and outer circles and slide on an inclined runway, making them self-closing.



Detail of Drop Pits and Jacking Foundations.



Longitudinal Section Through Engine Pit with Drop Pits.

The engine pits, which are made of concrete as already mentioned, are 60 ft. long and have a fall of 1 ft. in 20 toward the inner circle. A pipe pit 2 ft. 6 in. wide runs around the outer ends of the engine pits. The concrete pit-bottom is crowned, being 8 in. thick at the middle and 6 in. at the sides. There is a 6-in. sand filling under the concrete, and also under the wooden floor of the roundhouse. This floor is 3 in. yellow pine laid on 4-in. x 4-in. sleepers, 2 ft. centers.

The drop pits, which are the air-jack type, were built with the first section of the house last year. There are two, one each for truck and driving wheels, extending under two engine pits. They are 7 ft. wide and 5 ft. 6 in. deep. The four air jacks have a 1 ft. 3½-in. cylinder diameter and a 6-ft. 4½-in. stroke. The jacks are placed in special concrete-lined pits or wells.

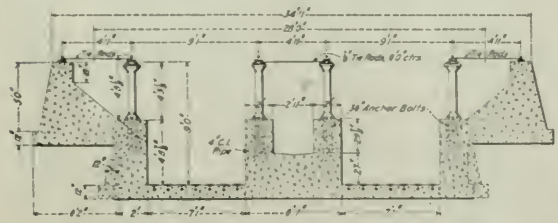
A hot-water washout and boiler-filling system will be installed. The details of this have not been definitely determined as yet. The house will be heated by hot water also, though this will be separate from the other installation.

On the east side of the roundhouse and only a few feet from it the locomotive repair shop is being built. The building is 100 ft. x 200 ft. and contains blacksmith machine, boiler and erecting shops, with small compartments for pattern and tin shops, and a good-sized store room at one end. Separate buildings are being put up for carpenter shop and boiler house. Two low-pressure boilers for heating will be put in this latter house. The locomotive shop tools and machines will all be motor driven. The electric power is to be obtained from the Union Stockyards station nearby.

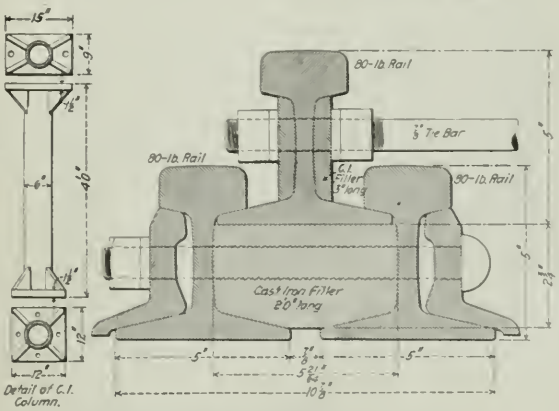
A 250-ton coal chute has been built. The coal is transferred from coal cars to storage bin by a crane with 35-ft. boom and 1½-yd. dipper. There is a locomotive track on each side of the coal chute and two locomotives on each side can be coaled at the same time. Next to the north locomotive track is the crane track and beyond this the coal car track. The crane-boom is long enough to take the coal from the cars and deposit it in the bin across the intervening track. The crane is self-propelling and can switch coal cars when necessary. The sand house is under the coal chute. The sand is shoveled from the cars, and after drying is blown to an overhead bin by compressed air.

Just east of and in line with the coal chute is a double ash pit, a cross-section of which is shown in the drawings. There are three tracks, the middle one being for ash cars and the other ones for engines, with room for six. The pit is of the submerged type and contains about 4 ft. of water at all times. The ash-pans are dumped into the water and the ashes are removed by the coaling crane and deposited in the cars on the center track. It will be observed that the rails of this track and the inner rails of the locomotive tracks are carried on cast-iron columns 4 ft. high, a detail of which is shown, together with the special girder construction employed with these rails. The cast-iron columns are anchored to the concrete by 36-in. anchor bolts. The central channel or trough under the ash-car track is for drainage. It has a drop of 1 ft. in 10 ft. toward one end, from which a 9-in. cast-iron pipe runs to a catch-basin. There are also 4-in. cast-iron pipes through both side walls at intervals. Inverted rails are embedded in the bottoms of the ash pits to protect the concrete from injury by the crane bucket.

A water tank of 100,000 gals. capacity supplies two water cranes.



Cross Section Through Engine Pits.



Detail of Column and Cross Section of Girder Rail.

The tank is wood on a steel framework and is supplied from the city mains. Because of the irregularity of the pressure an electric pump has been installed and operates automatically.

The plans were prepared and the work is being done under the supervision of J. B. Cox, Chief Engineer, to whom we are indebted for information.

1907 Cotton Crop.

The Crop Reporting Board of the Bureau of Statistics of the Department of Agriculture, from the reports of the correspondents and agents of the bureau, estimates that the total production of cotton in the United States for the year 1907-8 will amount to 5,581,968,000 lbs. (not including linters), equivalent to 11,678,000 bales of 500 lbs., gross weight.

The estimated production in 500-lb. bales, by states, is as follows:

Virginia	14,000	Texas	2,490,000
North Carolina	604,000	Arkansas	796,000
South Carolina	1,091,000	Tennessee	298,000
Georgia	1,898,000	Missouri	40,000
Florida	64,000	Oklahoma	919,000
Alabama	1,216,000		
Mississippi	1,536,000	United States	11,678,000
Louisiana	712,000		

Steel Rails; Their Mechanical Treatment; Past and Present.

BY S. T. FIEBO.
Inspecting Engineer.

In 1886, when I first began my experience as an inspector of rails, all mills used a greater number of passes in the rolling of their rails than at present. At that time the Joliet mills used 25 passes in the formation of the rails rolled by them. These rails were of 70-lb. pattern for the heavier sections, and down to 48 lbs. for the lighter ones, and I believe that a few 42-lb. sections were rolled.

An ingot of about 14 x 16 in. was used. There were three sets of rolls in the mill; blooming, roughing and finishing rolls. These rolls were divided into 13 passes in blooming rolls, seven passes in roughing rolls, and five passes in finishing rolls. This, with a small ingot of about 225 in. area. I believe that South Chicago was rolling rails with a couple of passes less than Joliet. Edgar Thomson was using 24 passes for rolling rails at that time, divided between four sets of rolls, blooming, roughing, intermediate or short rolls and finishing rolls. Twelve passes in blooming rolls, six in roughing, three in short and two in finishing. This in mill now known as number two. When Captain Jones built the new mill (now known as number one) he reduced the passes in blooming mill to 11, and built three stands of rolls in new addition, with five passes in roughing, five in the intermediate and one in the finishing rolls, a total of 22 passes for rolling rails that had increased to 80 lbs. per yard by that time, possibly 85 lbs. in several instances. I do not know the size of ingot used by him at that time.

Since then the blooming mill has lost four passes. The balance of the mill stands as built by Captain Jones, excepting that the rolls and roll housings have been strengthened, and larger engines have been installed, also a cooling bed has been built between the intermediate and finishing rolls, allowing a finish at a lower temperature than formerly. This has undoubtedly been a help to the quality of the rail produced, but not great enough to offset the detrimental effects of the fewer passes.

To-day mills are rolling rails with 18 passes to form their rails, with the exception of Edgar Thomson number two, the Pennsylvania Steel Company at Steelton, Pa., and the Maryland Steel Company at Sparrows Point, Md. This, with an ingot about 4 in. larger each way than was used with the greater number of passes, making a reduction per pass far beyond the limit of safety, and necessarily producing a great disturbance of the molecular structure of the steel, filling it with small interior cracks, that develop with a greater or lesser degree of rapidity (depending on the size and number of cracks, also on the amount of traffic over the rails), until they break and are entirely out of service. This heavy reduction leaves the rails with a very coarse granular structure, rendering them apparently soft, when possibly the analytical records show that the steel is unusually hard. The higher degree of heat necessary to allow for the heavy reduction is the cause of the coarse granular appearance of the steel, with the heavy reduction as a very good assistant. This is probably why steel with a carbon of 0.55 to 0.60 shows no harder than it showed 20 years ago, with carbon 15 points lower. The rails also show that they are a porous nature, that is full of small holes about the size of a small pea. This is caused, in my estimation, by the too rapid blowing of the metal during period of conversion, and the too rapid pouring of the steel into the ingot moulds at the time of casting the ingot.

Where mills formerly took from 15 to 18 minutes to blow a heat of steel, they now take from 10 to 12 minutes and are usually nearer the 10 than the 12 minute period. This, with a heavier burden in the vessel than in the earlier days of steel making. These small holes are a segregation of unconsumed gases, that would, under a longer period of blowing at a lower pressure of air, be consumed, or if not entirely consumed, would escape during the period of pouring of ingot, if poured at a slower rate of speed. They are the cause of the soft spots, or battered appearance of portions of the rail (when the balance is in good condition), and are not extremely dangerous.

When the partitions between these small holes disappear, or, in other words, when the gas segregates in one chamber, we have what is known as a pipe. This, of course, is extremely dangerous, and all rails showing pipe should be removed from track as soon as discovered. This pipe more frequently occurs at the top of ingot, but may, and does appear at other points of the ingot. The gases carry with them a great many of the detrimental elements. This is why an analysis of steel at point of pipe shows so badly as compared to the general analysis of the steel.

I would propose the following changes as a help to remedy these ills. Let the steel companies so regulate the pressure of air in their converting mills that it will take 15 minutes or more to convert a heat of steel. Let them take at least one minute in pouring each 2,000 lbs. of steel into ingot mould at the time of casting the ingot. At the present time steel companies take not more than one minute in pouring an ingot of approximately 5,000 lbs. weight, which is too fast pouring, if one desires a solid ingot, free from blow holes and gas pockets.

Then insist that the ingot be left in the soaking pit, or heating furnace, not less than 90 minutes before rolling. Nearly all mills conform to this time of heating of ingots, but there is more carelessness on this point than there should be.

Then let the rolling departments be remodeled so there will be at least 25 passes in the rolls for forming rail section. Let them still use the size ingot that is being used now.

If, at any time the mills find it necessary to increase the size of ingot, let them provide a corresponding increase in the number of passes.

Change the shape of the rail section so that it will be more nearly uniform as to division of metal in head and flange, reducing interior strain in the cooling, and needing less camber on hot bed.

Have another cambering machine at point of delivery of rails to finishing department, and run all rails through this machine, taking out all camber that is still in the rail when cool enough to straighten, thus reducing the number of blows needed to straighten rail to the least possible number. Every blow given a rail under a strengthening press is a bid for a break.

The steel rail question as it stands to-day is a serious one, and a few million dollars should not stand in the way of a number of mechanical changes that will do so much toward the improvement of the physical structure of the rail. It is a well-known fact that in the years spoken of, when rails gave the better service, there were from four to seven more passes in the rolls than at present, and the rails certainly showed better result from the extra work at the lower temperature at which they were finished, with the smaller percentage of reduction the steel had to stand per pass, than what it shows with present practice.

With 20 years experience as an expert rail inspector (during which time I received over four million tons of track material for some of the best roads in the country) to back my judgment, I believe that my suggestions, if acted upon, will go a long ways toward solving the problem now before the public and give the railroads the kind of rail (possibly a better one) that gave them such high satisfaction 20 to 30 years ago.

As a proof of the fact that rails are much more stiff and of a finer granular structure, under a greater number of passes, I give a few results of drop tests of rails made with 23 passes as against the same section made with 20 passes.

Eighty-lb. rail, rolled with 23 passes, receiving a blow of 2,000 lbs., falling free, 20 ft. Rail resting on supports three feet apart. Deflection measurements taken with three feet straight edge, and reading in inches and tenths of inches. These tests give an average deflection of 1.14 in. on 25 tests, representing about 3,000 tons of rails. The first 2,000 tons is represented by but one test every fifth heat. The balance shows a test for every heat rolled.

Eighty-lb. rail, rolled with 20 passes, receiving a blow of 2,000 lbs. falling freely, 20 ft. Rail resting on supports three feet apart. Deflection measurements taken with a three feet straight edge, measurements reading in inches, quarters, eighths and sixteenth inches. These tests gave an average deflection of 2.32 in. on 192 tests, representing about 1,500 tons of rails.

In conclusion, the tests show an average deflection of 0.72 in. greater on rails rolled in 20 passes, than on rails rolled in 23 passes, proving most conclusively that where the rails get the greater amount of work and are finished at a lower temperature, they are much finer grained and to a very great degree stiffer than where the steel is tortured into shape by insufficient passes.

I give the test and analytical reports verbatim herewith.

Heat No.	Defl;	Car.	Heat No.	Defl;	Car.	Heat No.	Defl;	Car.
64353	1 8	0.51	64387	1.6	0.50	64381	1.6	0.50
64354	1.6	0.51	64388	1.9	0.51	64382	1.6	0.50
64355	1.6	0.51	64389	1.7	0.51	64383	1.7	0.50
64356	1.6	0.50	64390	1.8	0.50	64384	1.8	0.50
64357	1.5	0.51	64391	1.7	0.52	64385	1.7	0.51
64358	1.5	0.51	64392	1.9	0.52	64386	1.9	0.52
64359	1.6	0.51	64393	1.9	0.52	64387	1.8	0.50
64360	1.5	0.52	64394	1.8	0.50	64388	1.8	0.52
64361	1.6	0.52	64395	1.8	0.52	64389	1.6	0.52
64362	1.5	0.52	64396	1.9	0.51	64390	1.9	0.52
64363	1.7	0.52	64397	1.7	0.51	64391	1.8	0.50
64364	1.9	0.52	64398	1.9	0.51	64392	1.7	0.52
64365	1.8	0.51	64399	1.9	0.51	64393	1.8	0.50
64366	1.6	0.51	64380	1.5	0.52	64394	1.7	0.50

AVERAGE ANALYSIS.

Silicon	Phosphorus	Manganese	Carbon	Sulphur—August 6th, 1907.
0.102	0.086	0.93	0.51	0.049

REPORT OF TESTS ON RAILS MADE IN 20 PASSES.

Heat No.	Defl;	Car.	Heat No.	Defl;	Car.	Heat No.	Defl;	Car.
80338	2-5/16	0.54	80351	2-3/8	0.53	80384	2-1/2	0.56
80339	2-5/16	0.53	80362	Broke	0.52	80385	2-3/16	0.54
80340	2-3/16	0.52	Retest	2-1/4		80386	2-1/16	0.62
80341	2-3/8	0.55	"	2-1/8		80387	2	0.53
80342	2-3/16	0.54	80363			80388	2-1/16	0.56
80343	2-5/16	0.56	80364	2-9/16	0.56	80389	1-7/8	0.63
80344	2-3/8	0.54	80365	2-3/8	0.56	80390	2-1/16	0.57
80345	2-1/4	0.52	80366	2-3/8	0.53	80391	2	0.53
80346	2-1/4	0.53	80367	2-1/16	0.52	80392	2-1/8	0.54
80347	2-1/4	0.56	80368	2-5/16	0.55	80393	2-3/16	0.55
80348	2-1/2	0.52	80369	2-3/16	0.54	80394	2-1/8	0.63
80349	2-5/16	0.56	80370	2-1/8	0.53	80395	2-3/16	0.53
80350	2-3/16	0.54	80371	2-1/4	0.53	80396	2-1/8	0.52
80351	2-3/8	0.53	80372	2-1/4	0.55	80397	2-3/16	0.54
80352	2-1/8	0.56	80373	2-3/16	0.54	80398	2-1/8	0.56
80353	2-3/16	0.54	80374	2-3/16	0.53	80399	2-3/16	0.56
80354	2-1/4	0.52	80375	2-3/16	0.56	80400	2-3/16	0.54
80355	Broke	0.53	80376	2-3/16	0.52	80401	2-3/16	0.63
Retest	2-3/16		80377	2-1/8	0.55	80402	2-1/16	0.65
"	2-3/8		80378	2-1/8	0.53	80403	2	0.53
80356	2-1/8	0.53	80379	2-1/4	0.53	80404	2-1/8	0.56
80357	2-1/4	0.55	80380	2-5/16	0.54	80405	2-3/8	0.53
80358	2-1/2	0.54	80381	2-3/16	0.53	80406	2-1/8	0.63
80359	2-1/4	0.53	80382	2-1/4	0.53	80407	2-3/16	0.54
80360	3-1/8	0.52	80383	2-1/4	0.55	80408	2-1/4	0.66
80409	2-5/16	0.55	80421	2-3/16	0.56	80432	2-3/16	0.56
80410	2-5/16	0.54	80422	2-5/16	0.56	80433	2-1/4	0.56
80411	2-5/16	0.50	80423			80434		
80412	2-3/16	0.56	80424			80435		
80413	2-1/16	0.55	80425	2-5/16	0.54	80436	2-3/16	0.56
80414	2-1/8	0.54	80426	2-3/16	0.53	80437	2-1/4	0.56
80415	2	0.57	80427	2-5/16	0.53	80338	2-1/8	0.53
80416	2-1/16	0.57	80428	2-1/8	0.54	80339		
80417	2-1/8	0.56	80429			80340	2-1/16	0.53
80418			80430	2-1/4	0.53	80341	2-1/4	0.55
80419	2-5/16	0.53	80431	2-3/16	0.55	80342	2-5/16	0.53
80420	2-1/8	0.54						

AVERAGE ANALYSIS.

Silicon	Phosphorus	Manganese	Carbon	Sulphur—June 29th, 1907.
0.05	0.078	0.90	0.54	0.072
0.04	0.068	0.92	0.54	0.069

Heat No.	Defl;	Car	Heat No.	Defl;	Car.	Heat No.	Defl;	Car.
84441	2-5/8	0.52	84473	2-5/16	0.54	84503	2-3/8	0.53
84442	2-1/4	0.54	84474	Broke	0.50	84504	2-3/16	0.54
84443	2-3/8	0.54	Retest	2-7/16		84505	2-1/4	0.50
84444	2-5/8	0.55	"	2-9/16		84506	2-3/8	0.52
84445	2-1/4	0.53	84475	2-1/2	0.53	84507	2-1/4	0.56
84446	2-1/2	0.56	84476	2-5/8	0.51	84508	2-1/2	0.51
84447	2-1/4	0.51	84477	2-7/16	0.53	84509	9/16	0.50
84448	2-5/16	0.50	84478	2-5/8	0.50	84510	2-1/2	0.56
84449	2-5/16	0.53	84479	2-1/2	0.51	84511	2-9/16	0.50
84450	2-1/2	0.51	84460	2-1/4	0.53	84512	2-3/8	0.50
84451	2-1/2	0.53	8448.	2-1/2	0.55	84513	2-1/2	0.51
84452	2-1/2	0.50	84482	2-5/8	0.53	84514	2-5/8	0.53
84453	2-5/8	0.54	84483	2-7/16	0.50	84515	2-3/8	0.54
84454	2-3/8	0.52	84484	2-1/4	0.52	84516	2-1/2	0.50
84455	2-1/4	0.51	84485	2-3/4	0.50	84517	2-5/16	0.56
84456	2-3/4	0.50	84486	2-3/4	0.52	84518	2-7/16	0.50
84457	2-5/8	0.53	84487	2-5/8	0.54	84519	2-5/8	0.51
84458	2-1/2	0.54	84488	2-3/8	0.53	84520	2-1/2	0.50
84459	2-1/2	0.51	84489	2-9/16	0.50	84521	2-3/8	0.54
84460	2-1/2	0.53	84490	2-1/2	0.51	84522	2-5/8	0.53
84461	2-3/8	0.50	84491	2-1/2	0.53	84523	2-3/4	0.56
84462	2-1/4	0.56	84492	2-1/2	0.52	84524	2-3/8	0.53
84463	2-5/8	0.53	84493	2-1/2	0.50	84525	2-3/8	0.55
84464	2-1/8	0.53	84494	2-3/8	0.51	84526	2-1/2	0.51
84465	2-3/8	0.50	84495	2-1/4	0.53	84527	2-9/16	0.51
84466	2-3/16	0.54	84496	2-1/2	0.50	84528	2-1/2	0.53
84467	2-1/4	0.52	84497	2	0.52	84529	2-3/16	0.54
84468	2-1/2	0.51	84498	2-1/2	0.54	84530	2-3/16	0.54
84469	2-1/2	0.53	84499	2-1/2	0.51	84531	2-3/16	0.50
84470	2-3/4	0.50	84500	2-7/16	0.50	84532	2-5/8	0.53
84471	2-3/8	0.53	84501	2-3/8	0.55			
84472	2-1/2	0.51	84502	2-3/8	0.54			

AVERAGE ANALYSIS.

Silicon	Phosphorus	Manganese	Carbon	Sulphur—Sept. 11th, 1907.
0.04	0.078	0.91	0.523	0.075

REPORT OF TESTS ON RAILS MADE IN 23 PASSES

Heat No.	Defl;	Car	Heat No.	Defl;	Car.	Heat No.	Defl;	Car.
58970	Broke	0.50	58975	1.7	0.50	58982		0.50
Retest	1.4		58976		0.52	58983		0.49
"	1.7		58977		0.49	58984		0.49
58971		0.49	58978		0.47	58985	1.7	0.50
58972		0.50	58979		0.50	58986		0.49
58973		0.51	58980	1.7	0.49	58987		0.50
58974		0.53	58981		0.51	58988		0.51

AVERAGE ANALYSIS.

Silicon	Phosphorus	Manganese	Carbon	Sulphur	
0.079	0.089	0.99	0.50	0.060	May 28th, 1907.

Heat No.	Defl;	Car.	Heat No.	Defl;	Car.	Heat No.	Defl;	Car.
58989		0.50	59026		0.49	59062		0.51
58990	1 6	0.49	59027		0.50	59063		0.52
58991		0.49	59028		0.50	59064		0.51
58992		0.47	59029		0.51	59065	1.5	0.50
58993		0.50	59030	1.5	0.52	59066		0.49
58994		0.50	59031		0.52	59067		0.50
58995	1.5	0.51	59032		0.52	59068		0.51
58996		0.50	59033		0.51	59069		0.51
58997		0.49	59034		0.52	59070	1.6	0.52
58998		0.50	59035	1.6	0.51	59071		0.52
58999		0.50	59036		0.51	59072		0.51
59000	1.7	0.51	59037		0.52	59073		0.50
59001		0.51	59038		0.52	59074		0.49
59002		0.50	59039		0.52	59075	1.5	0.50
59003		0.51	59040	1.4	0.51	9076		0.51
59004		0.50	59041		0.50	59077		0.51
59005	1.6	0.50	59042		0.47	59078		0.52
59006		0.49	59043		0.50	59079		0.52
59007		0.49	59044		0.51	59080	1.6	0.51
59008		0.50	59045	1.5	0.50	59081		0.50
59009		0.50	59046		0.50	59082		0.49
59010	1.5	0.49	59047		0.49	59083		0.49
59011		0.50	59048		0.50	59084		0.50
59012		0.50	59049		0.51	59085	1.5	0.51
59013		0.50	59050	1.7	0.51	59086		0.52
59014		0.50	59051		0.50	59087		0.52
59015	1.5	0.50	59052		0.50	59088		0.51
59016		0.50	59053		0.52	59089		0.51
59017		0.51	59054		0.52	59090	1.4	0.52
59018		0.51	59055	1.5	0.51	59091		0.51
59019		0.52	59056		0.50	59092		0.51
59020	1.6	0.51	59057		0.50	59093		0.50
59021		0.52	59058		0.49	59094		0.49
59022		0.52	59059		0.49	59095	1.6	0.50
59023		0.51	59060	1.6	0.50	59096		0.51
59024	1.5	0.51	59061		0.51	59097		0.52
59025	1.5	0.50				59100	1.6	0.51

AVERAGE ANALYSIS.

Silicon	Phosphorus	Manganese	Carbon	Sulphur—May 29th, 1907.
0.101	0.085	0.95	0.50	0.061

Heat No.	Defl;	Car.	Heat No.	Defl;	Car.	Heat No.	Defl;	Car.
59101		0.51	59112		0.51	59121		0.51
59102		0.50	59113		0.51	59122		0.50
59103		0.50	59114		0.52	59123		0.51
59104		0.52	59115	1.8	0.50	59124		0.51
59105	1.5	0.51	59116		0.52	59125	1.6	0.50
59106		0.51	59117		0.51	59126		0.52
59107		0.51	59118		0.51	59127		0.51
59108		0.52	59119		0.51	59128		0.51
59109		0.51	59120	Broke	0.52	59129		0.52
59110	1.7	0.50	Retest	1.5		59130	1.5	0.50
59111		0.50	"	1.4				

AVERAGE ANALYSIS.

Silicon	Phosphorus	Manganese	Carbon	Sulphur—May 30th, 1907.
0.102	0.082	0.96	0.51	0.060

Heat No.	Defl;	Car	Heat No.	Defl;	Car.	Heat No.	Defl;	Car.
64309	1.4	0.52	64324	Broke	0.50	64337	1.6	0.51
64310	1.5	0.50	Retest	1.6		64338	1.5	0.51
64311	Broke	0.51	"	1.6		64339	1.5	0.50
Retest	1.6		64325	1.3	0.52	64340	1.4	0.51
"	1.6		64326	1.1.4	0.50	64341	1.7	0.50
64312	1.5	0.51	64327	1.3	0.50	64342	1.6	0.51
64313	1.5	0.50	64328	Broke	0.50	64343	Broke	0.51
64314	1.5	0.50	Retest	1.6		Retest	1.6	
64315	Rejot'd	0.50	"	1.7		"	1.6	
64316	1.6	0.52	64329	1.5	0.50	64344	1.7	0.51
64317	1.6	0.52	64330	1.5	0.51	64345	1.6	0.51
64318	1.3	0.52	64331	1.4		64346	1.6	0.51
64319	1.4	0.51	64332	1.3	0.51	64347	1.6	0.52
64320	1.6	0.50	64333	1.3	0.52	64348	1.5	0.51
64321	1.5	0.51	64334	1.4	0.52	64349	1.4	0.51
64322	1.4	0.50	64335	1.3	0.52	64350	1.7	0.50
64323	1.4	0.51	64336	1.5	0.51	64351	1.8	0.51
						64352	1.6	0.61

AVERAGE ANALYSIS.

Silicon	Phosphorus	Manganese	Carbon	Sulphur—Aug. 5th, 1907.
0.102	0.086	0.93	0.51	0.049

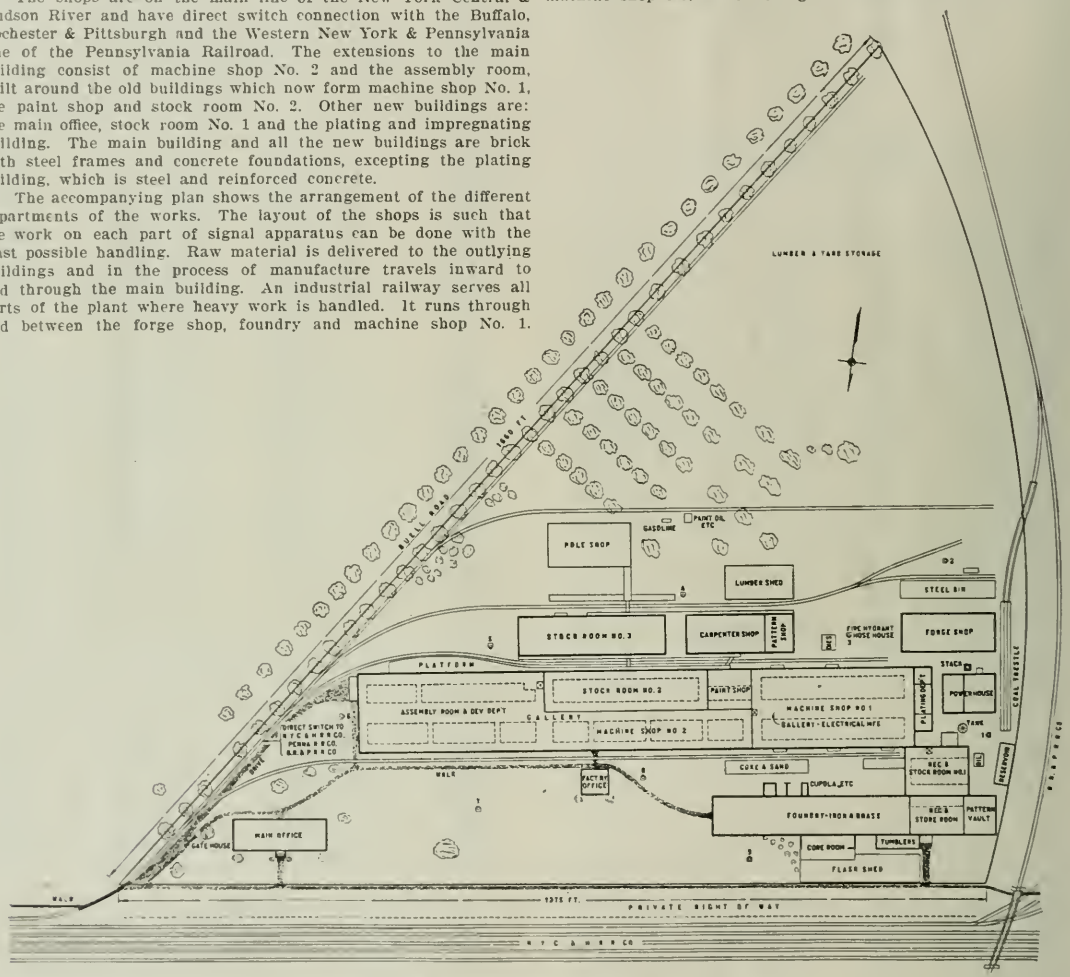
Results of Drop Tests of Rails Made in 23 Passes, Compared With 20 Passes.

The Enlarged Shops of the General Railway Signal Company.

The General Railway Signal Company was formed in 1904, and acquired the Taylor Signal Company, Buffalo, N. Y., and the Pneumatic Signal Company, Rochester, N. Y. A year ago the company decided to combine the two plants on the 25 acres of land owned at Rochester. Accordingly, the Buffalo property has been sold and the Rochester shops enlarged to make room for the machinery bought from Buffalo.

The shops are on the main line of the New York Central & Hudson River and have direct switch connection with the Buffalo, Rochester & Pittsburgh and the Western New York & Pennsylvania line of the Pennsylvania Railroad. The extensions to the main building consist of machine shop No. 2 and the assembly room, built around the old buildings which now form machine shop No. 1, the paint shop and stock room No. 2. Other new buildings are: the main office, stock room No. 1 and the plating and impregnating building. The main building and all the new buildings are brick with steel frames and concrete foundations, excepting the plating building, which is steel and reinforced concrete.

The accompanying plan shows the arrangement of the different departments of the works. The layout of the shops is such that the work on each part of signal apparatus can be done with the least possible handling. Raw material is delivered to the outlying buildings and in the process of manufacture travels inward to and through the main building. An industrial railway serves all parts of the plant where heavy work is handled. It runs through and between the forge shop, foundry and machine shop No. 1.



Rochester Shops of the General Railway Signal Company.

Material for foundry work and immediate use in the machine shop is brought in on the spur nearest the New York Central tracks. Metal for the foundry is delivered directly to that building, while steel bars and similar partly finished material goes into stock room No. 1. The store room adjoining the foundry is for rough castings. From these two rooms the work is carried into machine shop No. 1. Similarly, on the other side of the plant, lumber, and the steel for the forge shop are brought, respectively, to the carpenter shop and the steel bin. The rough forgings then also go into machine shop No. 1.

The main building is two stories high, the second story consisting of galleries running around the sides and down the middle. All heavy work remains on the ground floor throughout its progress toward the assembly room, while the lighter work remains in the galleries, thus no work has to be lifted to a higher level except at the start, when the material for lighter work coming from the forge, foundry and stock room No. 1 is raised to the gallery on an elevator in machine shop No. 1. On the ground floor of this shop the machinery is along two aisles; the planers and millers for work on heavy castings are on the side nearest the foundry and the heavy lathes used for forgings are on the opposite side, while the comparatively light work is done in the middle. The work in the galleries of this shop is mostly winding of armatures and magnets and machine work on small parts. At the rear of the large machine shop is the plating department. Electro plating is done on the first floor and on the second coils are impregnated with the insulating compound.

Before going to the assembly room, most of the work, particularly the castings, passes through the paint shop; those parts that are already finished go into stock room No. 2, while others go into machine shop No. 2. On the ground floor of this shop the heavy parts are finished. This work consists mostly of boring, reaming and tapping, so that everything is ready for the final assembling. Here, also, is the punching department, where laminated armature cores are made. The galleries of machine shop No. 2 are really the assembling department for the lighter parts which come from the galleries of machine shop No. 1. The final assembling of light parts is done in the galleries of the assembly room and these parts are then taken down to the first floor, where the heavy parts are being assembled, and there attached. The experimental and developing departments, the tool making department, and a testing department are also in the galleries of the assembly room. The finished machines and parts are taken from the ground floor of the assembly room into stock room No. 2 and stock room No. 3, or are loaded directly into the cars. Stock room No. 2 is also used as a store room for finished parts waiting to be assembled; No. 3 is particularly for finished repair parts. As shown in the plan, shipping platforms extend along almost the entire length of the main building and on the other side of the track along stock room No. 3 and the carpenter shop, so that there is room to load 27 freight cars simultaneously.

Motor drive is used throughout the shops, most of the tools

being driven in groups. The power house is equipped with four Babcock & Wilcox 200-h.p. boilers. A 200-k.w. generator is driven by a Skinner-Corliss engine, a 150-k.w. generator by a Westinghouse vertical compound engine and a 20-k.w. generator by a Buffalo Forge Co. vertical engine. A Chicago Pneumatic Tool Co. air compressor, with a capacity of 809 cu. ft. of free air per minute, supplies air for pneumatic tools. The old buildings were formerly heated with direct live steam, but direct exhaust steam is now used. In the new buildings the ventilation and heating are combined in a system developed by the contractors, the exhaust steam is carried from the power house to separate heating stacks for each building, the heated air being circulated by motor-driven fans.

Work on the improvements was started last January and the buildings were finished before the removal of machinery from Buffalo began. This transfer of machinery had to go on without interrupting production, so it was done piecemeal. The work done by each Buffalo machine was rushed for a few days before its removal so as to leave enough behind it for other machines to work on until it was in operation again at Rochester. In some cases, of course, other machines could be put on the work ordinarily done by the machine which was in transit. The last piece of machinery was transferred about three weeks ago.

The erection of the new buildings and the moving and reinstalment of the Buffalo equipment were carried out by Westinghouse, Church, Kerr & Co., New York. H. O. Pond was Engineer in Charge.

Rochester Shops of the General Railway Signal Company.

Ocean Rates on Grain.

The following table, from the *Monthly Summary of Commerce and Finance*, published by the Department of Commerce and Labor, shows the mean ocean freight rates on grain from the United States to six leading destinations in Europe for the three months ending November 30, 1905-1907.

(Cents per 100 lbs.)

Ports	Three months ending Nov. 30		
	1905.	1906.	1907.
To Liverpool, from—			
Boston	8.34	5.25	7.06
New York	8.60	5.08	7.24
Baltimore	8.78	6.43	8.30
New Orleans	13.20	12.32	*10.93
To Hamburg, from—			
Boston	13.09	11.78	10.06
New York	13.98	8.45	9.15
Baltimore	11.38	9.16	9.97
New Orleans	14.09	13.14	*12.03
To Rotterdam, from—			
New York	12.21	7.66	9.85
Baltimore	10.92	9.99	10.75
New Orleans	14.44	12.91	*12.54
To Copenhagen, from—			
Boston	12.81	9.79	14.88
New York	15.58	9.11	12.95
Baltimore	...	...	12.28
New Orleans	16.03	14.41	*15.82
To Marseilles, from—			
New York	10.76	14.10	12.49
New Orleans	18.77	18.20	*18.38
To "Cork for orders," from—			
New York (nominal)	14.38	12.67	12.17
Baltimore	15.00	11.78	12.05
Portland, Ore.	29.00	29.46	30.43
Seattle and Tacoma	27.96	28.06	32.29

*Mean, Sept. 1 to Nov. 20, 1907, inclusive.

The south island of New Zealand, which is about 500 miles long from northeast to southwest, is divided by a lofty range of mountains generally not far from the west coast, while the chief population is between the mountains and the east coast. Communication between sailing ports on the two coasts, only 140 miles apart, is now made by sailing half way around the island, some 600 miles, though the railroad termini on the two sides of the pass are not 40 miles apart. The colony has recently contracted with Murdoch McLean to make a tunnel 5¼ miles long through the range at Arthur Pass, through which the railroad will be extended. It is expected to be five or six years before the tunnel is finished. It will cost about $2,400,000.

The Organization and Working of Wrecking Outfits.*

The committee believes that the wrecking crews should be in charge of the mechanical and car department, as men employed in these departments are more able to handle derailed and wrecked engines and cars than other classes of railroad employees. The wrecking crews when out on the road and at wrecks should be under the authority of the superintendent of the division the wreck is on. Co-operation of the employees and heads of different departments are needed to facilitate the clearing of wrecks and repairing the damaged track, in order to reopen the road for traffic as quickly as existing conditions will permit.

At each division headquarters on busy lines where traffic is heavy and fast, a wrecking outfit and crew should be located. Such outfit should consist of a 50 to 100-ton steam wrecking derrick, a tool car to contain all necessary tools and blockings, a car for track material, a car for extra trucks, and a commissary car supplied with a cook stove.

The wrecking outfit should be in charge of a good wrecking master and 10 competent car repairers. The steam derrick should be in charge of a good engineer and fireman. At a wreck, in addition to these two men a good reliable man should be stationed on the steam derrick to take the orders and signals from the wrecking master and give them to the engineer, as the latter cannot hear the orders and see the signals given by the wrecking master and attend to the swinging of the boom and other work on the derrick.

The derrick and cars belonging to the wrecking outfit should be placed on a special track at division headquarters—a track that at no time will be blocked, but that can be approached at all times quickly with an engine, so there will be no delay caused at the starting point by not getting the wrecking outfit ready to start on short notice.

In order to always have the proper force ready for the wrecking crew, the master wrecking foreman, as well as the men needed for assistance, should be employed in the car department at their shops or repair yards. The engineer and fireman for the derrick should be employed either at the engine house or machine shop, in order that they can be called on short notice. During working hours the best method for calling wrecking crews is the shop whistle, which should be two long blasts, so it can be distinguished from any other use of the whistle. After working hours and at nights the crew should be called by telephone, electric bells or swift callers.

The wrecking train should be taken to the wreck by the first engine and train crew available.

For emergency use, a small supply of canned goods and coffee

*A committee report presented to the Chicago Convention of the Roadmasters' and Maintenance of Way Association.

should be kept in the commissary car, so that in serious wrecks the wrecking force can be supplied with lunch, until such time as the men can be conveniently spared to go to regular hotels for meals. If the roads are so located that hotels or eating houses are far apart, meals should be provided in the commissary cars for the wrecking crews.

The head of the track department and the section foreman of the division on which the wreck occurs should be advised by the train despatcher as promptly as possible of the nature of the wreck as reported to him by the train crew in charge of the wrecked train, so that the head of the track department can order to the wreck whatever track men may be needed to take care of the damaged track and give the wrecking crew what assistance they need.

The wrecking outfit should be provided with a good supply of different sized pine and oak blockings from 1 in. plank to 2, 3 and 6 in. thicknesses and from 24 to 36 in. long; also a supply of wooden wedges of different sizes. Four to six 20 to 50-ton jacks should be kept in the tool car. However, with a 75 to 100-ton steam wrecking derrick, jacks are not needed or used much, the derrick doing the work much quicker than jacks would.

Four ¾-in. x 15-ft. truck chains with a grab hook at each end and a ring in the center should be kept in the tool car. Two large and two small grab hooks to be used to turn over car frames and car bodies are a much needed article in connection with the steam wrecking derrick, since with a properly constructed grab hook attached to the cable of the steam wrecker and the hook properly placed, a box car body can be rolled over very quickly to clear obstructed tracks. At least 20 chains, including ⅝-in., ¾-in., ⅞-in. and 1-in. sizes, 15 ft. long, should be kept in the tool car to be used in chaining trucks to body of cars, and lifting and chaining cars together, where draft rigging and couplers are broken. In addition to these chains there should be at least six chains 1¼ in. in diameter and 20 ft. long for heavy lifts. There should be four wire cables 2 in. in diameter by 20 ft. long to roll and lift cars and engines. There should be at least four hemp ropes from 1 to 3 in. in diameter and from 200 to 300 ft. long, with the proper sized snatch blocks. There should be two guy anchors, four wrecking frogs, a good supply of tools such as sledges, chisels, hammers, wrenches, as may be needed to disconnect bent and twisted rods. There should be carried in the wrecking car a full set of track tools, such as claw bars, lining bars, spike mauls, track wrenches, track chisels, shovels, picks with handles and track gages for emergency cases. Scoop shovels and baskets and bags to handle and transfer grain.

The car with track material should be supplied with 20 rails, and the fastenings for same, of the pattern used on the main line, one switch complete, one right hand and one left hand spring frog of same angle used on main line, two guard rails, 100 to 150 ties, five kegs of spikes and two kegs of bolts.

The first aim in case of wrecks should be to clear the track and reopen it for traffic. After traffic is moving the wreck should be picked up, cars unfit for future use burned and scrap picked up as soon as possible, as portions of wrecked cars look very unsightly along railroad tracks.

Damaged freight should be reloaded and turned over to the claim department for adjustment. In serious accidents where a large amount of freight has been damaged or stock killed or injured, the claim department should be advised so they can have one of their agents at the wreck.

In passenger wrecks the first aim should be to take care of the injured persons. Medical assistance should be called from the nearest villages and cities, and every possible effort made to get physicians to the wreck as quickly as possible. The wrecking outfit should also be supplied with two or more stretchers and blankets to carry injured persons to a place of safety.

Two wrecks seldom occur alike. It therefore requires the best of judgment and mechanical skill to handle all wrecks with facility and promptness and reopen the blocked road with the least delay.

The report is signed by C. Buhrer, W. H. Kofmehl, A. Boydston and B. A. West.

William Bliss.

William Bliss, President of the Boston & Albany, died last Saturday at his home in Boston. Mr. Bliss was the active head of this corporation for over a quarter of a century, but since the lease of the road to the New York Central & Hudson River his office was only a formality. He was born in Springfield, Mass., in 1834. He worked in a store there and later went to New York. In 1865 he was made Assistant to President C. W. Chapin, of the Western Railroad, who was his father-in-law, and the next year he was made General Freight Agent. In 1872, the road having been consolidated with the Boston & Worcester, Mr. Bliss was made General Manager of the new company, the Boston & Albany. In 1878 Mr. Chapin retired and was succeeded by Vice-President D. W. Lincoln, and Mr. Bliss became Vice-President, retaining the office of General Manager. In 1880 Mr. Lincoln was killed in an accident and Mr. Bliss succeeded him. During the 20 years of his active work as President, he was always in close personal touch with every department of the road. He was just and considerate in his treatment of employees and they in turn were loyal to him and the road. During the panic of 1893 he insisted on paying wages in cash in spite of the example of many large roads which used checks or scrip. Like many railroad men of a quarter of a century ago, his jealousy of the independence of his road made him particularly conservative in establishing relations with connecting lines. The Boston & Albany was, however, always connected with the New York Central (of which Mr. Bliss was a director) and the lease, seven years ago, was a natural development. This spirit of independence in traffic relations was in large degree a concession to public sentiment, which, in Massachusetts, was almost synonymous with stockholders' sentiment. It by no means meant a paucity of the spirit of enterprise, however, and in some important respects the Boston & Albany was a leader. Its track was early put in the front rank, as Mr. Dudley's records, published in the *Railroad Gazette*, will show; and the company was one of the first to pay premiums to roadmasters and foremen. Structural economy and taste in design of passenger cars was a noticeable feature of the service of the road, and station buildings of real architectural character, surrounded by grounds laid out by competent landscape gardeners, in sympathy with the architect, were common on this road when few others had even begun to deal systematically with æsthetics. In all these features Mr. Bliss was the moving spirit.

William Bliss.

Railroads in Venezuela.

Venezuela has 13 railroads, the longest 111 miles long, and no other as much as 50. They are for the most part lines which climb the hills from the sea towards the interior, and have steep grades. On one line for 2½ miles there is a grade of 449 ft. per mile, worked by the cog-wheel system, and there are other grades of 213 ft., 185 ft. and 158 ft. Few of the lines connect with others, and there is a menagerie of gages. About half the mileage is of 42-in. gage, nearly a quarter of 36-in., a fifth of 24-in. and a little of meter gage and one of 25-in. The longest line is a German enterprise. Almost all the rolling stock was built in the United States. The aggregate length June 30, 1906, was 523 miles, and the gross earnings were at the average rate of $3,515 per mile; the net, one-third as much.

Proposed Rules for Interchange of Cars in Europe.*

At a meeting of the International Conference of the Union for the Standardizing of Railways held at Berne, Switzerland, May 6 to 18, 1907, a code of rules governing the interchange of cars between countries in Europe was drawn up to be submitted to the 17 states represented in the conference for adoption. A limited code of rules specifying the standard gage of track and a few requirements in the matter of construction of interchange rolling stock has been in force since 1886. A customs agreement covering the movement of goods in bond has also been in force since 1886. These two codes, somewhat modified, have been combined and expanded by the addition of rules dealing with the maintenance of cars and methods of loading. The Conference discussed the advisability of adopting automatic couplers and continuous train brakes on all freight cars but no action was taken. It concluded that as yet no existing pattern of automatic coupler had been proved, by sufficiently prolonged trial, to satisfy all requirements, and that, therefore, it was not yet necessary to propose that the European railroads should give up the coupling systems at present in use. It decided that the time had not yet come to arrive at any definite conclusion as regards any such coupler.

The proposed rules covering the maintenance of rolling stock and loading of cars are given below:

1. Cars used for international traffic must be kept in a proper state of maintenance so as in no manner to imperil the safety of the working. If that is not the case, more especially, if the cars do not satisfy the conditions specified under Secs. 2 to 4, or if they show one of the defects enumerated under Sec. 5, they can be refused.

2. When a car passes over on to the system of an adjoining country, the time which has elapsed since the last general overhaul must not exceed three years. All cars, however, whether loaded or not, still capable of running and returning to their home country, must be accepted by the management of intermediate lines, even if a longer time has elapsed.

3. The axle-boxes must be filled with suitable lubricating material. Cars with periodical lubrication, if the period of lubrication has elapsed, may not leave the railroad owning them without fresh lubrication.

4. Wagons used for the transportation of cattle must be returned perfectly cleaned and disinfected.

5. DEFECTS JUSTIFYING REFUSAL:

A.—Defects in the Wheels and Axles.—1. Wheels showing any signs of having shifted on their axle.

2. Wheels having their center cracked without being loose.

3. Wheels with their rims broken across and having tires less than $1^{3}/_{16}$-in. thick at the rolling circle. Any commencing fractures at the rim, are not causes for refusal.

4. Wheels having a spoke broken across, or more than one spoke cracked, and wheels with cast-iron centers in which the majority of the spokes are out of true.

5. Solid wheels having a circular crack extending over more than one-fifth of the circle in which they are located, or having more than two radial cracks.

6. Cast iron wheels without tires, showing any cracks. Slight lines on the tread, as well as unimportant defects in the body of the wheels resulting from the operation of casting, are not causes for refusal.

7. Wheels having flanges less than $^{25}/_{32}$-in. thick at the points where they touch the rails; wheels having a cutting flange, that is to say when there has been so much wear that a sharp edge has been formed. In the case of cars with three axles, the thickness of the flanges of the middle wheels is not taken into consideration.

8. Wheels with treads showing flats worn down more than $^{5}/_{16}$-in.

9. Wheels with tires which are crushed, broken, cracked across or cracked along the circumference.

10. Wheels with separate tires, when:

(*a*) The tires are loose or show signs of lateral displacement;

(*b*) More than two of the bolts, screws or rivets fixing the tire to the rim are broken, displaced or lost;

(*c*) If secured by means of Mansell rigs: When the sides or even the treads themselves show cracks more than $3^{15}/_{16}$-in. long, or when more than two of the bolts securing the rings are broken.

11. Axles out of true or showing cracks or commencing fractures.

12. Axles on which the draw-rods of brakes or other parts rub. If the rubbing pieces can be removed and if the wear does not extend deeper than $^{3}/_{32}$-in. ($^{3}/_{16}$-in. on the diameter) and there are no sharp corners, the car must be accepted.

B.—Defects in the Axle-Boxes and Bearings.—1. Axle-boxes so damaged that they cannot guide the axle properly or cannot hold the lubricating material.

2. Bearings which have become seriously heated.

C.—Defects in the Bearing Springs.—1. Displacement of more than $^{25}/_{32}$-in. of a spring or of its back plate relatively to the axle-box when the distance between the axles furthest apart does not exceed 14 ft. 9⅛ in., and of more than $^{3}/_{16}$-in. when that distance is greater.

2. Fracture of the back plate of a bearing spring.

3. Fracture of an intermediate plate near the middle, in the case of passenger cars; and fracture of two or more intermediate plates near the middle, in the case of freight cars.

4. Fracture of a helical spring not kept in position by a stop or a bolt passing through it.

5. Absence or fracture of the parts necessary to fix the springs.

6. Body or sole bars of underframe bearing on the buckles of the bearing spring rubbing against the wheels, or showing recent traces of such contacts. Old traces of former contacts or the contact of safety supports with the outer fourth of the length of the spring do not justify refusal.

N. B.—Cars in which the distance between the axles furthest apart does not exceed 14 ft. 9⅛ in. and returning empty to the system owning them must be accepted if they have the defects specified under paragraphs 2 to 6, provided that they are [illegible] and firmly secured.

D.—Defects in the Buffing Gear.—1. Rods or springs of buffers broken or damaged so as to prevent the buffers from working.

2. Absence of the parts which prevent the buffers from dropping.

3. Buffer boxes broken or missing. Buffer boxes which although damaged still support and guide the buffers sufficiently are not causes for refusal.

N. B.—Cars returning empty to the system owning them must be accepted if they have the defects specified under paragraphs 1 to 3 if they can run without danger at the tail end of a train.

E.—Defects in the Draw Gear.—1. Chief couplings or safety couplings or chains broken, draw hooks broken or showing signs of fracture when the regulation coupling up with other cars (including both the chief coupling and the safety coupling) becomes impossible.

2. Drawbars, pins and guides broken or showing signs of fracture.

3. Absence of safety chains or of safety couplings in the case of cars not equipped so that the two chief couplings of the two cars in contact can be used simultaneously.

4. Helical drawsprings broken, or plate drawsprings with the back plate broken at any point, or one of the other plates broken near the middle.

N. B.—Cars returning empty to the system owning them, must be accepted if they have the defects specified under paragraphs 1 to 4, if they can run without danger at the tail end of a train.

F.—Defects in the Underframe and Body of Cars.—1. Axle-guards broken or cracked through more than one-third of their section, also displaced axle-guards, if they cannot be adjusted by tightening the bolts.

2. Sole bars, headstocks and any intermediate cross-framing in connection with the draw gear, broken across.

3. Parts of the frame of the body broken right through, any damage at the doors, locks, sides of the body, flooring and roof, if such damage may result in the deterioration of the load or may endanger the safety of the working.

N. B.—Cars returning to the system owning them can only be refused on account of damage to the underframe, if running such cars would entail danger.

6. Cars with brakes which are damaged or do not act, cannot be refused, but they must bear conspicuous labels with very clear lettering stating that the car is not available for braking. Damaged or loose parts which might endanger the safety of working or cause other damage, must be taken off.

7. Empty returned cars must be accepted by the system owning them, no matter what their condition may be; in the case of cars which have been used for cattle, however, this acceptance is not compulsory until after the cars have been perfectly cleaned and disinfected.

LOADING OF WAGONS.

1. Wagons used for international traffic cannot be refused if the load is in a satisfactory condition which in no way can endanger the safety of working, and if it more particularly satisfies the following conditions:

2. The articles loaded on wagons must be arranged and stowed so that they cannot shift, even in case of shock or shaking.

3. The load must be distributed as equally as possible over all the wheels of the wagon, particularly as regards the end wheels. Wagons with the load so unequally distributed that the body or sole bars touch the buckles of the bearing springs, or that it makes them rub against the wheels can be refused.

4. The load in a wagon must not exceed the load limit. When no load limit is inscribed on the wagon, an overload of 5 per cent. in addition to the normal load inscribed on the wagon, is allowed.

5. The weight per wagon wheel (the wheel load) must not exceed the maximum allowed on each line. The regulations of the managements of each line must be communicated to the States participating.

6. The load on open wagons must not project beyond the loading gage used on the different systems. The width of long loads must be reduced so as to allow for running round curves of small radius. The regulations of the management of each line must be communicated to the States participating.

7. The load on open wagons must not project beyond the head stock unless there is, between the load and the places of the buffers not compressed, a space of at least 1 ft. 3¾ in. up to 6 ft. 6¾ in. above rail level, and of at least 7⅞ in. higher up. Moreover, in order to allow coupling up to be effected, there must be a completely clear space at least 7⅞ in. in height above the drawhook, and at least 7⅞ in. wide on each side of the center line of the hook. If the load projects further beyond the headstock than here specified, a safety truck must be added.

8. For loading up long articles which cannot be carried on one single wagon, two wagons equipped with swing bolsters must be used. The wagons may be connected by screw couplings, by an iron coupler bar, or a wooden coupler bar properly strengthened by iron, by an intermediate truck connected with the two carrying wagons by coupler bars or couplings; or finally by the load itself if it can be used for the purpose and if each swing bolster is supporting a weight of at least 7.5 tons. The load must rest on the swing bolsters only; it must project beyond them at least $11^{13}/_{16}$ in., and at least 3 ft. 3⅜ in. if the load alone connects the wagons.

When any improvements or modifications in the preceding articles appear desirable, new conferences can be held, at the request of one of the states participating, the notices calling the meeting being issued by the Swiss Federal Council.

The states which have not yet adopted the rules of the union for the Standardizing of Railroads are at liberty to join the union. If so, they must give notice to the Federal Council, and the latter will inform the other states represented at the conference of the

*Abstracted from the August *Bulletin* of the International Railway Congress.

fact. By doing so, they become fully bound to observe all the rules, and entitled to all the advantages specified in those rules.

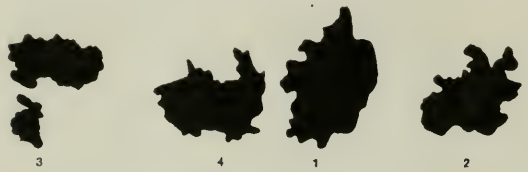
The governments concerned will inform the Federal Council before January 1, 1908, what determinations they have arrived at with reference to the present rules. When the states have notified their determinations, and at the latest on February 1, 1908, the Swiss Federal Council will propose to the governments participating a date when the present rules are to come into force. Each signatory state has the right to withdraw from the union, subject to notice given by its government, six months in advance, to the Swiss Federal Council.

Areas of Contact Between Wheels and Rails.*

BY GEO. L. FOWLER.

(Reprinted from a Volume of Reports made to the Schoen Steel Wheel Co.)

The mutual compression between the wheel and the rail when under a load has an important bearing on the durability of both and also on the adhesion of the wheels when used as drivers. The investigation was made with various types of cars and locomotives to determine the area of contact between the wheel and the rail; the average pressure exerted per square inch over this area; the



Contacts of 35-inch Steel Tired Wheel Under Cafe Car. Weight on Wheel, 6,075 lbs.

accumulated pressure at the center of this area; the yield of the metal in both the rail and the wheel under the imposed load; the relative action of the wheel and the rail under load; the comparative action of wheels of different diameters, and the comparative action of steel and cast-iron wheels.

Through the courtesy of Mr. J. F. Deems, General S. M. P. of the New York Central Lines, the preliminary work involving the use of cars and locomotives was done at the West Albany yards of the New York Central & Hudson River R. R. A concrete pier was built under one of the rails of a level piece of track to secure a firm foundation. A section about 10 in. long was cut out of the rail and a short piece with perfect contour was inserted on top of the pier. The car or locomotive, under which a wheel was to be examined, was run over this short section and one wheel allowed to rest upon it. The wheel was then raised with its mate so that the short section of rail could be removed and the top smeared with a thin coating of red lead. It was then replaced and the wheel lowered until it rested on the rail with its whole load. This made a spot on the red lead the size of the area of contact of the wheel and the rail. The wheel was again raised, the section of the rail removed, and the area of contact, as indicated by the spot on the red lead, transferred to tracing cloth. The rail was again smeared and replaced, and the wheel was turned through one-quarter of a revolution and the work repeated.

In the supplementary work in the laboratory, a section of a 78-in. tire, a section of a steel wheel and a section of a cast-iron wheel were used. One of these sections was fastened to the plunger of the testing machine and was raised and lowered on the heads of short sections of rails resting on the platen of the testing machine. The size and shape of the contact area was obtained

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Contacts of 33-inch Worn Cast Iron Wheel Under Gondola Car. Weight on Wheel 14,575 lbs.

by the interposition of a piece of white tissue paper resting on a sheet of carbon paper which made the imprint on the white paper.

The tests at West Albany were made with three cars and two locomotives. In all, 32 contacts were obtained, and plaster of Paris casts were taken of the treads of the wheels at all points at which the contact areas were obtained. Some of the wheels were new, while others were partly worn, a condition that evidently had much to do with the shape and size of the spot.

These areas were carefully measured with a planimeter and gave the following average results:

Wheels used under—	Total weight on wheels in lbs.	Average of area contact.	Average weight per sq. in. of area in lbs.
Café car (35 in.)	6,075	.2325	28,700
Gondola (33 in.)	14,575	.3775	40,100
Consolidation drivers (63 in.) .	17,325	.3350	52,080
Atlantic driver (78 in.)	19,995	.6325	31,820
Atlantic trailer (48⅜ in.) ...	19,210	.4725	44,400
Dining car (34½ in.)	9,415	.2600	37,870

In these tests, the influence of weight and diameter is partially illustrated. The two wheels of the Atlantic engine, for example, carry about the same weight. The areas of contact are nearly in an inverse ratio to the diameters. Comparing the wheels of the cafe and dining cars, the wheel with the heavier load has much the greater weight per square inch of area, showing that the metal

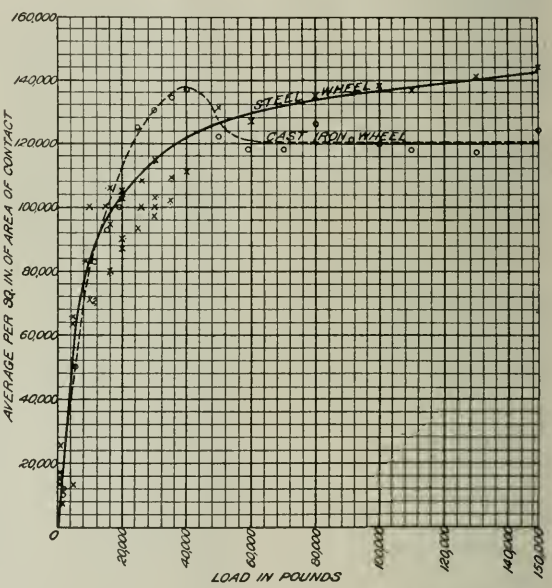


Diagram Showing the Relation Between Weights on Wheels and That on the Area of Contact Between the Wheel and the Rail.

does not yield in direct proportion to the weight, at least within the limits of the loads here imposed.

In the laboratory, the first series of tests made was to apply pressures, increasing by small increments, to the tread of a 36-in. steel wheel resting on an 80-lb. rail. The lowest load applied was 500 lbs. This was increased by increments of 500 lbs. up to 20,000 lbs.; then by increments of 1,000 lbs. up to 30,000 lbs.

The second series was made with the same wheel resting on a 100-lb. rail, starting at a load of 500 lbs. and increasing by increments of 500 lbs. up to 2,000 lbs.; then by increments of 1,000 lbs. up to 10,000 lbs.; then by increments of 2,000 lbs. up to 30,000 lbs.

The third series was made with a 78-in. tire on a 80-lb. rail, starting at 500 lbs. and then increasing by increments of 500 lbs. to 2,000 lbs.; then by increments of 1,000 lbs. to 8,000 lbs.; then by 2,000 lbs. to 30,000 lbs. and from that point by increments of 2,500 lbs. to 40,000 lbs.

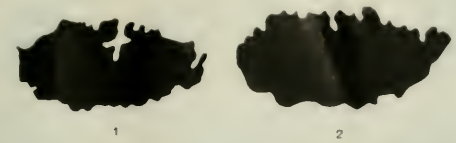
The fourth series was made with the 78-in. tire on a 100-lb. rail starting at 500 lbs. and increasing by increments of 500 lbs. to 2,000 lbs.; then by 1,000 lbs. to 8,000 lbs.; then by 2,000 lbs. to 30,000 lbs., and finally by 2,500 lbs. to 35,000 lbs.

The fifth series was made with the section of a cast-iron wheel 33 in. in diameter. This was tested on a 100-lb. rail only, starting at 500 lbs.; increasing by 500 lbs. increments to 20,000 lbs.; then by 1,000 lbs. to 30,000 lbs.; then by 2,500 lbs. to 40,000 lbs.; then by 5,000 lbs. to 150,000 lbs.

The sixth series was made with a 36-in. steel wheel on a 100-lb. rail and started at a load of 50,000 lbs. which was increased by increments of 10,000 lbs. to 150,000 lbs.

The results obtained from these tests have been plotted on the

accompanying diagram and average lines drawn which show the accumulated pressure per square inch of area under the actual loads imposed, the lines being an average of the results obtained. It will be seen, on comparing the lines of the 36-in. steel wheel and of the 33-in. cast-iron wheel, that there is comparatively little difference up to a load of 22,500 lbs. after which the load per square inch increases more rapidly with the cast iron wheel than with the steel wheel. At a load of 37,500 lbs. there is a marked breaking



Contacts of 78-inch Steel Tired Driving Wheel, Atlantic Locomotive. Weight on Wheel 19,995 lbs.

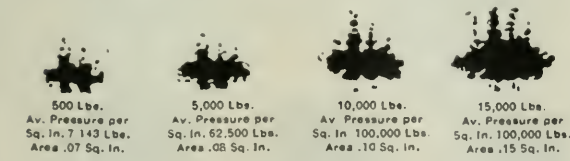
down of the metal in the cast-iron wheel showing that the crushing strength has been exceeded.

A tentative explanation of this phenomenon is that the hard chilled cast-iron wheel is practically unyielding and that, when the load is imposed, the whole of the compression takes place in the rail. The area of contact is small and the average pressure per square inch of area is high. The yield in the rail holds, for a time, against the increasing load, thus cutting down the size of the area between 22,500 lbs. and 40,000 lbs. The wheel itself then takes a permanent set, increasing the area of contact very rapidly and lowering the average. In the case of the steel wheel, yielding takes place in both the wheel and the rail, with the result that an equilibrium is established on a smaller area and the actual breaking down of the metal occurs under a higher pressure.

Contacts of 48-and-5-16-inch Steel Tired Trailer Truck Wheel, Atlantic Locomotive. Weight on Wheel 19,210 lbs.

In the case of the cast-iron wheel, it will be noted that the curve of average pressure shows a break and yield of the material at a load of 27,000 lbs. though it rises again and makes a second complete break at 37,500 lbs. from which there is no recovery. In the case of the steel wheel, the breakdown does not occur until a load of 50,000 lbs. is reached, and even then there is a gradual and practically uniform advance to 150,000 lbs.

In the tests of both the cast-iron wheel and the steel wheel, the permanent set was all in the rail. Both wheels were carefully examined with a microscope after the load of 150,000 lbs. had been imposed and the tests were completed and no appearance of yielding or cracking of either could be detected. The rail, on the other hand, showed signs of a permanent set under a load of 20,000 lbs., and this set increased with the increasing loads. The rail was

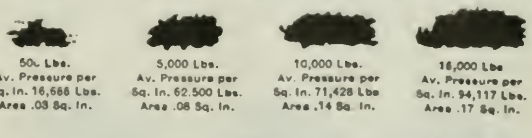


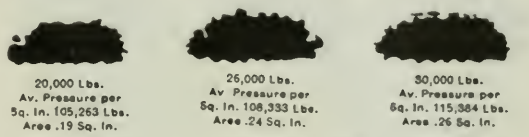
Contacts Between 36-inch Steel Tired Wheel and 80-lb. Rail.

examined immediately after applying loads of 12,000, 15,000, 25,000, 30,000, 35,000 and 40,000 lbs. The spot or depression left by the wheel could be seen after the 20,000 lbs. load had been imposed but not before.

The difference between the areas of contact of the wheels under cars and locomotives and the wheels tested in the laboratory, in which the area was larger, is probably due to the fact that the wheels under the cars and locomotives were worn somewhat hollow and so fitted the rail head to a greater extent. In service, however, the swinging of the wheels from one side of the track to the other brings the projections on the outer edge of the rim against the rail, undoubtedly causing a much higher load to be put on a smaller area of contact than was applied in the laboratory.

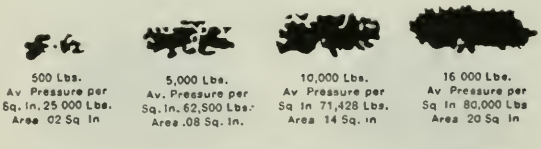
The permanent set taken by the rail at so low a load as 20,000 lbs. raised the question of the maximum pressure imposed at the center of the area of contact. It was assumed that, when the wheel first touched the rail, the area of contact would be a mathematical point if both surfaces were perfectly smooth and true. As the load is increased, the metal in both the wheel and rail yields and the area of contact increases. This increase is from the center out to the edge, and the pressure per unit of area is evidently at a maximum at the center and decreases to nothing at the edge. In order to estimate approximately the maximum pressure it was assumed that the metal in the area on which a load had once been

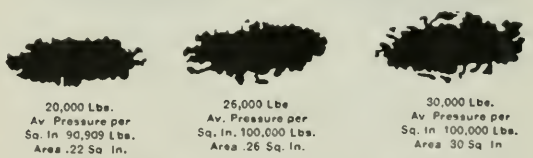




Contacts Between 36-inch Steel Tired Wheel and 100-lb. Rail.

imposed always sustained it, and by building up from the center by increments the final load was attained. Take the case of the 36-in. steel wheel on the 100-lb. rail. An area of .03 sq. in. sustained the initial load of 500 lbs., an average pressure of 16,666 lbs. per sq. in. By increasing this load to 5,000 lbs. the area is increased to .08 sq. in. If this extra 4,500 lbs. which was applied be considered as loaded uniformly over the whole area, there would be an average increase of pressure of 56,250 lbs. per sq. in., or $56,250 + 16,666 = 72,916$ lbs. per sq. in. on the original .03 sq. in. which carried the initial load of 500 lbs. This assumption runs the load up to an exceedingly high limit, possibly too high, as it

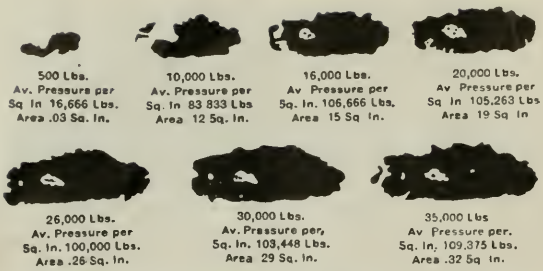




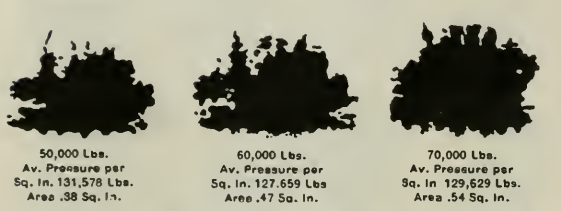
Contacts Between 78-inch Steel Tired Wheel and 80-lb. Rail.

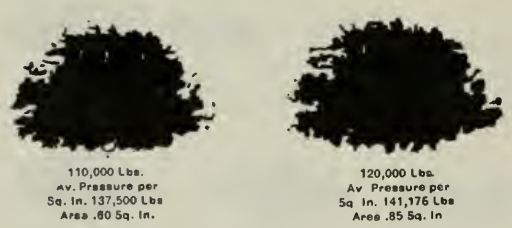
gives a pressure of more than 170,000 lbs. per sq. in. at the center of the area of contact, with a load of 20,000 lbs.

In considering the results obtained in this investigation, it must be borne in mind that the areas of contact were all obtained under static loads. Running conditions must necessarily be more severe and impose higher stresses. In an investigation conducted several years ago, it was found that the stresses in truck and body bolsters, while a car is in motion, are from 20 to 50 per cent. more than the stresses due to static loads alone. If this is true for parts located above the springs, there must certainly be an equal or greater increase at the point of contact between the wheel and the rail. Then, too, the blows received from passing over low joints or worn frogs, will raise the pressure between the wheel and the rail to a point which the tests under static loads have shown to be excessive. For example, the wheels, under a car of 100,000 lbs.

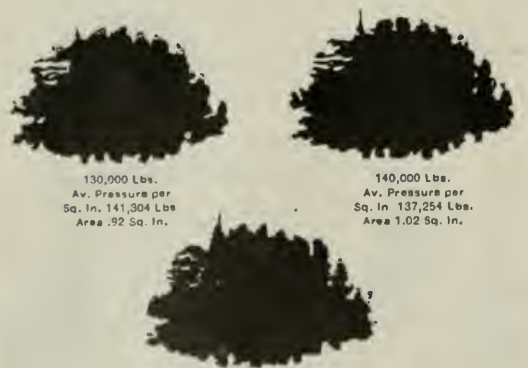


Contacts Between 78-inch Steel Tired Wheel and 100-lb. Rail.

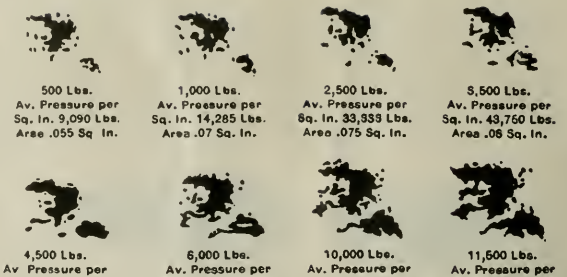


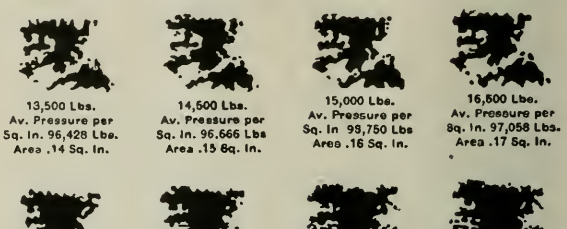


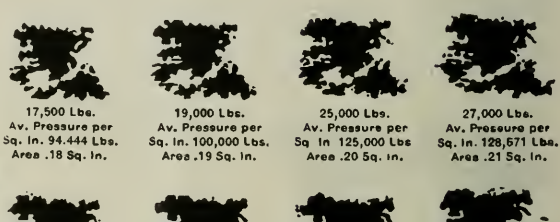
Contacts Between 36-inch Steel Wheel and 100-lb. Rail.

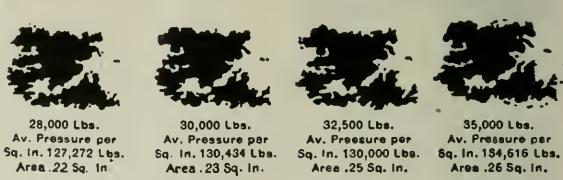


Contacts Between 36-inch Steel Wheel and 100-lb. Rail.

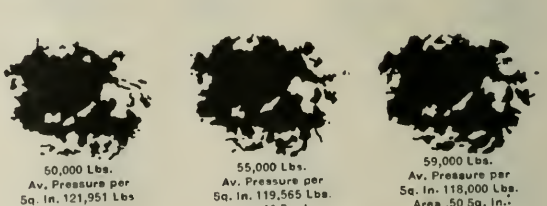


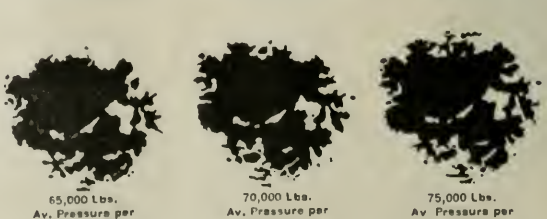




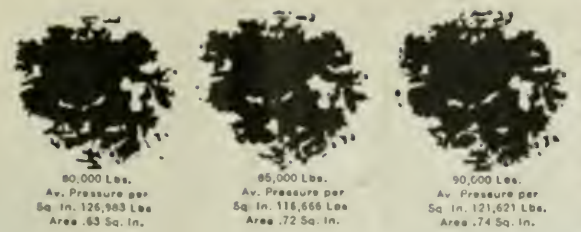


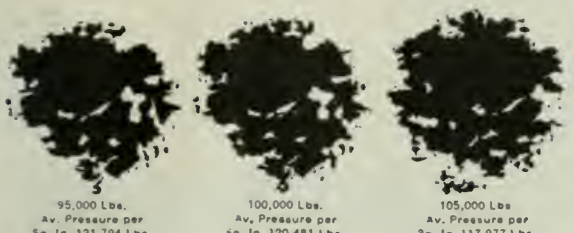
Contacts Between 33-inch Cast Iron Wheel and 100-lb. Rail.

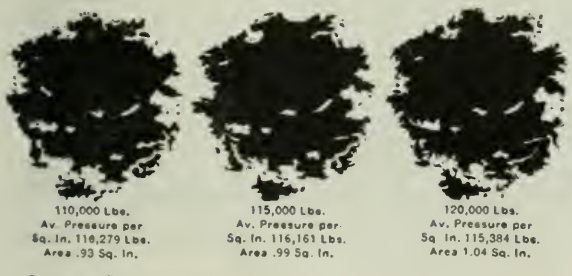




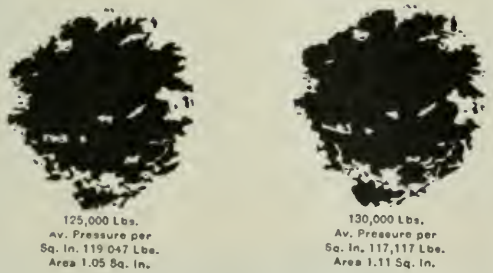
Contacts Between 33-inch Cast Iron Wheel and 100-lb. Rail.

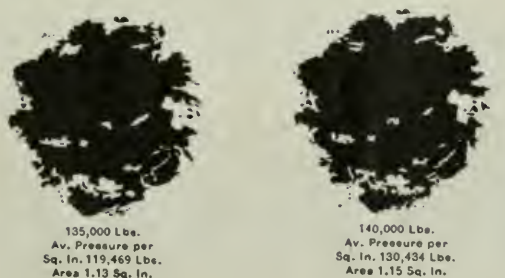






Contacts Between 33-inch Cast Iron Wheel and 100-lb. Rail.





Contacts Between 33-inch Cast Iron Wheel and 100-lb. Rail.

capacity with a 10 per cent overload carry an approximate static load of 18,750 lbs. each. A drop of [illegible] in. is equivalent to a blow of about 37 foot lbs. If the drop is checked by a yield in the rail of three-eighths of the amount of the drop [illegible] the pressure on the rail will amount to 50,000 lbs. This is certainly excessive.

Comparing the steel and cast iron wheels, it appears that no damage was done to either wheel under a static load of 150,000 lbs. If the two wheels are subjected to the pounding action of service, however, the result cannot fail to be the earlier disintegration of the harder, more unyielding and more brittle material. Exact comparative data along this line are not yet available.

The conclusions to be drawn from this part of the work may be summed up as follows:

The average pressure imposed on the metal of the wheel and rail is within safe limits at low loads, but when a load of 20,000 lbs. is reached the elastic limit of the metal is passed and a permanent set appears in the rail.

The accumulated pressure at the center of the area of contact is excessive at comparatively small loads, and is only prevented from doing injury by the support of the surrounding metal. How

Contacts Between 33-inch Cast Iron Wheel and 100-lb. Rail.

far this compression extends into the body of the two pieces of metal in contact is not known but presumably it extends down to the base of the rail and into the hub of the wheel.

Under a static load the rail yields first, owing, probably, to the fact that the metal of the surface of the head of the rail is not as well supported by the metal below as in the case of the wheel.

The effect of difference of diameter in wheels carrying the same load is insignificant and is only appreciable when the difference is great. Hence, it is immaterial, so far as stresses on the wheel or rail are concerned, whether small or large wheels, within the limit of practice, are used.

A hard, unyielding cast-iron wheel inflicts more damage on the rail than a steel wheel and the wear of the rail will be greater with the cast-iron wheels than with the steel wheels.

It is probable that the reason why the damage that would be expected from heavy wheel loads in service does not immediately appear, is that the rail, by bending under the passing wheel, increases the area of contact and thus relieves the surface stresses.

Massachusetts Street Railways.

From the annual returns of the street railway companies of Massachusetts to the railroad commissioners for the year which ended September 30, 1907, it appears that the street and interurban railway development of that state is still in advance of the requirements of the population. There are 80 companies whose returns may be considered in a summary of the situation as a whole, omitting most of those which are leased and the few which make returns but have not begun to do business. Out of these 80 there are 47 which declared no dividend at all during the year, and the official year ended before the financial depression had begun.

The highest dividend paid was 10 per cent., which was declared by the Middlesex & Boston and by the East Middlesex. The following roads come next with 8 per cent.: Holyoke; Athol and Orange; Springfield; West End (in Boston) preferred, (West End common pays 3½); Union (in Fall River), and the Dartmouth & Westport. Some of these are strong companies. The Holyoke had a year's surplus, after the dividend, of $8,479, making its total surplus $69,816. The Athol & Orange has a total surplus of $29,450, which is strong for a rural district. The Springfield rises to the large figure of $367,530 in all, its surplus for the year having been $4,698. Largest of all is the West End which, though it made only $285 surplus this year, has a total surplus of $1,150,093. The Union, with $29,851 for this year, reaches a total surplus of $208,605, which is large for Fall River. The Dartmouth & Westport, with a surplus this year of $21,823, reaches $78,731 in all. This company gets the benefit of nearness to New Bedford and Fall River.

The Worcester & Shrewsbury declared a 7.22 per cent. dividend;

the Newton & Watertown 7.2 per cent., and the Northampton 7 per cent.

Six per cent. was paid by the Fitchburg & Leominster; Linwood; Mount Tom; Pittsfield; Somerville, Winnisimmet (In Chelsea); Boston elevated, and the Boston & Worcester. The B. & W. is the principal interurban line in the state, competing with the Boston & Albany. It carries express matter, baggage and freight. The Boston elevated had a year's surplus of $33,278, and a total surplus of $668,603. The Boston & Worcester had a year's surplus of $3,034 and a total surplus of $14,951.

The Worcester Consolidated paid 5½ per cent. Five per cent. was paid by the Hampshire; the Webster & Dudley; the Worcester & Shrewsbury; the Boston & Northern; the Boston & Revere, and the Citizens' electric (in Fall River). The Old Colony (which, by consolidation, covers a large territory south of Boston) paid 4 per cent.; the Springfield & Eastern, 4; the North End (in Worcester), 3¾; the Milford & Uxbridge, 3; Newton, 2½; Uxbridge & Blackstone, 2; Natick & Cochituate, 2.

The 20 which were so unprofitable as to pay no dividends at all and besides had to show a deficit from the operations of the year, were the Haverhill & Amesbury; the Haverhill & Plaistow (N. H.); the Haverhill & Southern New Hampshire; the Marlboro & Westboro; the Worcester & Holden; the Ware and Brookfield; the Templeton; the Medfield & Medway; the Lowell, Acton & Maynard; the Lowell & Fitchburg; the Lowell & Pelham (N. H.); the Norton & Taunton; the Norwood, Canton & Sharon; the Conway; the Cottage City & Edgartown Traction; the Springfield & Eastern; the Berkshire; the Dedham & Franklin. Some of these have surpluses from former years: the Haverhill & Plaistow, $15,095; the Haverhill & Southern New Hampshire, $1,483; the Worcester & Holden, $7,065; the Lowell, Acton & Maynard, $857; the Springfield & Eastern, $14,576, and the Berkshire, $78,997.

The largest total deficits in the list are the Worcester & Southbridge, $77,395 (in spite of a surplus for the year of $13,949); the Templeton, $69,670; the Norton & Taunton, $39,870; the Norwood, Canton & Sharon, $61,407; the Blue Hill, $55,623; the Norfolk & Bristol, $61,274; the North End, $18,742; the Providence & Fall River, $20,939; the Amesbury, $19,247; the Amherst & Sunderland, $26,176.

There is constant pressure on the part of the people for better accommodations, for larger privileges of transfers, for reduced fares, especially to 5 cents within the limits of any municipality, no matter how long the distance traveled, and for more cars for working people during the hours when they are going to and from work. The railroad commissioners have tried to grant the requests of the public whenever the companies were financially able; but there have been several recent cases in which the companies were held not justified by their financial condition in doing what the public wanted. The Commission adheres closely to the principle that private persons cannot be expected to invest their money in public service at a loss, though in a few cases it has required companies to run particular cars which are unprofitable, holding that the general business of the company could bear the loss.

Passenger Cars for Tropical Climates.

A train known as No. 7 of the local series has just been built at Parel Shops of the Great Indian Peninsula Railway, Bombay, from the designs of A. M. Bell, Carriage Superintendent, which possesses some novel features in construction. The train consists of seven open cars coupled together with open gangways for the free passage of the train staff, ticket collectors, etc. The front vehicle is a third-class brake, with a compartment for women, the next a first and second class composite, with a private compartment for women, the third a second and third class composite; the fourth, fifth and sixth vehicles are third class only, and the last a third-class brake like the front one. The cars are each 62 ft. long and 10 ft. wide with the doors, which open inward, set back to 9 ft, 6 in. over. There are lavatories for each class of passengers, and the total seating capacity is for 20 first class, 90 second class and 550 third class. There is a luggage compartment at each end of the train, provided with seats, as on each journey a certain number of fishwomen invariably take possession of the front compartment and persist in remaining there with their wares.

The carriages are built on steel underframes, each running on two four-wheel trucks, with 10-ft. wheel centers. The framing of the bodies is of teak braced with diagonals from end to end, and the lower portion is matchboarded with very narrow strips of teak taken from the waste of the sawmill. The employment of these very narrow strips overcomes the difficulty of splitting—an almost certain

Combination First and Second Class Car; Great Indian Peninsula Railway.

Third Class Car; Great Indian Peninsula Railway.

failing of any wide wood panels in Utica. In this difficulty is to be found the explanation for the use of so much steel panelling on car linings built for tropical climates. Steel, however, has disadvantages. It readily takes up heat from the outer air and then tends to warm up the interiors of the carriages rather than cool them. To counteract this and protect the interior, it has been the practice in all the newer cars built for the C. I. P. Railway without exception to provide a layer of non-conducting material behind the steel sheeting. A carriage body thus consisted of three shells—viz. the outer panelling of steel, the intermediate lining of non-conductor and the internal lining of wood. Obviously, if a suitable heat resisting material could be found for the outer panels impervious to moisture and sufficiently strong to resist the bad treatment the body of a railroad carriage is subject to in service the intermediate lining could be neglected. In the train described this has been done, the outer panels above the waist are of hard "Uralite" sheet—a material largely composed of asbestos and possessing very satisfactory heat resisting properties. This is screwed to the pillars and framing in such a manner that air-tight cells are secured between the inner and outer skins of the car body in which the stagnant air further ensures the non-conductivity of the sides. The roof is similarly treated, but covered with a thin teak wood casing to offer a continuous surface for the roof canvas. About 1,000 sq. ft. of "Uralite" is incorporated in the construction of each car. To save time in the finish the lower sheeting is varnished, while the upper is painted with a quick-drying paint enamel. There is no lining except along the upper mouldings, and the letters, etc., are on embossed plates attached by screws. This procedure makes it unnecessary for the cars to wait for days in the paint shops for sizing, gilding and varnishing of letters and stripes.

Interior of Third Class Car.

The cars have a center aisle between "turn-over" seats, plain slatted wooden ones in the third class, spring seats upholstered in leather cloth in the second class and smooth-cushioned buffalo hide in the first. This style of seat enables the passengers always to face the engine and the breeze. All doors open inwardly and a simple gravity "slam" lock is provided.

The train is lighted throughout by electric light, a large dynamo of 1,000 watts being mounted under each brake and a small 250 machine under the center coach, this being the spare vehicle in case of reduction or increase of the size of the train. Punkah fans are provided in the first and second class (ladies') compartments. Alarm signal apparatus is installed in each car with handles in convenient places.

To indicate the destination of the train, prominent scarlet boards lettered in gold are used. They are illuminated at night by the front light of the electric tail side lamps.

Consumption of Ties in 1906.*

The statements in this report are based on the number of ties bought rather than on the number actually used. For all practical purposes, however, the two are identical; because the purchases in 12 months are an accurate index of consumption for a corresponding period.

The purchases of ties by steam and street railroads of the United States during the year 1906 amounted to 102,834,042, valued at $48,819,124, an average of 17 cents per tie. This value represents the cost to the purchaser at the point of purchase. In many, perhaps most, cases this point of purchase is the point of production, near the road's right of way; but in others, and this is particularly true of sawed pine ties, long shipments are involved and the point of purchase is a local distributing market distant from the source of supply. The average value of 47 cents therefore probably represents a higher rate than that received by the producer. The steam railroads purchased 91,177,625 ties, or about nine-tenths of the whole number.

Street railways as a rule use a smaller lighter tie than that required by the steam roads, so their material is less difficult to obtain.

KINDS OF WOODS USED.

Table 1 summarizes, by kinds of wood, the quantities of hewed and sawed ties purchased in 1906. Approximately one-fourth were sawed and three-fourths hewed.

TABLE 1.—*Ties Purchased by Steam and Street Railroads in 1906.*

Kind of wood.	Total.	Hewed.	Sawed.
Oaks	45,357,874	38,269,030	7,088,844
Southern pines	18,841,210	13,745,716	5,095,494
Douglas fir	7,248,562	657,934	6,590,628
Cedar	7,083,442	5,429,305	1,654,137
Chestnut	6,588,975	5,450,920	1,138,055
Cypress	5,104,496	4,448,052	656,444
Western pine	3,969,605	1,884,696	2,085,509
Tamarack	2,576,859	2,360,873	215,986
Hemlock	2,058,198	1,928,726	129,472
Redwood	1,248,629	892,687	355,942
Lodgepole pine	554,738	554,738	.....
White pine	373,387	278,270	95,117
All others	1,828,067	1,593,647	234,420
Total	102,834,042	77,493,994	25,340,048

Table 2 shows the quantity and value of hewed and sawed ties of various woods purchased by steam and street railroad companies in 1906. The average value of the sawed tie is higher than that of the hewed tie.

Oak, the chief wood used for ties, furnishes more than 44 per cent., nearly one-half of the whole number, while the southern pines, which rank second, contribute about one-sixth. Douglas fir and cedar, the next two, with approximately equal quantities, supply less than one-fifteenth apiece. Chestnut, cypress, western pine, tamarack, hemlock and redwood are all of importance, but no one of them furnishes more than a small proportion.

Oak and southern pine stand highest in both total and average value; the average value of each is 51 cents. Chestnut ranks next followed by cedar. Hemlock, at 28 cents, is the cheapest tie reported.

More than three-fourths of all ties are hewed; and with every

*Circular 124, Forest Service, Department of Agriculture.

TABLE 2.—*Number and Value of Ties Purchased by Steam and Street Railroads of the United States in 1906.*

	Total			Steam railroads.						Street railways.					
				Hewed.			Sawed.			Hewed.			Sawed.		
	No.	Value.	Ave. value, per tie.	No.	Value.	Ave. value, per tie.	No.	Value.	Ave. value, per tie.	No.	Value.	Ave. value, per tie.	No.	Value.	Ave. value, per tie.
Oaks	45,357,874	$23,278,052	$0.51	35,507,777	$17,583,827	$0.50	6,024,852	$3,672,691	$0.61	2,761,253	$1,428,711	$0.52	1,063,992	$592,820	$0.56
Southern pines	18,841,210	9,567,715	.51	12,851,239	6,311,585	.49	1,686,851	2,593,424	.55	894,477	438,180	.49	408,643	224,556	.55
Douglas fir	7,248,562	3,010,392	.42	631,939	220,331	.35	6,074,283	2,562,636	.42	25,995	8,747	.34	516,345	218,678	.42
Cedar	7,083,442	3,310,116	.47	4,940,337	2,334,675	.47	1,476,530	709,771	.48	488,968	194,238	.40	177,607	71,432	.40
Chestnut	6,588,975	2,995,942	.45	3,878,970	1,787,107	.46	767,793	345,817	.45	1,571,950	761,301	.48	370,262	161,657	.44
Cypress	5,104,496	1,802,435	.36	4,354,720	1,512,033	.35	633,865	301,467	.48	93,332	36,920	.40	22,579	11,715	.52
Western pine	3,969,605	1,698,927	.43	1,869,731	840,555	.45	2,039,769	832,804	.41	14,365	4,641	.32	45,740	20,027	.44
Tamarack	2,576,859	889,581	.35	2,310,050	795,803	.34	90,186	41,414	.46	20,823	7,394	.35	125,800	44,950	.36
Hemlock	2,058,198	582,968	.28	1,912,540	523,741	.27	124,462	53,155	.43	16,186	4,532	.28	5,010	1,540	.31
Redwood	1,248,629	536,172	.43	539,060	182,343	.34	186,286	66,501	.36	353,627	171,939	.49	169,656	115,389	.68
Lodgepole pine	554,738	210,818	.38	553,838	210,458	.38	.....	.....	.....	900	360	.40	.....	.....	.....
White pine	373,387	151,052	.40	243,515	70,397	.29	11,515	6,436	.44	34,755	17,108	.49	80,602	57,111	.71
All others	1,828,067	726,144	.40	1,575,699	587,162	.37	158,818	74,339	.47	17,948	8,437	.47	75,602	56,206	.74
Total	102,834,042	$48,819,124	$0.47	71,199,415	$32,960,077	$0.46	22,278,210	$11,260,455	$0.51	6,294,579	$3,022,511	$0.48	3,061,838	$1,576,081	$0.52

wood from which ties are made, except Douglas fir and western pine, the number of hewed ties is greater than the number sawed. About ten times as many Douglas fir ties are sawed as are hewed. Of the oak ties a little over one-sixth and of the southern pine ties less than one-third are sawed. In general, when lumber has a relatively low value the proportion of sawed ties increases, because the market for ties is always active, while that for lumber is frequently sluggish. All western species are affected by this condition, for stumpage is abundant and its value relatively low.

About one-third of the ties used by street railways are sawed, but not quite one-fourth of those used by steam roads. The greater proportion of sawed ties used by street lines is probably due to the fact that much of the trackage within city limits is on paved streets, where sawed ties are more satisfactory on account of their regular shape.

The average price of the sawed tie is, as a rule, higher than that of the hewed one, despite the fact that the hewed tie is more durable. This peculiar condition of an inferior commodity bringing a higher price is brought about by the difference in market conditions. Sawed ties, though admittedly less durable, represent a potential value equivalent to the amount of lumber into which they could be cut. Hewed ties, on the other hand, compete only with posts or fuel wood, both of which are of lower value.

CONSUMPTION IN 1905 AND IN 1906.

Table 3 shows the number and value of the different kinds of ties purchased by the steam and street railroad lines in the United States in 1906, and contrasts the purchases of steam railroad companies in 1905 and 1906. No statistics are available upon the purchases by street lines in 1905.

TABLE 3. *Number and Value of Ties Purchased by Steam and Street Railroads in the United States in 1905 and 1906.*

	Steam railroads, 1905.			Steam railroads, 1906.			Street railways, 1906.*		
	No.	Value.	Av. value, per tie.	No.	Value.	Av. value, per tie.	No.	Value.	Av. value, per tie.
Oaks	34,677,304	$19,072,517	$0.55	41,532,629	$21,256,518	$0.51	3,825,245	$2,021,534	$0.53
Southern pines.†	18,351,031	7,707,436	.42	17,538,090	8,905,009	.51	1,305,129	662,736	.51
Cedar	6,962,827	3,063,644	.44	6,416,887	3,044,446	.47	666,515	265,870	.40
Douglas fir	3,633,276	1,198,981	.33	6,706,222	2,782,967	.41	542,340	227,425	.42
Chestnut	4,717,604	2,264,450	.48	4,646,763	2,132,984	.46	1,942,212	862,958	.44
Cypress	3,483,746	1,149,636	.33	4,988,585	1,813,500	.36	115,911	48,635	.42
Western pine	‡	‡	...	3,909,500	1,673,359	.43	60,105	24,668	.41
Tamarack	3,660,082	1,101,630	.36	2,430,236	837,217	.34	146,623	52,344	.36
Hemlock	1,713,090	565,320	.33	2,037,002	576,896	.28	21,156	6,072	.29
Redwood	590,852	118,170	.20	725,346	248,844	.34	523,283	287,328	.55
Lodgepole pine	‡	...	...	553,838	210,458	.38	900	360	.40
White pine	‡	‡	...	258,030	76,833	.30	115,357	74,219	.64
All others	791,409	343,662	.43	1,734,517	661,501	.38	93,550	64,643	.69
Total	77,981,227	$36,585,446	$0.47	93,477,625	$44,220,532	$0.47	9,356,417	$4,598,592	$0.49

*No figures for street railways in 1905.
†For 1905 includes white pine, lodgepole pine, and western pine.
‡Included in southern pines.

The purchases of ties reported by the steam railroad companies in 1906 exceeded those of 1905 by more than 15,000,000. Nearly one-half of this excess was oak. The purchases of cedar ties showed a decrease of about one-half million, due possibly to the sharp demand for cedar poles, which operated against the production of ties. Douglas fir ties nearly doubled in quantity, and both cypress and hemlock increased by a large percentage, but tamarack purchases fell off more than one-fifth and chestnut about 1.5 per cent.

The street railways use about the same proportion of oak ties as the steam roads, a larger proportion of southern pine, cedar, chestnut, cypress and hemlock, but a smaller proportion of Douglas fir, western pine and tamarack. Comparing the consumption of ties by steam railroads and street railways, there is practically no difference between the average values per tie for all kinds of timber combined, but the average costs per tie for the individual kinds of wood show some wide variations. These cannot be attributed to any general condition, but are probably due to local influences which operate to increase or decrease the cost to users of certain kinds of ties in particular regions. Such local conditions in turn affect the general average for the kind of timber for the whole United States.

PRESERVATION.

The question of tie preservation is becoming more and more important as the demand for tie material increases and the traffic requirements become more exacting. So long as plenty of white oak ties could be secured the necessity for tie preservation was not felt; but with the constantly increasing use of pine and other less decay-resistant woods, it has become a vital economic question. The railroad companies have met the problem by establishing treating plants in various parts of the United States and by laying experimental tracks with treated ties to determine the efficiency of the several preservatives under varying conditions.

In 1906 the purchases of treated ties by steam and street railroad companies combined amounted to 5,289,435; in addition to this quantity the companies treated 6,190,203 at their own plants, a total of 11,779,630 treated ties during the year, or 11.5 per cent. of the whole number. Of this total the steam railroad companies purchased, during the year, 4,773,116 treated ties, and applied preservatives to 6,365,523 at their own plants. The street lines used 640,999 treated ties, 516,319 of them already prepared when they were bought, and 124,689 treated at their own plants.

State Control of Fast Interstate Trains.

The decision of the Supreme Court of the United States nullifying an order of the Railroad Commission of South Carolina directing the Atlantic Coast Line to stop a through fast train at Latta, a town of 453 inhabitants, was reported in the *Railroad Gazette* last week, page 727. Justice Peckham, in delivering the opinion, reviewed the defense of the road, in which it was shown that in addition to a number of daily local passenger trains there was also furnished the citizens of Latta the convenience of a daily passenger train each way for through travel north and south, and sustained the claim that the order of the commission was unreasonable and unnecessary; a direct burden upon interstate commerce, and therefore a violation of and in conflict with the authority given exclusively to Congress by the Constitution to regulate interstate commerce. Continuing Justice Peckham said:

"That any exercise of state authority, in whatever form manifested, which directly regulates interstate commerce, is repugnant to the commerce clause of the Constitution, is obvious. Any command of a state the necessary effect of which is to order the stopping of an interstate train at a named station or stations, if it directly regulates interstate commerce, is void. * * * But some orders which may cause the stoppage of interstate trains may be valid, if they do not directly regulate such commerce. The question of whether such order is void as a direct regulation of such commerce may be tested by considering the nature of the order and the character of the interstate commerce train to which it applies. It also may be tested by considering the adequacy of the local facilities. * * * "True, inherently considered, whether there be local facilities is not a Federal question, but in so far as the existence of such adequate local facilities is involved in the determination of the Federal question of whether the order concerning an interstate train does or does not directly regulate interstate commerce, that question for such purpose is open and may be considered by us."

Justice Peckham then proceeds to declare that local conditions do not necessitate the stopping of the trains in question at Latta. The railroad company has furnished such reasonable accommodations to the people of the place as it can be fairly and properly called upon to give. To stop these trains at Latta and other stations which could bring equally strong reasons for the stoppage of the trains at their stations, would wholly change the character of the trains, rendering them no better in regard to speed than the other trains and would result in the inability of what had been fast trains to make their schedule time, and a consequent loss of patronage, also the loss of compensation for carrying the mails, which would be withdrawn from them, and the end would be the withdrawal of the trains, because of their inability to pay expenses.

Foreign Railroad Notes.

The railroads of Siam were not increased in length during the last fiscal year, but their gross earnings increased 26 per cent. and their net earnings 21¾ per cent., the latter being 5.13 per cent. on the cost of the roads, which, however, has been only $27,240 per mile. The working expenses were only 36¾ per cent. of the gross earnings.

The Italian State Railroads have a new head, the late Minister of Public Works, Giantulco, having retired on account of serious illness. The new minister is Pietro Bertolini, who has been an under secretary in previous cabinets, and is regarded as a capable administrator, and a firm character, not likely to be bulldozed by the organized employees.

GENERAL NEWS SECTION

NOTES.

The New York New Haven & Hartford has modified its notice canceling through freight rates over the Central of New Jersey, making the date on which the notice will take effect March 31.

The United States District Court at Kansas City has issued a temporary injunction against the enforcement of the reduced express rates ordered by the Missouri State Railroad Commission.

The New York, New Haven & Hartford has announced at Boston that beginning December 28 a charge of 10 cents a ton will be made in all cases where carload freight is unloaded by the company into freight houses.

In the United States Circuit Court at Chicago December 14, a final decree was entered in the suits of 16 railroads against 52 ticket brokers, which, it is said, strikes a death blow at the business of ticket scalping in Chicago.

The pension plan for the employees of the Erie Railroad, which for some time has been under consideration by a committee representing the company and the employees, is based on rules under which the company will provide about one-half the funds necessary to pay the pensions, the other half to be contributed by the employees themselves.

The Supreme Court of Wisconsin has declared unconstitutional the law passed in that state this year permitting passengers in the lower berth of a sleeping car to require the upper berth, when unoccupied, to be pushed up, so as to give more room in the lower berth. The court decides that a law of this kind is not a reasonable exercise of the police power.

Mr. Walter P. Hall, the new Chairman of the Massachusetts State Railroad Commission, was promoted to that place from the office of Assistant Attorney General. He has had much experience in managing the interests of the state in connection with grade crossings and other railroad matters. He has practiced law in Fitchburg since 1892, and has been City Solicitor and Assistant District Attorney.

Reports from Ohio say that since the reduction of ticket fares to 2 cents a mile and the abolition of an extra charge in case of payment of fare in cash on trains, the number of cash fares collected has increased so largely that the work of the conductors has been made burdensome; and it is said that the railroads are going to try to secure legislation to suitably penalize passengers who do not buy tickets before boarding trains.

The Missouri Pacific has taken off a number of passenger trains from its secondary lines in Kansas. On one line of 85 miles and another of 42 miles the passenger service is discontinued and passengers will have to ride on mixed trains. A press despatch from Topeka states that, because of this action, the Kansas Railroad Commission has ordered the Attorney-General to sue for the revocation of the charter of the Missouri Pacific.

At a hearing before the Interstate Commerce Commission at Washington last Monday on the complaint of the Oregon and Washington lumber shippers, President James J. Hill, of the Great Northern, said that the increase in freight rates had been determined on simply because lumber was being carried at less than cost; there was an average loss of $80 a car. The revenue per car averaged $200, while the cost was $280. This estimate of cost apparently includes something for hauling the lumber cars westward empty.

The Montreal ice carnival is to be frozen out, so to speak. According to a press despatch from St. John, N. B., the holding of ice and snow sports and all kinds of winter carnival attractions in Canada is to be frowned upon systematically by the railroads, their reason being that the advertising of these things gives the idea that Canada is "a mere frozen fringe north of the states." The idea may have a bad effect upon immigration. The passenger traffic managers of the Canadian Pacific and Grand Trunk are reported as declaring that they will refuse to advertise the events and will grant no special rates.

From reports printed in New York City it would seem that claims received by railroads for damage to butter and eggs have recently become so numerous as to be a serious burden both to the railroads and to the tradesmen; and a committee, representing merchants, in a communication to the Pennsylvania Railroad, declares that the trouble is due to the general use of air-brakes and automatic couplers. This statement, interpreted, means, no doubt, that the trouble is due mostly to the rough handling of cars in switching, which has been made possible by the introduction of the improvements named.

An officer of the Pennsylvania is authority for the statement that in the month of October the passenger receipts of that road in the state of Pennsylvania were $64,000 less than in the same month a year ago, while outside the state of Pennsylvania they increased 8 per cent., and that but for the reduction to 2 cents a mile, ordered by the legislature, the receipts within the state apparently would have increased $140,000. The loss entailed by the law appears therefore to have been $204,000. The decrease is absolute and has not been offset by any increased business, the reduction has not stimulated travel.

It was announced at Raleigh, N. C., last week that Governor Glenn had come to an agreement with the Southern Railway under which the road would make all single ticket rates in the state 2½ cents a mile, both for intrastate and interstate trips, and sell mileage books of different classes at 2 cents. The Seaboard Air Line agreed to take the same action as that agreed to by the Southern. The next day, however, it was announced that the Atlantic Coast Line and others had rejected the proposition and, therefore, that the proposed agreement would fall through. To carry it out would have necessitated the calling of the legislature to rescind the rate laws now on the statute books, and the Governor declared that this would be useless unless all the roads would come in.

Between 6 a.m. and 12.10 night of every week-day there are 41 trains from New York to Philadelphia on the four-track line of the Pennsylvania Railroad, or an average of a train every 26 minutes. From 7 a.m. until 7 p.m. there are 33 trains, or an average of one in every 22 minutes. Seven of these trains make the run in two hours or less. Every one of these 41 trains, except four, has Pullman parlor or sleeping cars, and dining cars are attached to 17 of them. With one exception, all parlor cars have buffets except those on trains carrying dining cars. An equally complete service is maintained from Philadelphia to New York. The foregoing is from an advertisement of the Pennsylvania Railroad. The advertising agent believes that this is the most comprehensive and complete train service between any two cities in the world.

The New York State Public Service Commission for the First district (New York City) estimates that its expenses for the 1908 year will be $1,095,000, a figure which it is said was surprising to the Board of Estimate. The expenses of the Railroad Commission of Ohio for the last year were $37,305. The estimate of the New York commission contains the following: Office, telephone and rentals, $50,000; salaries, $850,000; furniture, $2,500; printing, stationery and supplies, $25,000; disbursements of employees and counsel, $15,000; maps, plans, prints and photographic apparatus, $5,000; engineering instruments and supplies, $10,000; compensation and expenses of special commissions, $10,000; advertising, $25,000; real estate searches and appraisals, $2,500; contingencies and rapid transit studies, $50,000, and special service and investigations, $50,000. The Board voted $71,000 to the Commission to pay the expenses until January 1, 1908.

At a hearing before the New York State Public Service Commission at Albany this week, on the question of making the fares on the New York Central more uniform, officers of that road announced their intention to make the rates on the Hudson division (New York to Albany) uniformly 2½ cents a mile. The short-distance rates on this division are now somewhat variable, though mostly not much above 2 cents a mile; but from New York to Albany, 142 miles, the fare through is $3.10, or nearly 2.2 cents a mile. Between Albany and Buffalo local fares are limited to 2 cents a mile by law, but the fare through to Buffalo is at a higher rate. It was stated that the tariff for the new increased rates on the Hudson division had already been printed, but it appears that no order has been issued fixing the day for putting it into effect. Under its charter the road may charge as high as 3 cents a mile on the Hudson division. Vice-President C. F. Daly said that the Central would abolish mileage tickets were it not for the competition of other roads.

The New York State Public Service Commission, Second district, has dismissed the complaint, made by a representative of a brotherhood against the Erie Railroad, alleging that not enough men were employed on certain passenger trains. On the trains in question there is in each case one brakeman, acting as rear flagman, and one porter. It appears that the porters are negroes. The railroad claimed that the porters were competent to act as rear flagmen in case of need, and the Commission sustains this position. The decision, by Chairman Stevens, declares that the complaint does not aver an insufficient number of trainmen and, therefore, that it can be entertained only as a complaint against the competency of the men. The only evidence supporting this charge is that one porter, last February, said that he had not passed an examination in flagging. But the General Manager of the road declares that now the colored trainmen-porters are competent to

discharge all of the duties of brakemen, and as this testimony is uncontradicted the Board dismisses the complaint.

Traffic Versus Main Line Mileage.

Chairman Knapp, of the Interstate Commerce Commission, had occasion to remark recently on the unequal increase this country is witnessing in the amount of traffic and the railroads' facilities for handling it. He estimated that whereas each of the past few years has seen an increase in the country's traffic of about 12 per cent., the railroads have grown in the same time at an average rate of only 2 per cent. It is freely predicted by authorities that the United States will find its industrial prosperity seriously retarded at no very distant date unless the transportation problem is given more liberal attention.

Below is a list of 14 important railroads whose tracks extend generally over all sections of the United States, with the amount of freight handled by each of them in the five years from 1902 to 1906 inclusive:

Number of tons, in thousands, of revenue freight carried:

	1906.	1905.	1904.	1903.	1902.
Southern Pacific	22,454	19,360	18,509	17,163	15,736
Union Pacific	13,048	11,204	10,264	9,657	8,590
Northern Pacific	15,356	13,036	13,283	12,791	11,080
Atchison	14,788	12,894	13,195	12,980	11,596
Rock Island	15,394	13,515	13,567	10,597	8,245
Erie	36,355	31,561	29,835	31,645	27,697
N. Y. Central	43,570	42,861	36,379	38,081	35,599
Pennsylvania	363,955	333,011	284,619	295,120	269,512
Baltimore & Ohio	65,216	56,322	50,964	52,249	49,476
Louisville & Nashville	24,553	21,041	21,429	20,677	18,320
Southern	23,518	20,973	20,733	19,197	16,811
Atlantic Coast Line	9,392	8,365	7,781	7,674	3,147
Illinois Central	25,641	23,148	22,420	21,881	19,096
New Haven	20,259	18,321	17,560	*17,350	17,145
Total	693,499	625,582	560,528	567,062	512,020

*Estimated.

The revenue freight hauled by these roads increased from 512,020,000 tons in 1902 to 693,499,000 tons in 1906, or about 181,479,000 tons. This is an increase of 35.4 per cent., or an average for each of the four years of nearly 9 per cent. A complete tabulation of every ton of freight carried by all roads, large and small, would probably show a larger percentage than this, owing to the new traffic originated by smaller systems in territory recently opened up.

How the railroads endeavored to keep pace with their growing business is shown by the two tables below. Operating a total mileage of 64,256 miles in 1902, they increased this in four years to 71,748, or 7,492 miles. This is an increase of 11.6 per cent., as compared with the growth of 35.4 per cent. in traffic.

Miles Operated.

	1906.	1905.	1904.	1903.	1902.
Southern Pacific	9,191	9,137	9,024	8,842	8,757
Union Pacific	5,403	5,357	5,352	5,762	5,710
Northern Pacific	5,401	5,314	5,262	5,111	5,019
Atchison	8,433	8,305	8,179	7,965	7,855
Rock Island	7,218	7,231	7,205	5,579	3,909
Erie	2,150	2,150	2,150	2,152	2,153
New York Central	3,783	3,774	3,490	3,422	3,319
Pennsylvania	3,756	3,695	3,670	3,663	3,663
Baltimore & Ohio	4,029	4,025	3,986	3,935	3,233
Louisville & Nashville	4,205	4,101	3,679	3,491	3,444
Southern	7,373	7,198	7,164	7,129	6,743
Atlantic Coast Line	4,327	4,306	4,192	4,138	4,138
Illinois Central	4,423	4,373	4,340	4,292	4,276
New Haven	2,056	2,087	2,057	*2,047	2,037
Total	71,748	71,053	69,759	67,528	64,256

*Estimated.

—*Wall Street Journal.*

Overhead Trolley on the Highland Division.

The line of the Highland division of the New York, New Haven & Hartford between East Hartford, Conn., and Vernon, 10 miles, is now traversed both by steam trains and by electric cars, the latter being those of the Connecticut Company. The principal termini of the electric company's line are Hartford and Rockville. The company will continue to operate the single-track electric line along the highway, parallel to the New Haven road, but the cars running over the New Haven tracks will furnish a faster service. Overhead trolley wires have been strung along the steam tracks, and this part of the road has been equipped with automatic block signals.

Old-Fashioned Interstate Commerce.

Charles W. Ellison, of Peekskill [N. Y.] sent his teams with five loads of furniture to Danbury, Conn., during the bad spell of weather a week or so ago. It was a tedious drive, as the roads were in bad condition. The furniture was taken in this way overland, because such freight is used so roughly on the cars that even at greater cost and the inconvenience of this mode of transportation, it was preferable to having it smashed to pieces on the cars. Nothing is handled with care any more on the New York Central. —*Highland Democrat.*

The distance between Peekskill and Danbury in an air line is 25 miles. The railroad route is rather roundabout, but even so, the engine ought to have a great advantage over the horses when it comes to a comparison of actual strain on the tender drawbar. From Peekskill north to Dutchess Junction by the New York Central the distance is 16 miles, and thence east by the New Haven to Danbury it is 46; total, 62 miles. The five teams were gone from home a week.

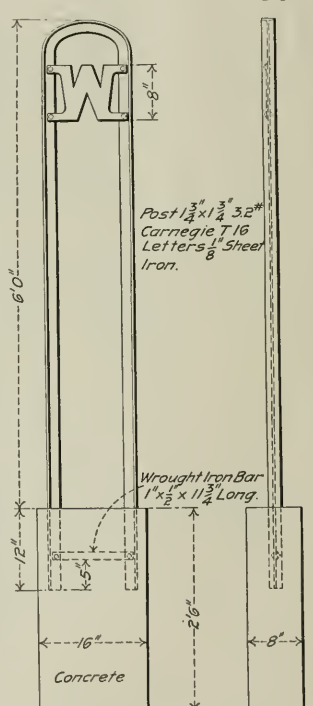
Reliable News.

We take no stock in the rumor that it is the South Manchester Railroad that is negotiating for the Boston & Maine.—*Hartford Courant.*

The "Continental" Whistling Post.

It is now possible to replace the familiar white tombstones with their black "W" and "R" that appear along our railroads at crossings and cuts by a durable, cheap and attractive steel whistling post.

The "Continental" whistling post has been designed to reduce the high cost of maintenance; to give longer life to the post and to keep the first cost as near that of the wooden post as possible. A light "T" iron is bent in an arch shape, the long ends of the "T" forming the legs of the post. The letters are stamped from sheet iron and riveted or bolted to the stems of the "T" near the top of the post. A bar riveted between the legs at the bottom of the post acts as an anchor when the post is set in concrete or in the ground.



The "Continental" Whistling Post.

The claims for this post are that being made of structural steel:

It will outlive the wooden post by many years.

It will reduce the amount of paint used to maintain the posts by at least 75 per cent.

It will reduce the amount of time necessary to properly maintain the posts by at least 75 per cent.

The letters will be silhouetted against any background in winter or summer.

Snow cannot drift against it.

Letters can be held in stock and new ones attached to a post at any time.

In all weather and under all conditions it will be efficient as a warning to the engineer.

This device is the invention of E. D. Hillman, Mechanical Engineer of the United States Metal & Manufacturing Company, New York, which is shortly to put the post on the market.

A Two-Cent Fare in Canada.

The Supreme Court of Canada has sustained the order of the Railway Commission made in July last directing the Grand Trunk Railway, as required by the terms of its charter, to run at least one train daily each way between Toronto and Montreal carrying passengers at a third class fare of 2 cents a mile.

Elaterite Car Roofing.

Elaterite car roofing consists of a solid body of elastic, non-drying "Elaterite" cement, reinforced in the middle with two layers of imported India burlap, and with an asphalt saturated wool-felt back. The top surface is finished with flake mica. It is put up in rolls of one square, 32 in. wide and 40 ft. long, or any length desired. No painting is required. The makers say that it is being used principally on western roads under severe conditions of torsion on curves and grades, where sudden, extreme changes in temperature occur and high winds and dry atmosphere prevail. An-

other advantage claimed is its resistance to fire. In lower altitudes and with greater humidity the results are correspondingly better. It is made by the Western Elaterite Roofing Co., Denver, Colo., whose product also includes high-grade roofings for roundhouses and for all other classes of railroad and general use; "Elaterite" paints for metal preservation and for heated surfaces; "Werco" cement for coating prepared roofing, and "Werco" waterproofing cement for masonry and concrete structures.

Driving It Home.

Bear in mind now that a stove factory in Atlanta made in 1906 over $47,000 of profits on an investment, as sworn to for taxation, of $46,475, and that Governor Smith tendered its president the position of railroad commissioner despite the fact that the legislature had disqualified him because he belonged to an association which raised the prices of stoves on the consumer. Bear in mind that a spring bed factory in Atlanta made in 1906 a profit of $41,000, on an investment, as sworn to for taxation, of $30,000, and that Governor Smith appointed its president a member of his staff. Bear in mind that he appointed to the position of railroad commissioner another gentleman who was the leading spirit in building and operating a cotton factory in La Grange which, in four years, on an investment of $251,000, made $370,000. Bear in mind that a great portion of the profits of the above three factories were secured by raising the prices of their products after the freight rates were reduced. And then read again Candidate Hoke Smith's declaration that "5 per cent. is a handsome return" for those who invest their money in railroad stocks and bonds, and that if he were elected Governor he would bring down the railroad rates sufficiently to place the income of railroad stockholders on the 5 per cent. basis.—*Ex-R. R. Comm. Joseph M. Brown, in Augusta Chronicle.*

INTERSTATE COMMERCE COMMISSION RULINGS.

Distribution of Cars to Shippers—No Fixed Rule.

The California Fruit Growers' Exchange and others attacked the reasonableness of a regulation of the Southern Pacific to the effect that in time of car shortage cars will be furnished to the various shippers in proportion to the amount of fruit picked and actually in the packing houses at the time of the demand for cars. Prior to April, 1907, cars were distributed in proportion to the season's business done by the various shippers. This so-called "crop-holding rule" is still in force over the Atchison, but in the case of the Southern Pacific has been displaced by the "house rule" to which objection is taken.

The Commission declares that the situation as described cannot be adequately covered by any fixed, inelastic regulation. Although the crop-holding rule appears to work more perfectly to the satisfaction of shippers and carriers, nevertheless the house rule does not appear to be unduly discriminatory. The complaint was dismissed.

Refusal to Reduce Transcontinental Rates.

In an opinion by Commissioner Clark in the case of the Railroad Commission of Oregon against the Chicago & Alton and others, the Commission has refused to make a low rate from the East to Oregon to compete with rates from California. The complainant asked for a reduction in the rates on denatured alcohol to Oregon points. These rates are already low. Denatured alcohol is manufactured in California and is sold in the north Pacific coast cities at a price which could be met by the eastern product only by reducing the transportation charges to nothing. An effort to place denatured alcohol on a parity with proof spirits would lead either to a large increase in the charges on the proof spirits of a practical wiping out of the charges on the denatured article.

Such increase in the charges on the proof spirits, in the opinion of the Commission, probably would render futile all effort to compete with the California product. The rates complained of were not shown to be unreasonable, unduly discriminatory or unjustly prejudicial. The Commission therefore dismissed the petition.

Private Siding Connection Ordered.

The Commission also, in an opinion rendered by Commissioner Prouty, announced its decision in the case of the McRae Terminal Railway, McRae, Ga., against the Southern and the Seaboard Air Line. This is a supplemental report involving the installation of a connecting track. The Commission decided that the complainant's application for physical connection to its line should be allowed as to the Seaboard Air Line, but not as to the Southern.

In its former report of this case the Commission left details to be agreed on, but no agreement could be reached and a further hearing was had. It is ordered that the Seaboard Air Line shall construct, by January 25, and maintain and operate for two years a "switch connection." • • • The switch used shall be of the value of not less than $50, rails 60-lb. and ties similar to those in a certain side-track near point of connection, but only on condition that by December 20 the McRae Terminal shall pay the Seaboard Air Line $150.

Minimum Carload Rates.

The Commission has announced its decision in the case of the Pacific Purchasing Company against the Chicago & North-Western and others. Complainant ordered several carloads of brass bedsteads to be delivered at Los Angeles from Kenosha, Wis. The initial road was unable to furnish a single car which would hold the minimum weight of brass beds provided for in the tariffs and instead thereof provided two small cars and this resulted in an excess charge of 55 cents per 100 lbs. The Commission holds that the complainant should be awarded reparation. Where three connecting roads publish a joint tariff under which they hold themselves out to the public as prepared to transport commodities in carload lots of a certain minimum magnitude at a certain specified rate such carriers are by their tariff allowed to charge no more than the rate on such carload no matter what cars they may provide for its transportation except as the tariff in specific terms provides certain minimum weights for carloads in cars of certain lengths or capacity.

Penalty for Misrouting—Innocent Carrier Forbidden to Participate

In an opinion by Commissioner Clements the Commission has ordered reparation in the case of the Hennepin Paper Company against the Northern Pacific and the Oregon Short Line, six carloads of paper having been misrouted by the carriers. The Commission says: It is the duty of a carrier, in the absence of routing instructions to the contrary, to forward shipments, having due regard to the interests of the shipper, ordinarily by that reasonable and practicable route over which the lowest charge for the transportation applies; and damage resulting to a shipper from a disregard of this obligation by the carrier can only be repaired by reparation to the extent of the difference between the higher rate applied over the line by which the traffic improperly moved and the lower rate which would have been applied had the freight been properly forwarded.

To require reparation in such a case is only to require the carrier to make just compensation for injury resulting from failure to perform its duty; but to require or permit any other carrier than the one responsible for the misrouting to participate in the making of such reparation would be to permit or require departure from established rates, which is expressly forbidden by law.

Trouble With Low Rates from Crowder City.

In an opinion by Commissioner Clark the Commission has decided 11 cases, most of them against the Missouri, Kansas & Texas concerning a special low rate made on live stock from Crowder City, Ind. T., to Kansas City. The rate was made temporarily, and because of competition, and the complainants ask to have the same reduction made on shipments which were made by themselves from points farther away than Crowder City. If they had paid local rates to that point and then shipped at the special reduced rate from there to Kansas City their total bill would have been smaller than at the regular through rate. The Commission, however, dismissed the complaints, holding that while a through rate that is higher than the sum of the local rates between the same points is prima facie unreasonable, it cannot be reduced to equal such sum of locals except through lawful change in tariff.

The Commission also held that a specific through rate is the lawful rate for a through shipment, even though some combination of rates may make lower, and carrier may not charge the higher through rate upon one shipment and the lower combination rate upon another shipment of the same kind between the same points at the same time.

The Commission further held from the facts disclosed in the record that while a shipper may consign his shipment to a given point, pay charges on same, assume custody and take possession of the property, and, later, reship to another point under rates lawfully applicable to such reshipment, neither a carrier nor an agent of a carrier may act as forwarding or reconsigning agent for a shipper in such manner as to evade or defeat the terms or intent or purpose of the law, and that as no complaint is made against the reasonableness of the specific through rates the demand for reparation is denied and the cases are dismissed.

TRADE CATALOGUES.

Eastward Through the Storied Northwest.—This booklet, which was written by Olin D. Wheeler, contains a description of the places and regions through which the traveler passes on an eastward trip from California over the Shasta Route of the Southern Pacific from San Francisco north to Portland, thence over the Northern Pacific from Portland, through Tacoma, Seattle and Spokane to Minneapolis and St. Paul, including a side trip to Yellowstone Park. There are many interesting photographs showing the mountains, the cities and the country traversed. One of the most striking shows a wall apparently 8 or 10 feet high of California geraniums, another a coasting party descending a glacier on Mt. Hood, and a third a sheep range in Montana. There are several photographs of the Columbia river, which the Northern Pacific will traverse on completion of the Portland & Seattle. On the outside cover are yellow California poppies. The book is issued by the passenger department of the Northern Pacific and contains a clear map of transcontinental territory with the route of the trip shown in heavy lines. It is an example of the best in railroad advertising.

Station Indicators.—The Boynton Indicator Co., Bridgeport, Conn., has issued a pamphlet describing its 1908 models of indicators used for showing in large stations the time and destination of departing trains. This company now makes three styles, the Terminal Sr., the Terminal Jr. and the Local. Patents have been applied for on improvements which are embodied in the 1908 models. In the largest indicators 216 station names can be displayed. In one style it is possible to show 25 station names. The Boynton indicators have been in service for 25 years and the pamphlet gives the names of a number of important roads to which they have been furnished.

Electric Locomotives.—Bulletin No. 4537, of the General Electric Company, Schenectady, N. Y., deals with electric locomotives in heavy passenger and freight work. The points taken up are: rating and capacity, motor cooling by forced ventilation, efficiency, maintenance, annual mileage and mechanical construction. An interesting table gives data on typical machines built by the company since 1894, showing the operating voltage, horse-power, maximum tractive effort, etc. The rest of the pamphlet consists of drawings and important figures and charts showing speed, horse-power and tractive effort of 11 engines in weight from 17 tons to 150 tons.

Santa Fe Employees' Magazine.—The second volume begins with the December number. This magazine appears to be growing in size and excellence. A history of the motive power of the Santa Fe constitutes the leading article. A Christmas at the Grand Canyon is an entertaining account, by Sharlot M. Hall, of a Christmas spent at this wonderful place in wilderness days, reprinted from *Out West*. Teamwork-Mail Department, The Gospel of Safety, The Alleged Rebate Case, Reporting Engine Failures, The "Thrack" Department, and Air-Brake Department are shorter articles.

New Orleans, the Gulf Coast and Florida.—The passenger department of the Louisville & Nashville publishes an exceedingly interesting and attractive pamphlet which contains descriptions and half-tone reproductions of New Orleans and the towns along the Gulf. The Mississippi Sound winter resorts are comparatively little known, and the illustrations in the pamphlet help convey an idea of their quaint charm.

Tie Plates.—"Economy" tie plates are shown in an 8½-in. x 11-in., 12-page pamphlet issued by the Spencer Otis Co., Chicago. There are eight styles, all of rolled steel. They differ in the style of ribbing or of corrugations on top, in the number and direction of flanges on the bottom, and in the presence or absence of shoulders. Suggestions for punching the different styles are made.

Mexico-St. Louis Special.—This semi-weekly solid through Pullman train between St. Louis and the City of Mexico is being advertised by a mailing card giving briefly the route, schedule and other facts. The interested lines are the St. Louis, Iron Mountain & Southern, the Texas & Pacific, the International & Great Northern and the National Lines of Mexico.

"Universal" Portland Cement.—Bulletin 43 of the Universal Portland Cement Co., Chicago, shows a number of important engineering works or structures in which this cement is used.

MANUFACTURING AND BUSINESS.

The Jeffrey Manufacturing Co., Columbus, Ohio, has opened a branch office at 924-925 Pierce building, St. Louis, Mo.

The Wisconsin Engine Co. Corliss, Wis., has been awarded the contract for a 20,000,000-gal. pumping engine by the city of Atlanta, Ga.

J. P. Jackson, Professor of Electrical Engineering at the Pennsylvania State College, has been appointed Dean of the School of Engineering of the college.

At a meeting on December 18 the directors of the New York Air Brake Co., New York, decided to defer action on the quarterly dividend, which has been 2 per cent. since 1899.

The Dominion Iron & Steel Company, Montreal, Que., has acquired control of the Cumberland Railway & Coal Company, which owns coal deposits said to amount to 150,000,000 tons.

The Westinghouse Air-Brake Co., Pittsburgh, Pa., has declared the usual quarterly dividends of 2½ per cent. regular and 2½ per cent. extra on the $11,000,000 capital stock. At the same time a stock dividend of 25 per cent. will be distributed.

The San Francisco, Cal., office and storeroom of the Independent Pneumatic Tool Co., Chicago, has been moved from 11 Front street to larger quarters at 61 Fremont street, where a full line of Thor pneumatic tools and parts will be carried in stock.

The Westinghouse Electric & Manufacturing Co., Pittsburgh, Pa., has been given the contract for electrifying a standard gage road running from El Ora, Mex., to mines nearby. The road will be operated by electric locomotives built by the Westinghouse company and the Baldwin Locomotive Works.

W. M. Lalor, Electrical Engineer and Assistant to Vice-President Dickinson, of the Bliss Electric Car Lighting Co., Milwaukee, Wis., has gone to Chili to supervise the installation of a number of Bliss axle light equipments to new passenger cars of the Chilian State Railroads and to secure additional business in South American countries.

The works of the Weston Electrical Instrument Co., Waverly Park, Newark, N. J., will be shut down from December 21, 1907, to January 2, 1908, for the annual stock taking and repairs to plant. Part of the office and shipping departments will, however, remain in operation and therefore urgent orders for standard goods can be promptly shipped during this period.

The Pantasote Co., New York, is putting on the market its new Agosote car head lining. This head lining is now made in England, but the company expects soon to be able to supply all orders from the products of its own mill in this country. It is made in sheets ⅛ in., 3/16 in. and ¼ in. thick, and is furnished shaped to conform to the curves of the upper and lower decks.

S. W. Midgley, formerly General Sales Representative of the National Car Coupler Co., Chicago, has been made Western Representative of the Curtain Supply Co., Chicago, with headquarters in Chicago. Mr. Midgley succeeds R. F. Hayes, who takes charge of the New York office, with the title of Eastern Manager, succeeding A. L. Whipple, who recently resigned to go to another company.

McCarthy racks, made by the Rostand Manufacturing Co., Milford, Conn., have been specified for the 100 coaches being built for the New York, New Haven & Hartford by the Bradley Car Works; the 20 coaches for the Boston & Maine being built by the Laconia Car Co.; the 25 coaches for the Chicago & North-Western being built by the Pullman Co., and the 30 coaches for the Central of New Jersey being built by Harlan & Hollingsworth. The company built a new factory at Milford about two years ago and since removal there from New Haven several additions to the new plant have been made. About a year ago a brass foundry was added. This branch of the business has also increased so rapidly as to require recent enlargement in facilities.

H. W. Clapp, special representative of the railroad engineering and construction departments of the General Electric Company, Schenectady, N. Y., is about to go to San Francisco, having been appointed to an office in the electrical department of the Southern Pacific. An informal luncheon was given him at the Engineers' Club, New York, on December 14, by officers of the General Electric Company, the New York Central & Hudson River, the Interborough Rapid Transit, the New York City Railway and members and officers of several engineering firms and supply companies. During the five and one-half years he has spent in New York, Mr. Clapp has been particularly concerned with the installation and operation of rolling stock for the electrified part of the New York Central, and the cars for the Interborough Rapid Transit. He also equipped the cars for the West Jersey & Seashore. He is a son of F. Boardman Clapp, Managing Director of the Melbourne (Australia) Tramway & Omnibus Co. Before coming to America Mr. Clapp was for four years Superintendent of Motive Power of the Brisbane Tramway Co., Brisbane, Australia.

Iron and Steel.

No large new orders of rails for 1908 delivery have yet been announced, although it is understood that negotiations are actively under way for a large tonnage. The Pennsylvania has replaced

orders for about 15,000 tons of rails the orders for which had been postponed. It is understood that this order was divided among a number of companies. The rails are to be made according to the Pennsylvania's new specifications which are about the same as those recommended by the American Society of Civil Engineers. The Union Pacific is said to have re-entered an order for 35,000 tons for which reservation had been made and it is understood that the Erie is in the market for 35,000 tons.

OBITUARY NOTICES.

Lord Kelvin died in Glasgow, Scotland, on December 17 after several weeks illness.

Luman F. Parker, General Solicitor of the St. Louis & San Francisco, died last Monday.

M. Hopkins, President and General Manager of the South Side Elevated Railroad, Chicago, died Dec. 7 of pneumonia. Prior to his connection with the elevated railroad he was with the Chicago & North-Western for 30 years, starting as brakeman in 1863 and working up to Superintendent of the Iowa division. He resigned this position in 1893 and became General Manager of the Chicago & South Side Rapid Transit Railroad the same year. The following year he was made President and continued as such until October, 1895, when he was appointed Receiver of the property. At the termination of the receivership he was made General Manager of the reorganized company, and in January, 1907, was elected also President. He was 63 years old.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad conventions and engineering societies, etc., see advertising page 24.)

New York Railroad Club.

The next meeting of the New York Railroad Club will be held at the building of the Engineering Societies, 29 West 39th street, December 20. Instead of the usual paper, there will be a smoker, vaudeville entertainment and luncheon.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Georgia & Florida.—J. M. Wilkinson has been elected Third Vice-President.

Lehigh & New England.—W. A. Lathrop, President of the Lehigh Coal & Navigation Company and Vice-President of the Lehigh & New England, has been elected President of the Lehigh & New England, succeeding W. J. Turner, who will become Vice-President and General Counsel.

New York, New Haven & Hartford.—C. F. Choate has resigned from the Board of Directors.

Pere Marquette.—William Cotter, General Manager, has been elected President. The temporary Board of Directors of the reorganized company is as follows: George W. Perkins, H. F. Shoemaker, George W. Young, W. T. Cross, E. H. Harriman, Charles Steele, F. D. Underwood, G. A. Richardson, George F. Baker, Norman B. Ream, J. G. McCullough, Walter H. Horn, Allen Wardwell and Thomas W. Joyce, all of New York, and Frederick W. Stevens, of Detroit.

Portland & Seattle.—F. B. Clarke, formerly Traffic Manager of the Great Northern, has been appointed Assistant to the President of the Portland & Seattle.

Pullman Company.—George F. Brown, Treasurer, has been retired on pension after 36 years of service. K. Demmler, Assistant Secretary and Assistant Treasurer, succeeds Mr. Brown. C. S. Sweet, Secretary to the President, has been made Assistant to the President. R. C. Kelly has been appointed Assistant Treasurer. Mr. Brown began work with the company in 1871 as Assistant to the General Superintendent, following four years in railroad service as Secretary and Treasurer to the Receiver of the Memphis, Clarksville & Louisville, now part of the Louisville & Nashville, and then as agent in the freight department of the Illinois Central. He was successively Acting General Superintendent, General Superintendent and General Manager of the Pullman Company, and of late years he has been Treasurer. He is 64 years old.

Silver Peak.—The officers of this company are as follows: President, G. T. Oliver, and Vice-President, William Flinn, both with office at Pittsburgh, Pa. General Manager, M. L. Effinger, and General Freight and Passenger Agent, F. L. Voorhees, both with office at Blair, Nev. The road is 18 miles long, connecting with the Tonopah & Goldfield at Blair Junction.

Operating Officers.

Ann Arbor.—W. F. Bradley, Superintendent at Toledo, Ohio, has resigned.

Ashland & Western.—E. D. Taylor has been appointed General Manager.

Chicago & North Western.—See Peoria & Pekin Union.

Halifax & Southwestern.—James Bain, Superintendent of the Quebec & Lake St. John, has been appointed Superintendent of the Halifax & Southwestern with office at Bridgewater, N. S.

Lehigh Valley.—W. W. Abbott has been appointed Trainmaster at Jersey City, N. J., succeeding G. W. Hardcastle, resigned.

New York, New Haven & Hartford.—A. R. Horn, Assistant Superintendent of the Western division, has been appointed Assistant Superintendent of the New York division, succeeding Andrew Ross, transferred to the Harlem River terminal.

John B. Gallery, general yardmaster of the Northern Pacific at Duluth, Minn., has been appointed Assistant Superintendent of the Western division of the New York, New Haven & Hartford, with office at Providence, R. I.

Northern Alabama.—O. K. Cameron, chief train despatcher of the Memphis division of the Southern, has been appointed Trainmaster of the Northern Alabama, with office at Sheffield, Ala., succeeding J. Y. Hill, promoted. See Southern under engineering and rolling stock officers.

Pan-American.—H. A. McCulloch, Assistant General Manager, has resigned to become General Manager of the Guayaquil & Quito in Peru.

Peoria & Pekin Union.—R. H. Johnson, Superintendent of Freight Terminals of the Chicago & North-Western at Chicago, has been appointed General Manager of the Peoria & Pekin Union.

Quebec & Lake St. John.—See Halifax & Southwestern.

Southern.—R. E. Simpson, Superintendent of the Spartanburg division, has been appointed Superintendent of the Asheville division, with office at Asheville, N. C., succeeding A. Ramseur, resigned. The Spartanburg division will hereafter be operated as part of the Columbia division, of which H. A. Williams is Superintendent, with office at Columbia, S. C.

G. A. Bradley, Trainmaster at Atlanta, Ga., has been appointed Superintendent of Terminals at that place, succeeding W. M. Deuel, promoted.

Southern Pacific.—E. S. Luty, Trainmaster at Ogden, Utah, has been appointed Trainmaster of the First district, including Ogden yard, of the Salt Lake division of the Lines East of Sparks, with office at Ogden, Utah. John McCarty, Trainmaster at Mina, Nev., has been appointed Trainmaster of the Second district, including the Montello and Carlin yards, with office at Montello, Nev. B. A. Campbell, Trainmaster at Sparks, Nev., has been appointed Trainmaster of the Third and Fourth districts, including the Winnemucca, Hazen and Sparks yards, with office at Winnemucca, Nev. The office of Trainmaster at Mina, with authority over the Sixth, Seventh and Eighth districts, is now vacant.

Traffic Officers.

Chicago & Alton.—W. L. Ross, General Freight and Passenger Agent of the Toledo, St. Louis & Western, has been appointed General Traffic Manager of that road and of the Chicago & Alton. The authority of George J. Charlton, General Passenger and Ticket Agent of the Alton, and of C. A. King, General Freight Agent of the Alton, has been extended over the Toledo, St. Louis & Western.

Chicago, Rock Island & Pacific.—H. S. Ray, Assistant General Passenger Agent at St. Louis, has been transferred to the Chicago office, in charge of the Advertising Department, and his former office has been abolished, effective January 1. G. B. Albright, Assistant General Freight Agent at St. Louis, has been appointed Assistant General Freight Agent at Kansas City, Mo., succeeding K. M. Wharry, resigned to go to the Missouri Pacific. The authority of H. H. Embery, General Freight Agent of the lines west of Missouri, has been extended to cover the line from Kansas City, Mo., to St. Louis.

International & Great Northern.—George D. Hunter, Assistant General Passenger and Ticket Agent, has been appointed General Eastern Freight and Passenger Agent, with office at New York. R. E. Lee, chief clerk in the passenger department, succeeds Mr. Hunter, with office at Palestine, Tex.

Oregon Short Line.—E. E. Buckingham, General Superintendent,

has resigned to become General Manager of the South Omaha stock yards.

San Pedro, Los Angeles & Salt Lake.—Allen Walbauer, General Agent of the freight and passenger departments at Pittsburgh, Pa., has resigned, effective January 1.

Toledo, St. Louis & Western.—See Chicago & Alton.

Engineering and Rolling Stock Officers.

Canadian Northern.—G. S. McKinnon has been appointed Assistant Master Mechanic, with office at Winnipeg, Man.

Duluth & Iron Range.—Wayne A. Clark, Assistant Engineer, has been appointed Chief Engineer, succeeding Robert Angst, deceased.

Manistee & Northeastern.—E. H. O'Neil has been appointed to the new office of Assistant to the General Superintendent.

New York Central & Hudson River.—F. E. Paradis has been appointed to the new office of Engineer of the Western district, with office at Buffalo, N. Y., in charge of new construction west of Minoa, N. Y. B. A. Cunningham and F. F. Gordon have been appointed Assistant District Engineers at Buffalo, and D. K. Van Ingam, Assistant District Engineer at Syracuse. A. M. Holcomb, Resident Engineer at Syracuse, has been appointed Engineer of the Eastern district, in charge of the construction between Minoa and Richland, with office at Albany. R. P. Horton and R. E. Dougherty have been appointed Assistant Engineers of the Eastern district. Mr. Paradis and Mr. Holcomb will report to F. B. Freeman, Engineer of Construction, whose office is at New York. The appointments are effective January 1.

Southern.—J. Y. Hill, Trainmaster of the Northern Alabama, has been appointed Engineer of Maintenance of Way of the Southern, with office at Birmingham, Ala.

Special Officers.

Pennsylvania.—Ivy L. Lee, of the firm of Parker & Lee, New York, who have been acting as publicity agents of the Pennsylvania and other roads, is to go to the Pennsylvania on January 1 in charge of similar work.

LOCOMOTIVE BUILDING.

L. J. Smith, Kansas City, Mo., has ordered two four-wheel (0-4-0) switching engines, cylinders 15 in. x 20 in., with both saddle tank and trailing tank, from the Davenport Locomotive Works. These locomotives are equipped with two 9½-in. Westinghouse pumps, one on each side, and special air capacity for both automatic and straight air-brakes, as well as for pneumatic dumping device for dump cars.

The Porto Rico Railway Company, through J. G. White & Co., New York, have ordered three 10-wheel (4-6-0) locomotives from the Baldwin Locomotive Works.

General Dimensions.

Weight, total	90,000 lbs.
Weight on drivers	80,000 "
Cylinders	17 in. x 22 in.
Diameter of drivers	44 in.
Boiler, type	Straight top
" diameter	54 in.
" steam pressure	160 lbs.
Heating surface, total	1,050 sq. ft.
Gage	1 meter.

The Tehuantepec National has ordered eight simple consolidation (2-8-0) oil burning locomotives from the Baldwin Locomotive Works.

General Dimensions.

Type of locomotive	Consolidation
Weight, total	134,000 lbs.
Weight, on drivers	118,000 "
Cylinders	20 in. x 26 in.
Diameter of drivers	56 in.
Boiler, type	Belpaire
" working steam pressure	180 lbs.
" heating surface, total	1,847 sq. ft.
" number of tubes	239
" diameter of tubes	2 in.
" length of tubes	13 ft. 8 in.
Firebox, length	107⅝ "
Firebox, width	33⅝ "
Grate area	21.94 sq. ft.
Tank capacity	4,000 gals.
Oil capacity	2,000 gals.

Special Equipment.

Air brakes	Westinghouse
Couplers	Janney
Headlights	Pyle National electric
Injector	Sellers
Journal bearings	Phosphor bronze
Piston rod packings	Swain
Valve rod packings	Swain
Safety valve	Crosby
Sanding devices	Leach
Sight-feed lubricators	Michigan
Steam gages	Ashcroft
Tires, driving wheel	Latrobe

The Toronto, Hamilton & Buffalo, as reported in the *Railroad Gazette* of November 1, has ordered one simple six-wheel switching (0-6-0) locomotive, one simple ten-wheel passenger (4-6-0) locomotive, and one simple ten-wheel freight (4-6-0) locomotive from the Montreal Locomotive & Machine Company for March, 1908, delivery. The specifications are as follows:

General Dimensions.

	10-wheel freight.	10-whl. passenger.	6-whl. switching.
Type of locomotive	10-wheel freight.	10-whl. passenger.	6-whl. switching.
Weight, total	246,000 lbs.	294,000 lbs.	135,000 lbs.
Weight on drivers	141,000 "	183,000 "	121,000 "
Diameter of drivers	69 in.	73 in.	51 in.
Cylinders	19 in. x 26 in.	20 in. x 26 in.	19 in. x 26 in.
Boiler, type	Ext. wagon top.	Ext. wagon top.	Straight top.
" wkg stm press.	200 lbs.	200 lbs.	180 lbs.
" number tubes	279	336	250
" material tubes	Diamond.	Nat'l Diamond,	Nat'l Diamond.
" diam. tubes	2 in.	2 in.	2 in.
" length tubes	14 ft.	15 ft. ½ in.	11 ft.
" staybolts		*	
Firebox, length	96 in.	102 in.	102 in.
" width	41 in.	65¼ in.	33 in.
" maker	Carnegie Steel Co.	Carnegie Steel Co.	Carnegie Steel Co.
" grate area	27.3 sq. ft.	46.0 sq. ft.	23.4 sq. ft.
Heating surface, total	2,157.0 sq. ft.	2,791.0 sq. ft.	1,620.0 sq. ft.
Tank capacity	5,000 gals.	5,500 gals.	3,500 gals.
Coal capacity	9 tons.	9 tons.	5 tons.

Special Equipment.

Air-brakes	Westinghouse.	Westinghouse.	Westinghouse also straight air.
Axles	Hammond open-hearth steel.	Nova Scotia Steel Co.	Nova Scotia Steel Co.
Balance valve		Richardson.	
Bell ringer	Gollmar.	Gollmar.	Simplicity.
Boiler lagging	Sect'nal magnesia.	Sect'nal magnesia.	Asbestos.
Brake-beams	Monarch.	Monarch.	Monarch.
Brake-shoes	American Brake-Shoe & Foundry Co.		
Couplers	Climax.	Climax.	Climax.
Headlight	Buffalo.	Buffalo.	Buffalo.
Injector	Nathan.	Nathan.	Nathan.
Journal bearings	Canadian bronze.	Canadian bronze.	Canadian bronze.
Piston rod packings	Hayden.	Hayden.	Hayden.
Valve gear		Walschaert.	
Valve rod packings	Hayden.	Hayden.	Hayden.
Safety valves	Hayden.	Hayden.	Hayden.
Sanding devices	Wilson.	Wilson.	Wilson.
Sight feed lubricators	Nathan.	Nathan.	Nathan.
Springs	Montreal St'l Wks.	Montreal Sp'g Co.	Montreal Sp'g Co.
Steam gages	Star.	Star.	Star.
Steam heat equipment		Gold.	

*Four rows flexible staybolts in breaking zone.

CAR BUILDING.

The New York, New Haven & Hartford has ordered 100 passenger coaches from the Bradley Car Works.

The Havana Central is said to have ordered fifty 36-ft. box cars of 60,000 lbs. capacity from the McGuire-Cummings Manufacturing Co. Up to the time of going to press we have not been able to confirm this item.

The Barrett Manufacturing Company, Chicago, is said to have ordered 40 tank cars of 60,000 lbs. capacity from the Cambria Steel Company. Up to the time of going to press we have not been able to confirm this item.

The Tehuantepec National is said to have ordered three baggage cars, two first class passenger cars and five third class passenger cars from the Pullman Company. Up to the time of going to press we have not been able to confirm this item.

The Boston & Maine, as reported in our advance sheet of December 11, has ordered 20 vestibule coaches from the Laconia Car Company for May and June, 1908, delivery. These cars will have a seating capacity for 72 passengers, will weigh 80,000 lbs., and will measure 59 ft. 2 in. long and 9 ft. wide, inside measurements, and 68 ft. 2½ in. long over coupling line, 10 ft. 2¼ in. wide over eaves and 14 ft. 4 in. high over all. The bodies and underframes will be of wood. The special equipment includes:

Bolsters	Commonwealth
Brake-beams	Buffalo
Brake-shoes	American Brake-Shoe & Foundry Co.
Brakes	Westinghouse
Brasses	Boston & Maine standard
Couplers	Tower
Curtain fixtures	Forsyth
Curtain material	Pantasote
Door fastenings	Boston & Maine standard
Doors	Boston & Maine standard
Draft rigging	Gould
Dust guards	Flexible
Heating system	Chicago-Vapor
Light	Pintsch
Paint	Boston & Maine standard
Platforms	Gould
Seats	Haywood Bros. & Wakefield Co., Boston
Trucks	Commonwealth, four-wheel
Vestibules	Gould
Wheels	Midvale-Allen

RAILROAD STRUCTURES.

Alexandria, La.—Local reports say that work will be begun this month on the union passenger station here.

Atlanta, Ga.—The Georgia Railway & Electric Company has asked permission to replace the present bridge over the Western & Atlantic with a new structure.

PORT ARTHUR, ONT.—The Canadian Pacific will probably build a new dock in front of its passenger station here next year.

PORT HURON, MICH.—The Grand Trunk shops here are to be enlarged.

WINNIPEG, MAN.—The Canadian Northern, it is said, is to put up a power house at Fort Rouge, to cost $25,000, and a foundry to cost $30,000.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

ASHLAND & WESTERN.—See Lorain, Ashland & Southern.

BOSTON ELEVATED.—This company during the year built two miles of line from Guild street to a point near Forest Hills, Boston. Surveys are under way from Sullivan square, Charlestown, to Malden, about three miles.

BRITISH COLUMBIA (ELECTRIC).—This company, it is said, has bought the charter for a proposed electric line to run from Vancouver, B. C., south to Blaine, Wash., about 40 miles. This is to form part of a proposed electric line from Vancouver south to Seattle, Wash. R. H. Sperling, Superintendent, Vancouver, B. C.

CANADIAN NORTHERN.—The connecting line from Brandon, Man., via a point on the Hartney Junction-Virden line south of Virden west to Regina, Sask., 175 miles, was officially opened on December 11.

CANADIAN PACIFIC.—An extension of the Pheasant Hills branch is now in operation from Strassburg, Assin., north and west to Saskatoon. The Canadian Pacific therefore now has a line from Winnipeg, Man., west via Kirkella, Assin., to Saskatoon.

CANANEA, YAQUI RIVER & PACIFIC.—See Southern Pacific.

CHESAPEAKE & OHIO.—Contracts have been let to Carpenter, Frazier, Haley & Co., of Clifton Forge, Va., and work is now under way extending the Coal River Railway from Peytona, W. Va., northeast to Racine, two miles; Madison southeast to Laurel, 12 miles; Laurel, southeast to Sang, five miles, and a branch from Laurel northeast five miles.

CHICAGO, MILWAUKEE & ST. PAUL.—Work, it is said, has been started by this company elevating its tracks in the south side of Milwaukee. The cost of the improvements will be between $500,000 and $750,000.

CHICAGO, ROCK ISLAND & PACIFIC.—Reports from Colorado Springs say that this company is preparing to build into Denver. At present its trains reach that city over the Denver & Rio Grande and the Union Pacific, using the track of the Rio Grande between Denver and Pueblo, 119.60 miles, and over the U. P. between Denver and Limon, 89.78 miles. It is said that between Denver and Colorado Springs preliminary surveys have been made, although the officers of the company refuse to confirm the report. Options are being secured on land in Denver for terminal grounds.

COAL RIVER.—See Chesapeake & Ohio.

DENVER, NORTH-WESTERN & PACIFIC.—This road has been extended from Kremmling, Colo., west to Yarmony, 19.7 miles. Work is under way by Orman & Crook, of Denver, Colo., extending the road from Yarmony to Steamboat Springs, 68 miles. Steamboat Springs is about 340 miles from Salt Lake City. The road is now built from Denver, 147 miles west.

GEORGIA ROADS (ELECTRIC).—According to reports from Atlanta, a number of residents of that place in conjunction with R. F. Yoakum are planning an electric line from Atlanta south to Albany, 180 miles.

INDIANA ROADS.—A number of St. Louis and eastern capitalists are planning to build a through line from Terre Haute, Ind., southwest via Chester, Ill., to a point in Missouri, 100 miles west of Chester, about 285 miles, through an oil and fruit and coal section in Illinois. The plans include securing control of existing lines from Mount Vernon, Ill., southwest to Chester, about 60 miles, also a line in Missouri about 60 miles long, and to build 125 miles from Mount Vernon northeast to Terre Haute, and about 40 miles in Missouri.

INDUSTRIAL OF LORAIN.—See Lorain, Ashland & Southern.

INTERBOROUGH RAPID TRANSIT (NEW YORK CITY).—This company during the past year, on its subway division, has added .375 miles of new line, from 221st street to 230th street, on Broadway. The company has under construction 3.51 miles, as follows: from 230th street on the Broadway division to Van Cortland Park, one mile; from Bowling Green in the Borough of Manhattan to Atlantic avenue in the Borough of Brooklyn, 2.51 miles. The work is being done by the Rapid Transit Subway Construction Company.

LORAIN & ASHLAND.—See Lorain, Ashland & Southern.

LORAIN, ASHLAND & SOUTHERN.—The Lorain & Ashland organized by Joseph Ramsey, Jr., and associates to build a line from Lorain, Ohio, south via Wellington to the Ohio river, of which 22 miles from Lorain was finished last year, is said to have secured control of the Ashland & Western, operating a road from Ashland, Ohio, southeast to Custaloga, 25 miles. This road is to be consolidated with the Industrial Railroad of Lorain and the Lorain & Ashland under the name of the Lorain, Ashland & Southern. The consolidated company will have $3,000,000 capital. About $1,000,000 is to be spent in extensions, terminals and equipment next spring. The new line is to form part of the proposed line from Lorain south to the Ohio river. (Oct. 4, p. 403.)

LOS ANGELES & REDONDO (ELECTRIC).—This company, which was formerly a steam railroad, during the last year has built 8.64 miles of road, as follows: from 48th street and Gardiner division to Arlington avenue, 1.74 miles; from Los Angeles to Strawberry Park, 6.9 miles.

MANISTIQUE RAILWAY.—This company, which operates 52 miles of railroad in Michigan, has during the past year added 32 miles of sidings and spurs.

MEXICAN-PACIFIC COAST.—See Southern Pacific.

MINNEAPOLIS & RAINY RIVER.—This company is building with its own forces an extension from Big Fork, Minn., north to Second Crossing, 11½ miles. Grading is finished for 9.2 miles.

MINNEAPOLIS, ST. PAUL & SAULT STE. MARIE.—Work is under way by Foley Bros., Larsen & Co., on the extension from Brooten, Minn., north to Duluth, 189 miles.

MINNESOTA TRANSFER RAILWAY.—This company, operating a terminal switching road of 67 miles for railroads entering St. Paul and Minneapolis, during the year added 11.89 miles of side tracks.

MORGAN'S LOUISIANA & TEXAS.—See Southern Pacific.

NEBRASKA, KANSAS & SOUTHERN.—Surveys are reported made by this company from Stockton, Kan., southwest to Garden City, 165 miles. Rights of way have been secured in Finney and Hodgeman counties and work will shortly be started in Ness county. Surveys are to be continued northeast to Superior, Neb., 80 miles. Construction work will be started on this end of the line when work is well under way on the section from Stockton to Garden City. F. T. Burnham, Secretary, Beloit, Kan. See Nebraska, Kansas & Southwestern. (March 15, p. 387.)

PACIFIC & IDAHO NORTHERN.—Surveys are being made for an extension from Evergreen, Idaho, east to Roseberry, 35 miles.

PORTLAND & SEATTLE.—Contract let to Siems & Shields, of St. Paul, Minn., for building a 10-mile section of this road from Vancouver, Wash., south to Portland, Ore. Work is now under way.

PORT SIMPSON & SKEENA RIVER.—Under this name a company is being formed by Colonel C. J. Prior, of Victoria, B. C., and associates to build a line from Port Simpson, B. C., east to a point on the Skeena river, about 200 miles.

SOUTHERN PACIFIC.—Morgan's Louisiana & Texas is building from Lafayette, La., to Baton Rouge, 52 miles; from Eunice to Mammau, 10 miles, and from Bayou Sale to South Bend, 10 miles.

An officer of the Cananea, Yaqui River & Pacific writes that this company during the year built about 102 miles in Sonora. Work is now under way from Cumuripa, Sonora, north to the international boundary, 345 miles; from a point on the Naco-Cananea line at Del Rio, Sonora, northwest to Nogales, 75 miles, and from Nacozari, Sonora, south to Rio Yaqui, 108 miles.

The Mexican-Pacific Coast Railway under a concession granted this company is building from San Blas, Sinaloa, southeast to Guadalajara, 650 miles.

The new double-track Bay Shore cut-off has been formally opened. The new line runs from San Bruno, Cal., north to San Francisco, 9.84 miles, and has easy grades.

WABASH.—This company has completed work changing the alinement and grading on its line over the Sangamon river east of Decatur, Ill., and the second-track has been put in use. The work, which was very heavy, included a fill requiring the moving of 700,000 cu. yards of earth; also a concrete bridge 654 ft. long and 84 ft. high with four arches. This work is part of the plan to double-track the entire line between St. Louis and Chicago.

RAILROAD CORPORATION NEWS.

ATLANTIC COAST LINE.—The directors have declared the regular semi-annual dividend of 3 per cent. on the $47,537,600 outstanding common stock. The dividend will be paid in certificates of indebtedness bearing 4 per cent. interest. Each holder of 33⅓ shares of common stock will receive $100 in 4 per cent. cer-

tificates of indebtedness. Non-interest-bearing certificates will be issued in fractional amounts, which will be exchangeable for 4 per cent. certificates of indebtedness when presented at the Safe Deposit & Trust Co. of Baltimore in amounts of $100. The trust company will, if notified before January 6, buy fractional amounts only, at 75 per cent. of their face value, or will sell at the same price sufficient fractional amounts to make up the required amount of $100.

Chicago, Peoria & St. Louis.—The July, 1907, interest on the $2,000,000 consolidated mortgage 5 per cent. 30-year bonds was paid on December 10. The two preceding semi-annual interest payments were similarly delayed.

Lake Erie & Western.—A dividend of 1 per cent. on the $11,840,000 6 per cent. non-cumulative preferred stock has been declared payable January 15, 1908. The company has been paying 3 per cent. annually on this stock for the last four years, paying 2 per cent. in January and 1 per cent. in July.

The income results, partly estimated, of the Lake Erie & Western, including the Northern Ohio, for the year ending December 31, 1907, are given below:

	Year Ending Dec. 31, 1907.		
Earnings	$5,112,400	Dec.	$100,400
Expenses (75.53 per cent.)	3,861,500	Inc.	1,200
Net earnings	$1,250,900	Dec.	$101,600
Other income	5,900	"	5,800
Gross income	$1,256,800	"	$107,400
First charges and taxes	975,200	"	25,300
Available for dividend	$281,600	"	$81,500
Dividend (2 per cent.)	236,800	"	118,400
Surplus.	$44,800	Inc.	$36,900

Lake Shore & Michigan Southern.—The regular semi-annual dividend of 6 per cent. and an extra dividend of 2 per cent. on the $49,466,500 stock have been declared, payable January 29.

The following are the income results, partly estimated, for the six months and the year ended December 31, 1907:

	Six Months Ending Dec. 31, 1907.		
Earnings	$23,428,700	Inc.	$1,491,400
Expenses (76.24 per cent.)	17,861,900	"	1,597,200
Net earnings	$5,566,800	Dec.	$105,800
Other income	3,150,000	Inc.	646,500
Gross income	$8,716,800	"	$540,700
First charges and taxes	4,435,000	"	329,500
Available for dividend	$4,281,800	"	$211,200
Dividend (6 per cent.)	$2,968,000		
Extra dividend (2 per cent.)	989,300		
	3,957,300	"	989,300
Surplus	$324,500	Dec.	$778,100
	Year Ending Dec. 31, 1907.		
Earnings	$45,018,200	Inc.	$2,473,800
Expenses (75.51 per cent.)	34,175,200	"	1,499,400
Net earnings	$10,843,000	"	$974,400
Other income	5,100,000	"	946,500
Gross income	$15,943,000	"	1,920,900
First charges and taxes	8,641,600	"	1,106,100
Available for dividends	$7,301,400	"	$814,800
Dividend (12 per cent.)	$5,936,000		
Extra dividend (2 per cent.)	989,300		
	6,925,300	"	1,978,700
Surplus.	$376,100	Dec.	$1,163,900

Michigan Central.—The regular semi-annual dividend of 3 per cent. and an extra dividend of 2 per cent. on the $18,738,000 stock have been declared, payable January 29.

The following tables show the income results, partly estimated, for the six months and the year ending December 31, 1907:

	Six Months Ending Dec. 31, 1907.		
Earnings	$14,752,400	Inc.	$1,096,000
Expenses (80.15 per cent.)	11,823,600	"	427,300
Net earnings	$2,928,800	"	$668,700
Other income	287,600	"	86,000
Gross income	$3,216,400	"	$754,700
First charges and taxes	2,235,700	"	256,600
Available for dividend	$980,700	"	$518,100
Dividend (3 per cent.)	$562,100		
Extra dividend (2 per cent.)	374,800		
	936,900	"	374,800
Surplus	$43,800	Inc.	$143,300
	Year Ending Dec. 31, 1907.		
Earnings	$28,586,100	Inc.	$2,310,800
Expenses (81 per cent.)	23,155,100	"	1,424,800
Net earnings	$5,431,300	"	$886,000
Other income	538,200	"	136,200
Gross income	$5,969,500	"	$1,022,200
First charges and taxes	1,351,200	"	391,700
Available for dividend	$1,618,300	"	630,500
Dividend (6 per cent.)	$1,124,200		
Extra dividend (2 per cent.)	374,800		
	1,499,000	"	562,100
Surplus	$119,300	Inc.	$68,100

Chicago, Rock Island & Pacific.—A quarterly dividend of 1 per cent. on the $74,854,100 capital stock has been declared payable January 2, 1908. In 1907 5½ per cent. was paid, in 1906 6 per cent., in 1905 6¼ per cent., and in 1904 8¼ per cent.

Illinois Central.—Arguments were heard this week before Judge Bull in the Superior Court of Illinois on dissolving the injunction preventing the voting of the Illinois Central held by the Railroad Securities Company and the Union Pacific. It was announced that Stuyvesant Fish has been given proxies for $180,500 of Illinois Central stock held by the Rothschilds.

New York Central & Hudson River.—The general balance sheet, as of September 30, 1907, shows loans and bills payable of $25,192,000, as compared with $8,154,000 at the same time in 1906, while in 1905 and in 1904 the amount was less than $3,000,000. The $25,000,000 three-year notes issued February 1, 1907, are probably included under this head. The special improvement fund was $1,282,488, which compares with $881,720 last year. The cost of road and equipment is given as $214,369,326, an increase of $11,914,431, and securities owned, $154,596,380, an increase of $4,733,654. The bonded debt remains the same while the capital stock outstanding amounts to $178,632,000, as compared with $149,197,800 last year. The surplus on hand was $14,707,483, a decrease of $2,140,979.

The following are statements of the income account, partly estimated, for the quarter and the year ending December 31, 1907:

	Quarter Ending Dec. 31, 1907.		
Earnings	$24,712,500	Inc.	$284,900
Expenses (79.49 per cent.)	19,644,600	"	1,452,700
Net earnings	$5,067,900	Dec.	$1,167,800
Other income	3,841,400	Inc.	948,700
Gross income	$8,909,300	Dec.	$219,100
First charges and taxes	5,944,900	"	47,100
Available for dividend	$2,964,400	"	$172,000
Dividend (1.50 per cent.)	2,679,500	Inc.	441,500
Surplus.	$284,900	Dec.	$613,500
	Year Ending Dec. 31, 1907.		
Earnings	$98,713,200	Inc.	$6,623,400
Expense (76.61 per cent.)	75,624,700	"	9,362,700
Net earnings	$23,088,500	Dec.	$2,739,300
Other income	11,276,000	Inc.	3,568,300
Gross income	$34,364,500	"	$829,000
First charges and taxes	23,318,300	"	750,400
Available for dividend	$11,046,200	"	$78,600
Dividend (6 per cent.)	16,717,900	"	2,885,000
Surplus.	$328,300	Dec.	$2,806,400

Norfolk & Southern.—This company, it is said, has sold $700,000 three-year 6 per cent. collateral trust notes dated October 1, 1907, and due November 1, 1910, subject to call on any interest day at 102½ and interest, being part of an authorized issue of $2,750,000. It is also said that a syndicate has agreed to take $1,000,000 more of these notes. The issue is secured on $1,000,000 first mortgage bonds; $2,040,000 first general mortgage bonds, and $1,200,000 10-year 5 per cent. equipment trust notes.

North American Company.—This company, through a subsidiary, has bought the Laclede Power Company and the Edison Electric & Illuminating Company, both of St. Louis, Mo. The North American Company now controls all the light, power and street railway companies of St. Louis.

Northern Pacific.—With an increase of 11 miles operated, freight earnings on the Northern Pacific (main system) decreased 1.3 per cent. in the month of October, as compared with October, 1906. Mail and express earnings decreased 15.8 per cent. Passenger earnings increased 15.9 per cent., and gross earnings, 2.2 per cent.

Pennsylvania.—See Pennsylvania Company.

Pennsylvania Company.—A semi-annual dividend of 4 per cent. on the $60,000,000 stock has been declared, payable December 31, making 7 per cent. for the year. In 1906, 6 per cent. was paid, and in 1905 and 1904, 5 per cent. The company controls the Pennsylvania Lines West of Pittsburgh and operates the Northwest System. All its stock is owned by the Pennsylvania Railroad.

St. Louis, Rocky Mountain & Pacific.—The semi-annual interest on the $7,000,000 5 per cent. first mortgage bonds of 1955, which is due on January 2, will be paid on and after December 20.

Southern Pacific.—In October the gross revenue of the Southern Pacific Company was $1,200,000 larger than in the corresponding month a year ago. Operating expenses and taxes increased $2,600,000, so that there was a decrease in net revenue of $1,400,000. In the four months ended October 31, gross revenue was $7,000,000 larger, and net $2,200,000 smaller than in the same period in 1906.

RAILROAD GAZETTE

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CONTRIBUTIONS—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.

ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

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CONTENTS

VOL. XLIII., No. 26. FRIDAY, DECEMBER 27, 1907.

CAR AND LOCOMOTIVE OUTPUT IN 1907.

Last year when the output of the car and locomotive builders in the United States and Canada was compiled, the returns indicated that in spite of the record breaking production of 1906 a still larger output would be recorded for 1907. Some of the companies reported last year that they had unfilled orders on their books for 1907 delivery for a greater number of cars than they had built during 1906 and orders were being placed for delivery from nine months to a year in advance. Last spring when the financial situation became acute and the railroads as well as the industrial corporations began to feel the effects of hard times, it was generally expected that many of the large orders for cars to be delivered during the last months of the year would be cancelled. New orders dropped off to very small figures, but few standing orders were actually cancelled and the car and locomotive builders have continued through the year working practically to their full capacity. In order to compare the business situation at this time with the business situation last year, the builders were asked this year to state the number of unfilled orders on their books as compared with the number of unfilled orders on their books a year ago. Almost without exception both the car and locomotive builders in the United States report a heavy falling off in orders and inquiries, and many of them are running now on orders placed last spring with no new work in prospect. One of the large locomotive building companies reported a falling off of 75 per cent. in orders, as compared with last year. The Canadian car and locomotive builders have not felt the effect of the disturbance in financial and business conditions to any extent. All of the companies report as many or more unfilled orders on their books now as they reported last year.

Official returns from 36 car building companies in the United States and Canada (estimating two small plants not heard from) give the total number of railroad cars built during 1907 as 289,645, an increase of 19 per cent. over the record breaking output of last year. This includes subway and elevated cars, but does not include electric street and interurban cars. No estimate has been made of the number of cars, both freight and passenger, built by the railroads in their own shops. Of the total number of cars built by manufacturers 284,188 were for freight service and 5,457 for passenger service; 280,216 were for domestic use and 9,429 for export. The number of passenger cars built during the year shows an increase of more than 70 per cent. over last year's output. About 72 per cent. of the freight cars built were of steel or steel underframe construction. Canada built 9,159 freight cars and 106 passenger cars, an increase of 30 per cent. over last year's output; all of these cars were for domestic use. The one company building cars in Mexico retired from business during the year and no returns were received from it. The following table shows the *Railroad Gazette's* compilation of the number of cars built during the last nine years:

Year.	Freight.	Passenger.	Total.
1899	119,886	1,305	121,191
1900	115,631	1,636	117,267
1901	136,950	2,055	139,005
1902	162,599	1,948	164,547
1903	153,195	2,007	155,202
1904	60,806	2,144	62,950
1905	165,455	2,551	*168,006
1906	240,503	3,167	*243,670
1907	284,188	5,457	*289,645

*Includes Canadian output.

The locomotive output shows a smaller increase over last year than the car building output. This is probably due to the fact that the locomotive builders worked their plants practically to their full capacity last year and were unable because of lack of manufacturing facilities to turn out any large increase over last year's figure. The 12 builders in the United States and Canada built 7,362 locomotives during the year, of which 6,564 were for domestic use and 798 for export. This is an increase of 6 per cent. in the total output; the export output increased 11 per cent., as against 5 per cent. for the domestic output. These figures, as in the case of the totals of cars built, do not include locomotives built in railroad shops or locomotives rebuilt or repaired. There were 330 electric locomotives and 240 compound locomotives built, as against 237 and 292 respectively last year. The Canadian output of locomotives was 264. The following table shows the number of locomotives built during the last 15 years:

Year.	No. built.	Year.	No. built.	Year.	No. built.	Year.	No. built.
1893	2,011	1897	1,251	1901	3,384	1905	*5,491
1894	695	1898	1,875	1902	4,070	1906	*6,952
1895	1,101	1899	2,475	1903	5,152	1907	*7,362
1896	1,175	1900	3,153	1904	3,141		

*Includes Canadian output.

The cost of cars and locomotives has increased slightly over last year. Estimating the average cost of freight cars at $1,100, the total spent for freight cars amounts to $312,607,000; for passenger cars at $8,500 the cost was $46,384,000, and for locomotives at $16,000 the cost was $117,792,000. The increase in the cost of locomotives is due largely to the increased average weight of modern

locomotives. The total amount spent by the railroads for new rolling stock and locomotive power approximates this year $477,000,000, an increase of about 25 per cent. over last year.

RAILROAD BUILT IN 1907.

The new mileage added during the past year, although somewhat less than that for the unusually prosperous year 1906 which was the largest since 1903, is as much as could be expected when the changing and adverse conditions that prevailed during this period are considered. Official returns from nearly all the railroads, supplemented by our own records and figures furnished by the State Railroad Commissions, show that approximately 5,212 miles of new railroad line were built in the United States during the calendar year 1907. These figures include 14 miles of new main track relocated, but do not include new second, third or fourth track, sidings or electric lines. The total is 7½ per cent. less than was built in 1906. Conditions at the close of last year indicated that the mileage for this year would exceed that of the previous year, as a large amount of grading had been finished ready for the track and many new projects were contemplated. During the early part of the year the railroads were not able to get all the labor and supplies necessary to carry out the authorized work. Soon the railroad legislation in various states and the difficulty of borrowing money, resulted in suspension of new work by a number of companies. Considerable progress was, however, made in permanent improvements to roadbed, particularly straightening the lines and reducing grades.

The joint low grade line of the Great Northern and the Northern Pacific, from Kennewick, Wash., west to Vancouver, 220 miles, constructed under the name of the Portland & Seattle, was the longest single stretch of new road built. Work is being pushed by the Chicago, Milwaukee & St. Paul on its Pacific extension. In 1906, there were 39 miles of track laid and 298 miles were added in 1907, leaving between 1,100 and 1,200 miles yet to be built to finish the line to Seattle. The Kansas City, Mexico & Orient built 47 miles in Oklahoma, 25 in Texas and 18 in Mexico. There are over 900 miles yet to be built to finish the line from Kansas City through to Topolebampo, on the west coast of Mexico. On the Western Pacific all of the road in Utah, 122 miles, has been finished, in Nevada 39 miles of track have been laid, and 102 in California, leaving 577 miles yet to be built.

In Canada, the Grand Trunk Pacific has made its full surveys from Moncton, N. B., west to Winnipeg, Man., 1,800 miles, and has let contracts for 852 miles of line on this section. In the West, contracts are let to the Rocky mountains, except for about 125 miles, for which contracts will shortly be let. It was definitely decided this year that the line would cross the main range of the Rockies through Yellowhead Pass. Up to April of this year only 36 miles of track had been laid, but track has been laid on 325 miles west of Winnipeg and on 100 miles of the Fort William branch. The Canadian Northern recently finished a connecting line from Brandon, Man., west to Regina, Sask., 175 miles, and has projected a large number of other extensions. The Canadian Pacific has built a long extension from the East to Saskatoon, Sask., which is being extended 325 miles beyond that point to Wetaskiwin, Alb., on the Edmonton branch. Beyond Saskatoon, 26 miles of track have been laid and the grading is 95 per cent. finished. Though not included in its total, one of the most important construction works carried out by this company has been the completion of the double track between Winnipeg and Fort William, a greatly congested section of its through line. In Mexico the Southern Pacific built 205 miles on the west coast during the year and is pushing work from San Blas, which is on the Kansas City, Mexico & Orient, down the west coast to Guadalajara, 650 miles.

New main track mileage is reported in 44 states and territories, including Alaska, where 90 miles of new track were built. Louisiana, which was third in 1906, was first this year with 384 miles. Texas, South Dakota and Washington came next in order, each with between 340 and 320 miles. In 1906 Texas was first with 635 miles, far ahead of the record of any state in 1907. Besides Texas with its decrease of nearly 300 miles, Arkansas, Illinois, Nebraska each show at least 100 miles less than last year. The largest decrease in 1906 was in North Dakota, where only 217 miles were built, as compared with 521 in 1905. In addition to the states already mentioned, which lead the list, Alabama, Arkansas, Georgia, Idaho, Indiana, Minnesota, Mississippi, Montana, North Carolina, North Dakota, Oklahoma, Pennsylvania, Virginia, West Virginia and Wisconsin, each built over 100 miles of main line in 1907. No new mileage was reported in Connecticut, Delaware, Iowa, Massachusetts, New Hampshire Rhode Island or Vermont.

The number of miles built in Canada was 977, a small decrease as compared with 1906, when 1,007 miles were built. The number of miles built in Mexico was 333 as against 297 in 1906.

The following table shows our figures for mileage built in the United States during the last 15 years:

1893.....3,024	1898.....3,265	1903.....5,652
1894.....1,760	1899.....4,569	1904.....3,892
1895.....1,428	1900.....4,894	1905.....4,388
1896.....1,692	1901.....5,388	1906.....5,623
1897.....2,109	1902.....6,026	1907.....5,212

RECEIVERSHIPS AND FORECLOSURE SALES IN 1907.

The receivership record of 1907, in spite of the great financial disturbances and the banking panic in the latter part of the year, is an unusually clear one. Only 349 miles of railroad went into the hands of receivers during 1907, which is the smallest mileage since 1903. It is to be hoped that the year 1908 will have an equally clear record, although there is no doubt that it will be a time of test and trial. The encouraging feature of the situation is that expenditures for additions and betterments during the last few years have generally been so large and so continuous that the average railroad is in a strong position to meet a curtailment of traffic. In 1906 there were 657 miles of road which suffered receivership. Up to December 26 of that year there were only 254 miles of road so affected, but on that day receivers were appointed for the Mobile, Jackson & Kansas City and its subsidiary, the Gulf & Chicago, adding 403 miles to the total. As the receivership of the parent road was terminated four days later, on December 31, 1906, these receiverships were in reality unimportant. In 1905 3,593 miles of railroad entered receivership, this large figure being the result of the Cincinnati, Hamilton & Dayton and Pere Marquette troubles. In 1904 there were 744 miles, of which the largest railroad was the Detroit Southern, now the Detroit, Toledo & Ironton. In 1903 there were 229 miles involved; in 1902, 278 miles, and in 1901, 73 miles. Back of this year as far as 1882 was a long period during which the annual mileage of new receiverships ran into the thousands, with the climax in 1893 with over 29,000 miles.

The largest railroad which went into the hands of receivers during 1907 was the Chattanooga Southern, which owns 99 miles from Chattanooga, Tenn., south through the northeastern corner of Georgia to Gadsden, Ala. This is said to have occurred because some of the stockholders were unwilling to agree to terms offered by the Louisville & Nashville for purchase of the securities of the road. The next largest road was the Apalachicola Northern, an 80-mile line from River Junction, Fla., to Apalachicola, for which receivers were appointed in September. The Colorado & Northwestern runs from Boulder, Colo., to Ward and from Sunset to Eudora, a total of 48 miles. It was previously sold under foreclosure in 1904. The Missouri River & Northwestern has 35 miles of line built from Rapid City, S. Dak., to Mystic in the Black Hills region. It also was reorganized in 1904, its predecessor company being the Dakota Pacific Railroad. Its road, however, was not opened throughout until 1906. There was no default of interest on its bonds, but the present receivership came as a result of difficulties among the stockholders, following damage done to the property during the severe weather of last winter. As soon as possible it is planned to extend the line 50 miles beyond Mystic to coal areas in Wyoming. The Council City & Solomon River is an Alaskan road which has been building a few miles each year until it now has 35 miles of line from Dickson, Alaska, to Penelope Creek. This receivership was due to the claims of construction companies; these have since been adjusted. The receivership of the North-East Texas, an 18-mile lumber road, from Red Water, Tex., to Munz, was due to the burning of a sawmill on which the road depended for most of its traffic. The Ione & Eastern has 13 miles of line from Ione, Cal., to Martell. The Medford & Crater Lake runs from Medford, Ore., to Eagle Point, 11 miles. It was in receiver's hands only a short time, for on May 11 it was sold under foreclosure, as shown below, to the Pacific & Eastern, the successor company. The Alabama Central runs from Booth, Ala., to Autaugaville, 9 miles.

The most important receiverships of the year are not included in the list because they were not of steam railroads, but of street railway companies. On September 24 Adrian H. Joline and Douglas Robinson were appointed, by the Federal court, receivers of the New York City Railway and on October 2 the Metropolitan Street Railway was also put in their hands as receivers. The New York City Railway is the lessee of the Metropolitan Street Railway and operates the surface lines in the boroughs of Manhattan and the Bronx, New York City, and also controls considerable trolley mileage north of the city limits. This receivership involved a clash of

jurisdiction, for on November 29 three receivers for each of these companies were appointed by the Attorney-General of the state of New York. These state receivers were, however on December 12 restrained by the United States court from taking possession.

The following table lists in the order of their occurrence the receiverships of the year:

Receiverships.

Name.	Mileage.	Bonds.	Stock.	Date of receivership.
Alabama Central	9			Jan. 21
Mo. River & Northwestern	56	$700,000	$1,000,000	Feb. 14
Medford & Crater Lake	11		200,000	April
North East Texas	18	80,000*	250,000	Apr. 13.
Chattanooga Southern	94		3,000,000	Apr. 23.
Colorado & Northwestern	54	1,000,000	1,000,000	June
Apalachicola Northern	80			Sept.
Ione & Eastern	13	360,000	50,000	Sept. 10
Council City & Solomon Rvr	35	347,000	895,460	Oct. 11
Total	349	$2,187,000	$6,395,460	

*About.

There were only six roads sold under foreclosure during 1907, with a total mileage of 175 miles. Of these the most important were two terminal railroads, both of which were among the roads which went into the hands of receivers during 1906. The Toledo Railway & Terminal had been taken over by the Cincinnati, Hamilton & Dayton-Pere Marquette combination and was dragged down into receivership by them on January 3, 1906. This company, the last of the three to go into receivership, was the first to come out of it. It was sold at foreclosure last May and is now reorganized as the Toledo Terminal Railroad, in whose ownership most of the railroads entering Toledo have a share. The other company is the Peoria & Pekin Terminal. This is a road operated by both steam and electricity, which has two lines of road between Peoria, Ill., and Pekin, and trackage rights over five miles of street railway in Peoria. This company was bought by the Peoria Railway Terminal, which is controlled by the Chicago, Rock Island & Pacific and the Chicago & Alton jointly. The Texas Western is a 52-mile road from Houston, Tex., to Sealy which has not been in operation for years. After having gone into receivership in 1873, it was sold in 1900 to the Houston, Brazos & Northern for $25,000 cash and a note for $125,000, whose payment was later defaulted. On October 2, 1907, it was sold for $10,000 to satisfy a judgment for $165,542, representing this note and interest. The Dayton, Lebanon & Cincinnati runs from Lebanon, Ohio, to Lebanon Junction, 30 miles, and has trackage arrangements with electric lines over which it reaches Cincinnati and Dayton. Its passenger service is operated by trolley and its freight service by steam. The Dayton, Lebanon & Cincinnati Railroad & Terminal is the successor company. The Traverse City, Leelanau & Manistique is a 30-mile branch of the Grand Rapids & Indiana, from Traverse City, Mich., to Northport, whose sale was a formality of fixing the parent company's control.

There is one more road more important than any of those included in the list of foreclosures which was advertised to be sold at foreclosure sale during the year. This is the Chicago Terminal Transfer, which owns the Grand Central Station and 84 miles of belt railroad in Chicago. Its troubles began in 1904, when the Lake Shore, the Rock Island, the New York, Chicago & St. Louis terminated their contracts with it and moved into the La Salle street station. Interest has been in default since 1905 and the foreclosure sale of the road was set for May 3, 1907, but before that time the Baltimore & Ohio, which has a valuable lease of the passenger and freight facilities of the Chicago Terminal Transfer, gained permission from the Federal court to assume the company's bonds. These bonds were paid off at par and accrued interest on the announced date of the foreclosure sale and the Baltimore & Ohio's lease of its Chicago terminals was protected. This explains the fact that these bonds for the two years that they were in default sold most of the time at a price near par. Another important foreclosure which apparently just missed getting in the year's record was that of the Pere Marquette, whose reorganization is now under way and soon to be completed by formal termination of the receivership. It is also probable that the Cincinnati, Hamilton & Dayton will before long be taken out of its receivership.

The following table shows the railroad foreclosure sales during 1907, listed in the order of the date on which the sale was made:

Foreclosures.

Name.	Mileage.	Bonds.	Stock.	Date of sale.	Selling price.
Peoria & Pekin Termnl	21	$977,000	$600,000	Feb. 9.	$600,000
Texas Western	52	.....	.....	Apr. 2.	10,000
Dayton, Leb. & Cin.	30	1,500,000	2,500,000	Apr. 16.	200,000
Traverse City, Leelanau & Manistique	30	300,000	500,000	Apr. 17.	339,229
Medford & Crater Lake	11	.....	200,000	May 11.	82,500
Toledo Ry. & Terminal	31	3,825,000	3,500,000	May 28.	2,000,000
Total	175	$6,602,000	$7,300,000		

FIVE PANICS

There have been five severe commercial panics in this country; four of them important and far reaching; the fifth, severe at the time but of short duration. The really first class panics occurred in 1837, 1857, 1873 and 1893; the lesser one, in 1884. The question which everybody would like to know the answer to, at the present time, is, which kind of panic and depression are we having now—the long kind or the short kind?

To begin with, let us separate ethics and economics, and keep them vigorously apart. Wickedness did not cause the 1907 panic; it never caused any panic, except as a secondary and minor cause groupable with a great many other secondary and minor causes. Every noteworthy panic that this country has had can count among its causes one constant—speculation and credit inflation—and a large number of variables. Wherever there has been heavy and continued speculation, some wickedness, some breaches of trusteeship have crept in, but the wickedness has always been rather an incident than a moving cause. The variables, not the constant, have, so to speak, brought out the symptoms of panic. Then, when the fever has run its course, the duration of the after drag has been governed principally by two things: the nature of the variables, and the soft spots which the panic has disclosed in the commercial structure. By attention to these things it is possible to see how causes and effects in previous panic years compare with the exhibit of 1907 thus far presented, and to deduce analogies, if not indications.

Without going at length into historical details that are more or less readily accessible, it should be noted that the panic of 1837 was immediately preceded by the very great success of the United States Bank. This central bank had become one of the richest institutions in the world, but its power was greatly distrusted, and the political party that elected Andrew Jackson President was strongly opposed to the renewal of the charter of the bank. Consequently, President Jackson, on constitutional grounds, refused to re-charter the bank, and a law was passed requiring the huge surplus which had been piled up after our entire war debt had been paid, to be distributed among the states. The sum of $28,101,645 was thus distributed among the states, in proportion to their population, and this distribution took place during the pinch. It was estimated that $10,000,000 was taken out of New York, and taken out at the very time when it was much needed.

This distribution act was quite generally blamed by the daily press of the time as the direct cause of disaster, but a glance at the general speculative situation which closed late in 1836, the year before the panic, casts a rather different light on the subject. In September, 1836, the United States was importing grain. The money market was growing tighter every day, all costs were rising and speculation in real estate was in progress. New York real estate, valued in 1835 at a total of $144,000,000, was valued in 1836 at $226,000,000. Meantime, a host of state banks were being opened, the most prominent of them all being the Pennsylvania State Bank, chartered by Nicholas Biddle, former President of the United States Bank, and these new banks were absorbing more and more of the scarce capital. In October, 1836, money was costing from ⅛ to ¼ per cent. per day in lots of $5,000 to $10,000, loaned on call, and during that month there were 10 or 12 failures in Wall street. Meantime, good money was getting scarcer and scarcer and bad money was becoming more and more plenty. "Wild-cat" currency, so-called, was issued not only by the state banks but by large commercial houses all over the country, and as soon as financial stringency began to be felt there were as many prices for money as there were kinds of money. People were accused of hoarding, especially in the West, but the more conservative critics of the time believed that this hoarding was over-estimated.

In March, 1837, gold was going out fast to England and much loose currency was in use in the United States. In April there were daily failures in New Orleans, where the banking facilities had been engrossed by speculators who were trying to corner the cotton crop. The *Evening Post* of April 6, 1837, referred to "the brood of incorporated banks that had treated credit like a Roman race-horse, hung it with spurs and goads and set it galloping off without a rider." Comment was also freely made to the effect that the merchant and the speculator had traded by the help of the banks on borrowed capital and had anticipated prices, and that their ruin had thrown the mechanic and the laborer out of employment. On May 4 there were crowds in Wall street and a run on the Mechanics' Bank. "New York never saw such a time." On May 5 there was panic. It was complained that southern and west-

ern money could not be sold anyhow and that the brokers "take nothing west of Albany and the banks take nothing, even for collection, on the South." The New York banks suspended specie payments on May 10 and comment was made that nothing whatever was done in country money.

Without going into the details of the gradual improvement which set in after the crash, it may be noted that dull times lasted in varying degrees of intensity for about four years. As regards stock prices; Delaware & Hudson Canal Company, which sold at 96 in the high period in the summer of 1836, was down to 87 January 4, 1837; to 73 March 24; to 69 April 6; to 64 April 27; to 53 May 4; to 50 May 8; then up again to 67 May 10, the day when specie payment was suspended; to 79 May 15; down to 75 in September; up to 78½ in November, and to 85 in June, 1838. This stock is selected as characteristic. The number of railroad stocks sold on the exchange in those days was naturally small and they all acted in a similar manner.

In the seven years ending with 1837 the country had increased its railroad mileage from 23 miles in operation to approximately 1,500 miles, and much of the new mileage was highly unprofitable at the time the crash came. The railroads had not been properly built or maintained and much of the mileage owed its existence to the great prosperity of the past few years and to the ready influx of money into all commercial opportunities, whether these were lands, mines, canals and railroads, or state banks.

1857.

Starting with the constant of speculation, we find in 1857 that there had been rapid railroad expansion, land jobbing and frauds in Congress, a high market and tight money, the railroads mostly not earning anything and everybody speculating in whatever presented itself. The new mileage built in 1856 amounted to some 3,650 miles, and the aggregate mileage built in 1857 and the six previous years exceeded that of the 10 years which followed. Again, just as in 1837, everybody was doing business on credit, and increasing expenses; with the difference, as recognized at the time, that the basis of inflation in 1837 was government specie to the extent of some 30 odd million dollars, while in 1857 there had been an enormous gold production in California and in Australia, and the basis of inflation amounted to hundreds of millions of dollars. The *Herald* complained that "our fictitious paper bubbles of all kinds have been inflated in proportion to this augmented specie basis and the crash in the same proportion brings with it its accumulated disasters. The states have created banks by the hundred and the thousand; they have issued their paper accommodations by millions; railroads and all sorts of speculative combinations have followed suit with their stocks and bonds; merchants have been enriched by credit purchases and sales upon promise to pay; speculators have become millionaires, and thus we have had a grand carnival of universal credits, universal extravagances and unbounded paper wealth." The *Herald* also said, earlier in the year, when it was preaching against the extravagance that was going to cause trouble, that "A fashionable lady cannot move abroad without a silk dress worth perhaps $50; laces, $50 more; sables, $50 more; a French hat almost $50 more, and with bracelets, watch and charms to match she moves along a capitalization of the floating funds of her husband. And this is but an item, compared with the costly contents of her boxes and bureaus at home."

In January, 1857, an investigating committee was appointed to report on the lobby corruption at Washington, which was alleged to have originated under the careless and lazy administration of President Fillmore five or six years before, and to have greatly increased under President Pierce. In February the railroads were sustaining their own stocks in the market and were borrowing short time money to pay their dividends. On February 20 the Corruption Investigation Committee reported amidst great excitement. The expulsion of Representatives Matteson, Gilbert and Edwards, of New York, and Welch, of Connecticut, was demanded, and it was testified that there were 20 or 30 members of the house associated and pledged to each other not to vote for any law or resolution granting lands or money unless they were paid for it. The *New York Herald* observed that Horace Greeley had been bought and sold to the service of the Des Moines Improvement Company at the low figure of $1,000—"the average price of a common Virginia nigger." In March the newspapers said drearily that railroad prosperity had seen its best days in the United States, that competitive construction, depreciation and destruction accounts had not as yet been properly considered in the financial movements of the railroad companies; that the country had just arrived in the point of the history of the railroads where it could not longer be overlooked that large reservations must be annually made to keep the property in working order before dividends could be paid out of net earnings. Meanwhile, President Buchanan was inaugurated and better feeling prevailed for a time, but imports were much in excess of exports, and when the crops came along, cotton was very backward. Grain was abundant, but there was no foreign market because of the good harvest all through Europe. The market for American railroad securities abroad had been spoiled by common understanding of the fact that a great many dividends were being paid which had not been earned. The output of California gold was smaller than in 1856, yet speculation, expansion of credits and extravagance went on unchecked.

On August 24, 1857, the Ohio Life & Trust Company suspended. The concern had been a large borrower, and it was subsequently developed that a trusted eastern agent had been shamefully misusing its funds and that the failure was going to be a very bad one. On September 21 the Mechanics' Bank, and Beebee & Company, specie brokers, suspended. There were runs on the Hanover Bank, the Metropolitan Bank and the Bank of Commerce, and runs and bank suspensions in Buffalo, Paterson, Detroit, etc. The Erie, the Michigan Southern, the Illinois Central, the Cleveland & Toledo, the New York Central and the Reading were all in a more or less insolvent condition. The Illinois Central assessed its stock $10 a share but was not able to stem the tide even with this assistance.

There was a slight upward turn of the stock market in September, 1857, but it did not have special significance. In the week ending Oct. 1 there were 100 commercial failures, and banks all over the country were in difficulties. On Oct. 9 the Erie and the Michigan Central were unable to meet the interest charges on their floating debts; on Oct. 10 the Illinois Central suspended, for the same reason. Up to Oct. 26, beginning with the suspension of the Ohio Life & Trust Co., there had been some 1,500 failures of merchants and traders, and about the same number of suspensions of banks and railroads, yet contemporary comment pointed out that the country as a whole had never been richer.

Better feeling in 1857 began in November; there was a steady influx of gold from Europe and from California, and in October and November together, over 11 millions of specie arrived in New York. The banks resumed specie payments in December, and had, in New York, double their usual reserve. Prospects were then considered bright, and in January, 1858, money was abundant in Wall street, although commercial money was extremely tight. In March, 1858, very dull business was reported everywhere except in Wall street, where transactions were brisk, but things were looking better ahead, and after a large number of commercial failures throughout the spring, prosperity began to reappear. The exact duration of the drag after the 1857 panic is rather hard to estimate because of the interference of the Civil War period, but it may be set down roughly at two years, during which industry, though by no means paralyzed, was clearly below normal.

1873.

The next first-class panic came in the year 1873 and it is curious to see how closely the speculative features of 1837 and 1857 were repeated. Again there were heavy railroad speculations. Following 1856, the year before the previous panic, the annual increase in railroad mileage did not exceed 2,500 miles until 1868, when almost 3,000 miles were built. In 1869 4,615 miles were built; in 1870, 6,078; in 1871, 7,379, and in 1872, 5,878. After the '73 panic, 5,000 miles of new road were not built in any single year again until 1880, but the over-extension in 1873 was very great; unproductive lines encumbered almost every system, and people began to realize that it would be a long time before some of these lines were worth anything. Extravagant and extended business were much in evidence in 1873, just as they had been in 1857 and in 1837. There was also inflated currency, much watering of stock and reckless management of trust companies and savings banks. The Chicago fire of 1871 was a very important contributory cause. The absolute loss to the country resulting from the Chicago fire is estimated at $150,000,000; a sum much larger in those days than it is now. Another moving cause of the panic, though a subsidiary one, was the passage of the severe Granger laws in the Northwest, and the rate wars between the railroads themselves, which did not give much hope of amicable settlement. The subsequent truce between the trunk lines dated from the Saratoga conference, in 1874, although there was much trouble after this prior to the formation of the Southern Railway and Steamship Association, in 1875, and of other kindred organ-

lizations. The operations of Gould, Fiske, Drew, Vanderbilt and Keep were fresh in everybody's mind, although the most notable corners in Erie, Chicago & North-Western and Milwaukee & St. Paul occurred in 1868. Manipulation of money and the attempt of Jay Gould to corner the gold market in 1869 were also remembered, consequently it took only the suspension of the Warehouse & Security Company, which had loaned money to a construction company to aid in building the Missouri, Kansas & Texas, to precipitate the 1873 panic.

In July, 1873, there was abundant money to be had at 3 and 4 per cent., and the stock market was strong. Prime discounts were at the rate of 5½ to 7 per cent. In August the government surplus was very low, trade was declining and there was a decreasing bank reserve in New York. Call money rose about 1 per cent. in the second week of August and advanced to 6 per cent. on August 19, though it slacked off somewhat in the next few days. Exports from Jan. 1 to Aug. 26 amounted to $185,000,000 in 1873, as against $147,000,000 in 1872; while imports had amounted to $275,000,000 in 1873, as against $296,000,000 for the same period in 1872. On Aug. 31 the contemporary press regarded the prospects as being very good, but early in September call money went up to 7 per cent. and, following a rather sharp speculation in Wall street, the suspensions of the New York Warehouse & Security Company and of Sheppard Gandy and Francis Skiddy were announced. On Sept. 9, prime discounts cost from 10 to 12 per cent. On Sept. 15, the Eclectic Mutual Life Insurance Company failed, and on Sept. 17 Jay Cooke & Company went under, involving the Northern Pacific and the Western Union directly, and a host of concerns and individuals indirectly. By the close of the exchange on the following day, 17 well-known stock exchange houses and a number of smaller ones had failed. The stock exchange was closed on Sept. 22, and there were runs on savings banks. So far as the solvency of banks was concerned, confidence was restored in 1873 very soon. President Grant courageously refused to sign a bill providing for a treasury loan and the feeling at once began to be better, although trade everywhere became greatly depressed and there was no real and substantial recovery until about 1878.

1884.

Measured by the retardation of business and the ensuing drag, the 1884 panic cannot be called a first-class one, yet this panic is in some respects so closely analogous to the conditions of 1907 that the principal facts of it should be recorded. Unlike 1907, there had been a period of great railroad construction; there had also been heavy inflation of securities. Along with this came the exposure of great financial frauds. On May 5 the Marine National Bank suspended in consequence of the speculations of its President, J. D. Fish, with the house of Grant & Ward, and Grant & Ward themselves failed May 14. The defalcation of John C. Eno, President of the Second National Bank, involving some $4,000,000, had occurred just before; then the Erie defaulted, as usual. But it is incorrect to describe 1884 as a year of real commercial crisis. The prime effects of the panic had disappeared by July and partial confidence was restored, while in June, 1885, there was substantial recovery upon the negotiations for a cessation of the war between the New York Central and the West Shore. The lease of the West Shore was effected in August, 1885, and prices advanced. The panic of 1884 has been described as an incident following the long drag-down of stock values from the culminating point in July, 1881, with the crisis precipitated by the events which have been mentioned, and in this drag-down it is closely comparable with 1907.

1893.

The panic of 1893 is so fresh in everybody's mind that only brief reference to it need be made. The silver bullion purchase act of 1890 depleted the gold reserve of the treasury in the Harrison administration; then came speculation, the inevitable precursor of panic. The business done in 1892 was very great, but depression was felt at the close of the year and people were afraid that the redemption of the 1890 treasury notes in gold would be suspended. Poor crops were also anticipated. The National Cordage Company suspended in May, five months after it had declared a stock dividend of 100 per cent., and the value of silver was unsettled by the June 27 cable announcing that the Indian government had suspended the public coinage of silver. Meanwhile bank reserves were fluctuating and then falling. Clearing house certificates were issued on June 21; bank reserves began to recover in August, following heavy imports of gold, while at the close of the year, in spite of the fact that it was the crop moving season, there was an abundance of money and rates for it were very low. The total bank clearings of the United States in 1893 were 54 billion dollars, as against 62 billion dollars in 1892. The total number of commercial failures in the country was placed at $114,000,000 in 1892 and at $347,000,000 in 1893, while imports of merchandise fell off from $811,000,000 in 1892 to $777,000,000 in 1893, exports of merchandise from $938,000,000 to $876,000,000 and the gross earnings of 124 railroads from $564,000,000 to $552,000,000. The wheat crop was very small, the corn crop not as good as that of 1892, pig iron production was about one-fifth less in 1893 than in 1892 and immigration to the country fell off from 543,000 to 180,000.* Meantime, railroad suspensions and receiverships had been continuous, and at the close of the year 25,375 miles of road were in receivers' hands, a total equal to about one-seventh of the entire railroad mileage in the country.

As is well-known, the drag after the 1893 panic lasted about four years. The part which speculation played in the panic is shown by the railroad receiverships. The record for new construction was made in 1887, when 12,876 miles were built, while in the next five years the additions to the mileage of the country totaled over 25,000 miles and equalled in amount all the mileage built between 1893 and 1903. This was the special form which the 1893 speculation took, and when the workings of the silver purchase act had sufficed to bring on a state of extreme fear, the railroads were the weak spot and they suffered, involving much of the general prosperity of the country with them.

1907.

In view of the facts outlined above it is extremely interesting to see if it is possible to match off events in such a way that a reasonable basis for a prediction of the length of the drag to follow this year's panic may be ascertained. Accepting the element of speculation as the constant, as has been mentioned before, its outworkings can, of course, be traced in the extraordinary stock exchange prices of the closing months of 1906; in the boom in mining stocks and, to a lesser extent, in suburban realty. But the speculation in real estate has been on a far less dangerous basis than in the other panics, excluding 1903, when it was not particularly apparent. In 1857, for example, town lots were being sold in localities all over the country where the towns have not yet come, after a lapse of 50 years, and suburban property located, say a mile from the center of New Haven, Conn., or even of Des Moines, Iowa, could be readily sold in New York City to purchasers who never saw it and never expected to see it, but relied on their profits for a quick turn to somebody else who had never seen it. This same feature had characterized 1837, and, in less degree, 1873; it was almost wholly absent in 1893 and in 1907. In 1837, direct loss of confidence was caused by distribution of the surplus and by the wild-cat currency; in 1857, by land jobbing, bad crop markets and the general feeling that railroad properties had seen their best days and that investments in them were subject to heavy depreciation. In 1873 there was a bad government surplus, paper money with gold at a high premium, the manipulations of Jay Gould and his clique, and the Chicago fire; in 1893, the silver purchase act and over-extension of railroads.

Now, we have had no over-extension of railroads in the last five years. On the contrary, the excess of traffic over facilities has occasioned great hardship, and it may be said, broadly, that there was no unprofitable mileage in the country whatever in 1906. Bad money, the fear of which was so potent a factor in 1837 and in 1893, and to a greater or less degree in all the other panics, has not been in evidence this year at all; our defective currency system may at times be an encumbrance upon prosperity and a drag upon recovery, but it is certainly not a moving cause of panic.

The speculation which preceded the 1907 panic covered a very large range of industries, but, as we see it, the really important difference between the speculation of 1907 and that of the other notable panics in our history is that the money of speculators has been spent in productive instead of non-productive enterprises. The difference in the railroad investments of the period prior to 1907 and the period prior to 1893 is that in the former period railroads were built where the demand for them was not real, while in the latter period, shares changed hands at higher and higher prices, but the new securities put out in this golden time were devoted rather to consolidating and bettering existing lines and recognized trade routes, than to exploring unknown territory. The difference in the outcome must necessarily be very great.

The defective trust company law in New York, which allowed

*We are indebted to the *Commercial and Financial Chronicle* for these figures.

these great institutions to indulge freely in the speculative fever and to so involve their affairs that their assets were not liquid at time of need, was doubtless an important moving cause of the panic, but it seems to us that the most important cause of all—always presupposing a general situation made unsound by a long speculative period—was the action of the government and particularly of the President of the United States. We are well aware that in each previous panic the President in office at the time has been attacked and subsequently exonerated; but there has been no previous instance where the President has so mixed with his duties as chief executive, his own personal ambitions and animosities, and gone on creating bugaboos and shrieking at them under conditions of intense publicity until he has succeeded in creating a condition of childish terror throughout the length and breadth of the country. Moreover, this sort of political success spreads, and when a self-seeking judge imposes a $29,000,000 fine on a technicality, Europe may well be pardoned for declining to continue her investment in American securities, and the American investor may feel doubtful of all his holdings. The question of wickedness is in no wise involved. Our courts have been neither more nor less efficient in administering the laws of the land than they were in previous times. The average of railroad and industrial management has not only been no lower than it used to be, in these years that President Roosevelt has known how to make political capital out of it; it has been infinitely higher.

Assuming that speculation was the fundamental cause and an unstable, socialist President the precipitating cause of the 1907 panic, the situation gains strength from the fact that the first of these causes is already spent, without disclosure of any important area of weakness, while the second will be remedied next fall. With sound currency and no important overproduction, the elements of a long drag appear to be lacking.

CONTRIBUTIONS

Accident Record—Correction.

An officer of the Chesapeake & Ohio informs us that the report of a derailment on that company's line, published in the *Railroad Gazette* of November 29, page 642, with a notation of one person killed, is erroneous; no persons were killed in the accident and none seriously injured.

Curve and Switch Tables.

Chicago, Dec. 16, 1907.

To the Editor of the Railroad Gazette:

In looking over the curve and switch tables published in your issue of November 8, which only recently came to my notice, I observe what appear to be two errors in the explanation of the tables as printed. The frog distance for crossovers between parallel tracks is given as $c\ c - 2\ g\ n$, where c c is the distance center to center of tracks, n the number of frog and g the gage. This is obviously a misprint, or an oversight by the author of the tables. An approximate formula for this frog distance would be $n \times c\ c - 2\ g\ n = n\ (c\ c - 2\ g)$.

In the explanation of the combined use of Tables I. and II., the example states that it is in explanation of a turnout from the inside of a curve, but the example covers a turnout from the outside of the curve, the word "inside" being used for "outside" as will be noted a little further along in the paragraph where it states that the location of the turnout from the inside of a curve would be obtained by subtracting the quantities before added.

S. S. Roberts,
Assistant Engineer, Illinois Central.

Reforming Careless Trainmen.

Montreal, Dec. 2, 1907

To the Editor of the Railroad Gazette:

In your issue of October 11 referring to the action of the Canadian Government in prosecuting conductors and enginemen in connection with railroad wrecks, you use the word "collisions." This does not cover the ground; neither does the word accident, so I prefer the word wreck, which means a total loss.

It seems to me you confuse the issue. You imply that the Canadian Government is likely to punish too severely men who are guilty of nothing more than errors of judgment. Would it not be fair to wait until such a thing has happened? As yet it has not.

In the judgments handed down in such cases as have so far been tried, there is nothing to find fault with, but they [the judges] do show a knowledge of the subject in hand, and a mastery of detail that would, I admit, have a tendency to get onto the nerves of reckless and careless trainmen.

Our Government has not gone too far. It has shown a perfect willingness to "go higher up" at any time, and punish the guilty whenever found. I do not agree with you that abundant experience has shown the futility of everything but careful instruction to make men careful and trustworthy. You forget that careful instruction has been tried for years, while prompt and effective prosecution by law has not. I have nothing to say against careful instruction. That will, and must go on as it always has, but there are men who cannot be made careful and trustworthy by this means, and it is high time that other and more drastic means be employed. Take the case of the conductor who had years of careful instruction, and was paid extra money by the railroad company to perform certain work and who deliberately lay down and went to sleep, thereby causing loss of life and heavy money loss to his company. Can anyone find fault with the judgment in his case?

Or the engineman who is paid much more money than he is worth, who is intrusted with an important train on a piece of road with which he is perfectly familiar, and who runs that train at a rate of speed that even people on the train, and men beside the track know is far beyond the limits of safety, (see evidence in recent case), and finally wrecks the train with loss of life. Is he anything else than criminal?

These are cases that have come to trial and are fresh in the minds of the public; but think of the many cases of which the public know nothing and where the railroad company are the only sufferers. Here is one: On a certain railroad there is a long grade where trains should be handled with judgment and care. The almost constant use of the brakes causes heating of shoes and wheels. The railroad officials fully recognize this and have standing orders that trainmen shall examine their train at water station at top of hill, and come to a full stop and examine again at water station at foot of grade. As I happen to know, the officials do not hope to have this examination made with any degree of thoroughness, but they hope by having the train brought to a full stop for a time to insure a decrease of speed, and at least give shoes and wheels time to cool. Now when an engineman runs past this point with a heavy freight train, at 60 miles an hour, so that people get out of bed and make bets as to how far he will go before he ditches his train, and he does ditch it inside of one mile, destroying $20,000 worth of cars without counting other loss, and then comes in with his crew and states he was running "20 miles an hour and struck a spread rail," what are you going to do with him? Condole with him for his error of judgment, and protect him from a Government that is likely to punish? Unfortunately the Government does not take up such cases, and the railroad company has no redress whatever. The discharging of the criminal from the employ is small satisfaction. I have no doubt "alarm and resentment" is felt by such men, but we want considerable more "alarm" and I think all decent people will feel that we can stand the "resentment."

I hold no brief for the soulless railroad company, but the world gains nothing by maudlin sentiment that would make a hero of the man who by criminal carelessness destroys property and lives.

For the past few days we have been reading the harrowing details of a wreck on one of our Canadian roads; and the facts at hand point to still one more case of this kind, where two men intrusted with moving a light engine over a division run on the time of an important passenger train until they meet her, killing several people, injuring many more, and destroying two engines and three cars with mail, baggage, etc. It is true these men were killed, but does that help? And we must not lose sight of the fact that the men responsible for these things are the men who by organization have the railroads by the throat, and are and have been for some time bleeding them of their last dollar.

There is no danger that the good and careful man will suffer at the hands of the Government prosecutor, and as a matter of fact he is just as much in need of protection as the public and the railroad company, for one sad feature of these wrecks is that the good man is often the greatest sufferer. It is most unfair that the railroads and their officers should bear the onus in these troubles. The superficial thinker may say at once, why should the railroads have such men in their employ; but you might as well ask why a bank will have in its employ a cashier who will run away with its funds.

It is a strange travesty that prosperity brings out the worst in men. You can do nothing with the man who cares nothing for his job. Twenty-five years ago you would find in the railroad service the reckless man, the liar, the drunkard and the thief. In fact, to be a "railroad man" was equivalent to being a little below the general standard, but that condition slowly passed away until the reverse was the case. But to-day we find that the wonderful and widespread prosperity has brought it back. It will disappear again more quickly than it did before, and while the public and the decent railroad man may suffer, as they have, it is after all the

railroad company that suffers most, and it is both right and proper that the law of the land should step in and protect all three.

E. J. M.

Our correspondent presents some fallacious arguments, which the cool-headed reader will readily answer without our assistance, but we print the letter because it voices grievances which we often hear from the mouths of railroad officers. His chief point against our note of October 11 is that we advocate education instead of imprisonment as a cure for carelessness on the part of enginemen, and he claims that punishment under criminal law is the true preventive of "wrecks." But if he admits that death is a punishment he must admit that fear of the penalty does not deter men from running trains to destruction, for surely enginemen know that when they neglect the rules of safety they imperil their own lives. Our correspondent will also agree that to prevent the "wrecks" we must take systematic measures to prevent lesser errors; yet he himself cites a case which the Government does not take up. No, the criminal law, however just its provisions, cannot be made to touch a tithe of the causes of railroad "wrecks." Our correspondent calls for drastic measures because "careful instruction" has been tried and has failed. The trouble is that usually it has been tried only in a desultory way. The wrecks cited in the letter seem to have been caused mostly by men who were reckless, as distinguished from careless. Moral delinquency is, indeed, often incurable, but men of that class can be weeded out. Adequate discipline exposes them. The railroad officer who keeps such men in the service because prosperity has overburdened him with traffic, deliberately takes upon his own shoulders the responsibility for the safety of his trains.—EDITOR.

Courts on Ticket Scalping.

The Federal Supreme Court has at last confirmed the long line of decisions against ticket scalping by affirming the injunction issued by the Supreme Court of Louisiana against the resale of limited tickets. It is now nearly 30 years since legislation was secured in Pennsylvania, followed by New Jersey, against the resale of railroad tickets. In 1897 legislation was secured in New York, but the statute was declared unconstitutional by the Court of Appeals in 1898, and the Everett act met the same fate in 1901. The New York courts, though with dissenting opinions, have held that a railroad ticket was property and that, once bought, its sale could not be interfered with. The Illinois Supreme Court reached a like conclusion, and it is the general drift of common law that a common carrier cannot limit contracts for transportation; but the Pennsylvania courts have held a different doctrine, as have those of Texas and other states; and the Federal courts have for years tended to regard it lawful to prohibit the resale of special rate, excursion or limited railroad ticket.

It is a settled doctrine of the Federal Courts that a contract for transportation can be limited to the original holder. Judge Wood, of the United States Circuit Court, confirmed this. Injunctions have been issued by the state courts, and one of them was sought in Louisiana. The lower court refused this summary redress. The Supreme Court of Louisiana granted the injunction. The case was carried to Washington and the Federal Supreme Court holds that "a non-transferable reduced rate ticket" can be protected by an injunction from resale, as the ownership gained by the purchase is only "limited and qualified" and the roads issuing "retain a subordinate interest in the ticket amounting to a right of property therein which a court of equity would protect." —*Philadelphia Press.*

The Sigl Locomotive Works in Austria took a number of contracts to supply foreign railroads last year, there being not enough Austrian orders to keep the works going. These foreign orders were executed at a considerable loss, and not only could no dividend be paid, but the face of the shares is to be reduced 10 per cent.

Lord Kelvin.

William Thomson First Lord Kelvin, died in London on December 17 after several weeks illness. Lord Kelvin was considered the foremost physicist in Great Britain and probably in the world. He was identified with the development of many theories now generally accepted. He took an important part in building up the doctrine of the conservation of energy and the theory of the dissipation of energy is almost entirely due to him. His most important book is his "Treatise on Natural Philosophy," written with Prof Tait. His other works include papers on mathematics, thermodynamics, magnetism and electrostatics. His greatest contributions to the application of science were in the field of electricity. He was electrician for the company which made the unsuccessful attempt to lay the Atlantic cable in 1857, and for the company which succeeded in laying it in 1866. He acted in similar capacity for several other lines laid between 1869 and 1879. He designed one of the first practicable alternating current dynamos and was chairman of the first advisory board which considered the development of electric power from Niagara Falls. Among his other inventions of immediate practical value are: the present form of the mariners' compass, the siphon recorder and other apparatus used with most submarine cables, and many instruments for measuring electric current.

Lord Kelvin.

He was born at Belfast, Ireland, on June 26, 1824, his father being Professor of Mathematics at Glasgow University. He was educated there and at Cambridge, and when 22 years old was made Professor of Natural Philosophy at Glasgow University. This chair he filled until 1899. He was knighted in 1866 and in 1892 was made Baron Kelvin of Netherall, Largs, Ayrshire. He held many other titles and honors, conferred on him by societies and universities in Europe and the United States. Lord Kelvin was married twice, but leaves no heir.

Sleeping Car Berths in Wisconsin.

The Supreme Court of Wisconsin has declared unconstitutional the act of the 1907 Legislature which assumed to give the occupant of a lower berth in a sleeping car the right to say whether the unoccupied upper berth shall be open or closed. The court declares that the act is an unwarranted interference with the right of dominion over property by the owner thereof, and an unlawful appropriation of property, not in the interests of the general public but for the convenience of a few. It is suggested that the Legislature could compel a railroad to give a passenger this right if he paid reasonably for it.

The main opinion was written by Justice R. D. Marshall, and Justice William H. Timlin filed a supplementary opinion, concurring in the result, but setting forth that he believes that the Legislature has a right to regulate the operation of sleeping cars.

The syllabus says: Police regulations which are reasonable are not inhibited by the constitution though invading its letter, since the exercise of the police power is so essential to the public welfare that it is presumed that such exercise within reasonable limits was not intended to be prohibited, but, on the contrary, guaranteed by the general declared purposes of civil government and the manifest purpose of the constitution.

It is a judicial function to determine the proper subjects for police regulations and a legislative function to determine, primarily, the expediency of regulation and the character thereof subject to judicial supervision to the extent of determining, in cases as they arise, whether the boundaries of reason have been so clearly exceeded as to violate some constitutional prohibition, express or implied; the judgment of the Legislature being controlling unless it appears beyond reasonable controversy that the interference is unreasonable.

The doctrine that the police power is a law of necessity may well be said to furnish the key to what is within and what is

without the boundaries of such power; not that a police regulation to be legitimate must be an absolute essential to the public welfare, but that the exigency to be met must so concern such welfare as to suggest reasonable necessity for a legislative remedy, the legislature to be the primary judge and the supreme judge as well except as to interference so unreasonable as to be excessive beyond reasonable controversy.

* * * Is the restraint or requirement in proportion to the danger? Is it possible to secure the object sought without impairing essential rights and principles? * * * A legislative declaration respecting the character of a law, as that its purposes is to promote public health, is not absolutely binding on the courts. It is their function to determine the real intent of the law and if its ostensible is not the real purpose, to give effect to the constitution by condemning the enactment.

A law providing that the upper berth in a sleeping car, when unoccupied, at the option of the occupant of the lower berth, be closed, is not for the promotion of the public health and comfort in that the option is given in each instance where the regulation is applicable to say whether it shall operate or not, manifestly suggesting that it is for private rather than for public interests.

The penalty for violating the law was imprisonment for six months or a fine of $100, or both. The Pullman Company instructed its porters to disobey the law. Stone, a passenger, filed a formal complaint with the District-Attorney of Brown county, at Green Bay, against a porter on the Northwestern road; the porter was arrested and convicted. The Pullman Company appealed to the Supreme Court, having backed the porter at all steps in the court procedure.

Vandalia Track Elevation and Improvement Work at Indianapolis.

In September, 1905, the city of Indianapolis, Ind., passed an ordinance requiring the elevation of all steam railroad tracks west of the Union Station as far as West street. Although the lineal distance covered by the ordinance was less than half a mile, some serious and puzzling problems were presented. The roads chiefly concerned were the Vandalia, the Big Four (C., C., C. & St. L.), and the Indianapolis Southern—the Illinois Central's recently completed line into Indianapolis, described in the *Railroad Gazette* of March 15, 1907. As mentioned in that article, the original construction of this line was made to conform to the elevation ordinance requirements and it is therefore built on an elevated steel structure for about three-quarters of a mile.

Of the other roads, the Vandalia had the heavier work to do. The accompanying map, Fig. 1, shows the district between Union Station and White river, with the lines as at present revised. The most serious problem of the Vandalia was to take care of its Vincennes division line to the best advantage. As the map shows, this line comes in from the southwest parallel to Kentucky avenue. There are two tracks, which for the last few hundred feet of their length occupy the west side of this street. Elevation of this portion of the line would have required the construction of a double-track steel viaduct and the raising of the various industry tracks connecting therewith, this being the solution offered by the city for this portion of the work. But the excessive cost of the work and the remonstrances of the owners of the industries affected caused the abandonment of the idea in favor of the one adopted. This was the construction of what is known as Eagle creek connection, a cut-off from the Vincennes division to the St. Louis division, west of the city, as shown in Fig. 2. The Vincennes division traffic is thus diverted to the St. Louis division outside the city. There was no necessity therefore for elevating the Vincennes division tracks, which, however, will be used as switching tracks to the industries adjacent thereto.

Just after crossing White river the old single-track main line of the St. Louis division passed through the city freight yard as shown in Fig. 1. To avoid elevating this yard it was decided to relocate the line to pass around the north side of it, crossing White river about 210 ft. north of the old bridge. The new line, which is double track, continues across the bottom west of the river and joins the old line near the Belt (Indianapolis Union Ry.) crossing about 1½ miles west of the station. The Vandalia already owned most of the necessary right-of-way for the new location. The additional land needed west of the river was secured by exchanges with the Big Four.

The map also shows the profile of both the old and new lines. In the city, on the elevation work, the greatest raise above the former grade is 10½ ft., which is at the Kentucky avenue crossing. From this point there is a 1 per cent. temporary run-off toward the station, and on the west, following 500 ft. of 0.1 per cent. down grade, there is a 0.25 down grade across the river and Parry avenue. From Parry avenue the line runs down to a grade crossing with the Belt, which is about 1,400 ft. west of the river.

When the Kentucky avenue crossing was begun the old main track of the Vandalia had to be abandoned and arrangements were made to run into the station over the Big Four tracks. The new

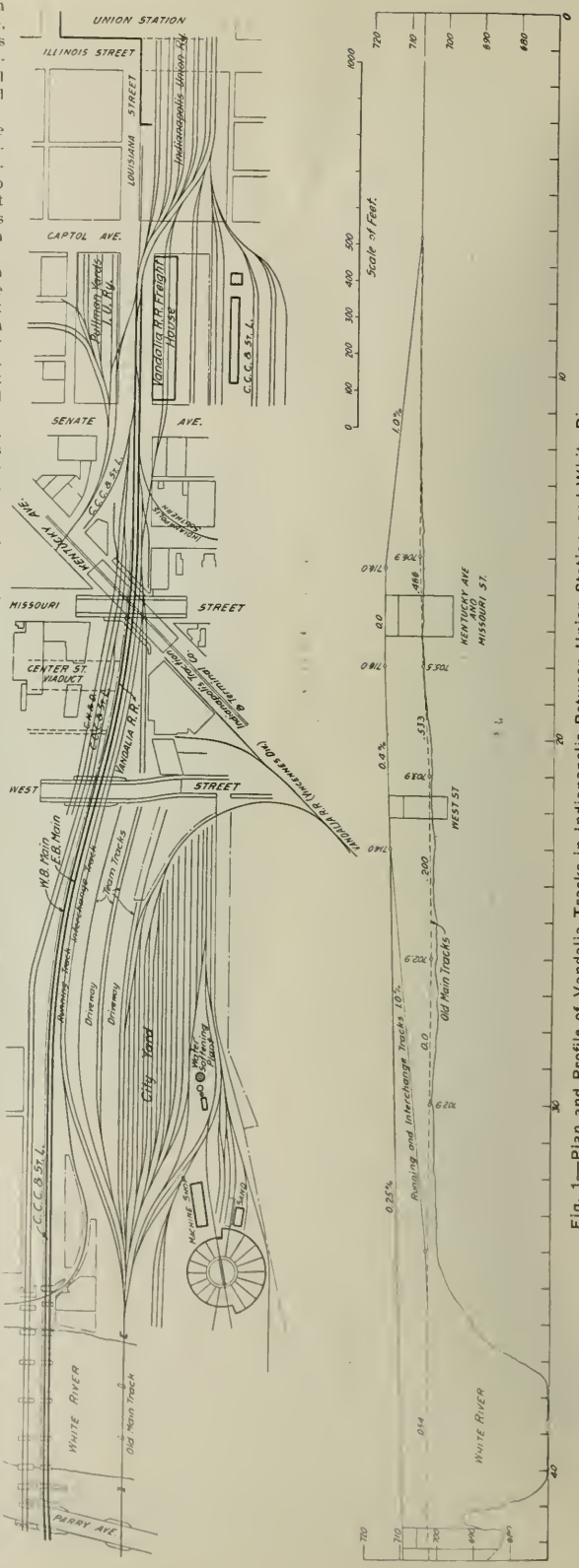


Fig. 1—Plan and Profile of Vandalia Tracks in Indianapolis Between Union Station and White River.

line west of the river had been completed and a temporary connection with the Big Four was therefore put in west of Parry avenue. As soon as the Vandalia was ready to use its new tracks, the arrangement was reversed in order to permit the Big Four to build its portion of the West street and Kentucky avenue crossings and raise its tracks to the new grade. The Big Four did not disturb its White river crossing and the temporary connection with the Vandalia tracks was therefore put in about 500 ft. east of the river. The Cincinnati, Hamilton & Dayton's Springfield, Ill., line enters Indianapolis over this division of the Big Four and the trains of

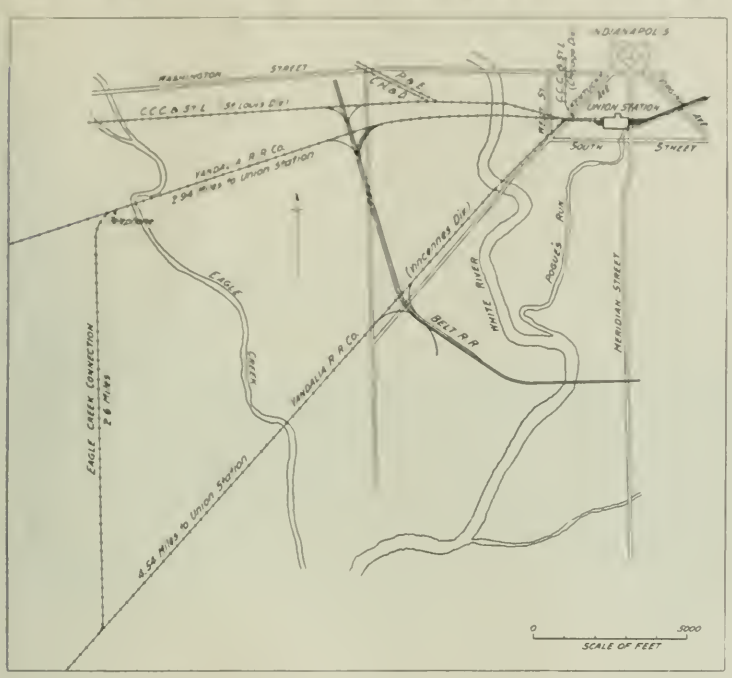


Fig. 2—Map of Vincennes Division Connection; Vandalia Railroad.

the two will continue to use the Vandalia tracks until the elevation work of the Big Four is completed enough for resumption of traffic on its own lines. This will probably be about the first of the year.

The most important single feature of the work is the White river bridge, in conjunction with which is the Parry avenue crossing immediately west. The two were built at the same time, under one contract. The river crossing is a deck plate girder structure on concrete masonry, the superstructure being independent for each track, except for sway bracing. The Parry avenue crossing is similar to the other street crossings, which will be referred to in detail later. White river bridge is 545 ft. long, made up of seven spans as follows, beginning at the east end: One 43 ft. 6 in. span, two 81 ft. spans, two 103 ft. 3 in. spans, one 81 ft. span and one 52-ft. span. The dimensions given are center to center of piers. Work was begun on the substructure early in April, 1906, and the bridge was finished late in December of that year. The masonry was to have been done in three months, but numerous unexpected obstacles delayed progress on the foundations. All masonry rests on piles except the east abutment, the piles being driven to gravel in all cases. In pulling down the foundations easy digging was impeded by the occurrence of large boulders, old trees, etc. United States interlocking steel piling was used on three of the piers and wooden sheathing on the rest, the wood sheathing being 6-in. x 8-in. yellow pine in one instance. Better progress would have been made had the steel piling been used throughout. This and most of the wooden sheathing was driven with a steam hammer. A drop hammer was used for the steel piling and in several cases the piles were driven completely through old logs. The bottoms of these piles, which were 12-in. wide, weighing 35 lbs. to the foot, were badly battered in several instances where large boulders were encountered. The steel piling made almost a water-tight cofferdam, but proved exceedingly hard to pull, requiring 90 tons to start some of the sections, and in some cases four or five sections would come up together.

The total weight of the superstructure of the bridge is 1,608,411 lbs. The contractor for the substructure was the Essex Construction Company, and for the superstructure the Pennsylvania Steel Company. A view of the two bridges—White river and Parry avenue—is shown in Fig. 3, the truss bridge back of the river crossing being that of the Big Four.

The most important subway is at Kentucky avenue. It will be observed from the map (Fig. 1) that this occurs at the intersection of Kentucky avenue with Missouri street, Kentucky avenue passing under the tracks at a skew of about 45 deg. A single structure serves the two elevating roads and also carries a switching track for the C., H. & D., making eight tracks in all. It is a solid ballasted floor bridge built up of columns, cross-girders and troughs. For Kentucky avenue the distance between abutments is 85 ft., and for Missouri street, 60 ft. Details of the concreting of the Vandalia's portion of the floor are shown in Fig. 4. The troughs are filled with 1:3:6 gravel concrete carried 3½ in. above the tops of the troughs. One inch below the surface is embedded electrically welded wire cloth of 3-in. x 8-in. mesh. Over this is a five-ply coat of felt and pitch applied according to the Barrett specifications. A layer of soft building brick on 1 in. of sand protects the waterproofing and over this the ballast is laid. The details show how the concrete

Fig. 3—Parry Avenue and White River Bridges, Showing Big Four Bridge in Background.

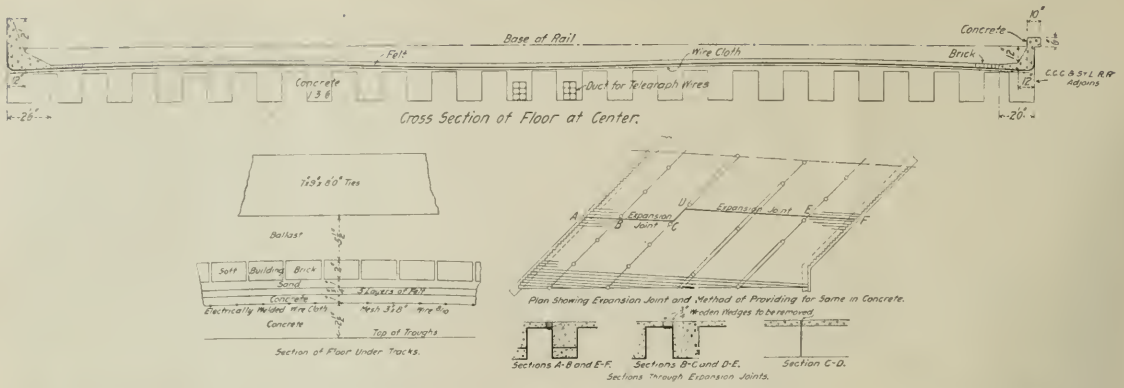


Fig. 4—Details of Concrete Floor; Kentucky Avenue Bridge.

Fig. 5—Kentucky Avenue Bridge; Indianapolis Track Elevation.

is carried up to the tops of the fascia girders. They also show the expansion joint placed longitudinally of the bridge and the method used in providing for same in the concrete. All telegraph wires are being put underground on the elevation work from the passenger station across Parry avenue. Two six-hole conduits are used, which are placed one above the other in the fill, and side by side on the bridges. Their position in two of the troughs is shown in the cross-section of Kentucky avenue bridge in Fig. 4. A manhole, for access to the wires, is placed at each end of each bridge. A photographic view of Kentucky avenue bridge is shown in Fig. 5.

In conjunction with the work in the city, and the changes necessitated thereby, a large amount of improvement work is under way immediately west of the city, including grade revision and second track work from the west end of the terminal freight yard, just west of the Belt crossing, to Ben Davis, about 6½ miles west of Union Station. As already mentioned, and as indicated in Figs. 2 and 6, the Eagle creek connection from the Vincennes division joins the St. Louis division about three miles west of Union Station. This line is continued as a third track across Eagle creek and into the terminal yard already referred to, about half a mile east of the junction. The old crossing of Eagle creek was a two-span single-track lattice girder bridge. This was replaced by the three-arch reinforced concrete bridge, shown in Fig. 7, the arches being 55 ft. clear span.

The construction of the Eagle creek connection also necessitated a considerable change in the grade and alinement of the electric interurban line paralleling the Vandalia—the Terre Haute, Indianapolis & Eastern. To avoid a grade crossing, the traction line was carried overhead by the railroad company. In order to do this it had to be swung to the south, as shown in Fig. 6, in order to have room for the fill. This is shown best in Fig. 8, which is a general view of the change, the proximity of the old location of the traction line to the Eagle creek connection being apparent. Another reason was a possible future connection toward the west from Eagle

Fig. 8—General View of Traction Line Change; Vandalia Track Elevation.

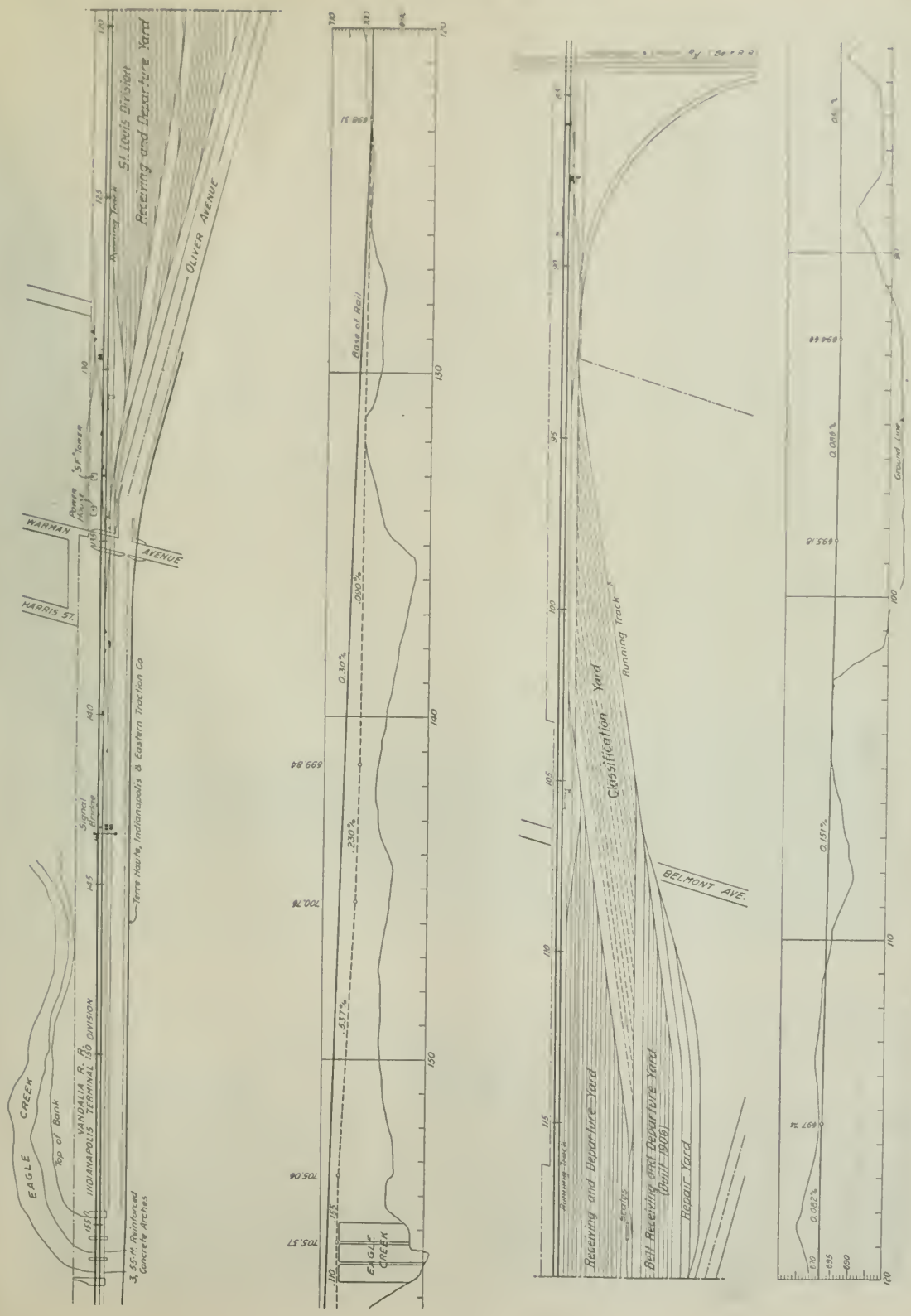


Fig. 6—Plan and Profile of Vandalia Tracks at Indianapolis from Belt Railroad Crossing to Eagle Creek.

creek connection to the St. Louis division. The change affected about 3,200 ft. of the traction line and, in addition to the heavy fill and the bridge over Eagle creek connection, required the construction of a double box subway for the highway near the east end of the change. A view of this subway and the fill at this point are shown in Fig. 9. The bridge over Eagle creek connection is 91 ft. between faces of abutments, on account of the sharp curvature at the point of crossing.

Enlargement of the terminal freight yard of Fig. 6 is part of the work. Indianapolis is the terminus of the Vandalia, which is controlled by the Pennsylvania Lines, but operated independently. Through freight traffic between the Vandalia and the Pan Handle (P., C., C. & St. L.) is interchanged by way of the Belt. The drawing shows the addition last year of trackage for a Belt receiving and departure yard and for repair tracks; also the contemplated addition of a classification yard at the east end. Entrance to the yard is at the west end, and an electric interlocking plant is being installed for the control of this entrance. The positions of this tower, called S F tower, the power house for the plant and the signal bridge are shown in Fig. 6. The signal bridge spans four tracks, the most southerly being a drill track for the yard. Electric automatic signals are being installed from Union Station to S F tower.

The heaviest work on the grade revision and second track work is Ben Davis cut at the western end of the work. This cut is 7,000 ft. long, 16 ft. deep at maximum point and contains about 226,000 yds. It has supplied a good part of the filling material for all of the work here described. However, a part of the work east of White river was filled with the strippings from a large gravel pit opened up a short distance west of Eagle Creek. The new work is being ballasted with gravel from this pit. With the exception of the masonry and bridges, all work is being done by company forces. The track elevation work is practically completed. This and the other improvement work is being done under the general supervision of F. T. Hatch, Chief Engineer of the Vandalia. R. K. Rochester, Principal Assistant Engineer, is in immediate charge, assisted by H. T. Sympson, Assistant Engineer. All steel work was designed in the office of J. C. Bland, Engineer of Bridges of the Pennsylvania Lines West of Pittsburgh.

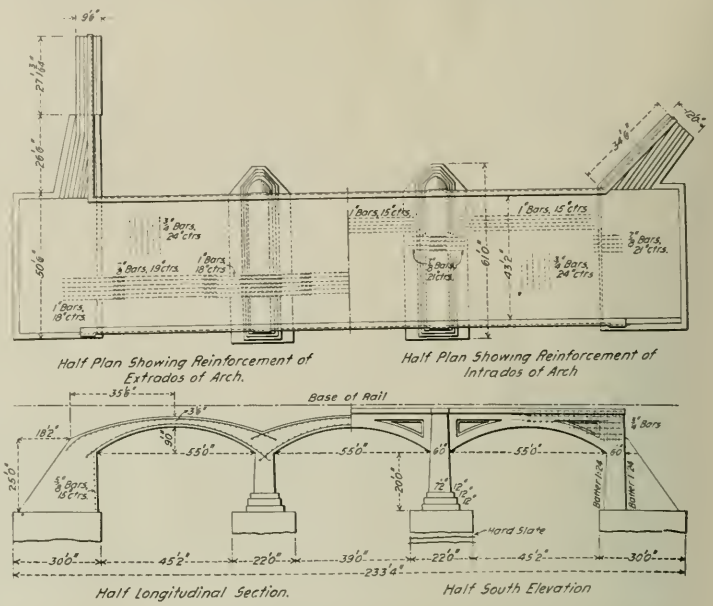


Fig. 7—Plan and Elevation of Eagle Creek Bridge.

Fig. 10—Concrete Arch Over Eagle Creek; Vandalia Track Elevation.

Fig. 9—Double Box Center Subway for Highway on Traction Line Change; Vandalia Track Elevation.

Railroad Built in 1907.

United States.

Table Showing Mileage Built in 1907, Classified by States.

	No. of Companies building	1907	No. of Companies building	1906
Alabama	6	154.82	8	81.80
Alaska	4	91.00	1	15.00
Arizona	1	26.66	[illegible]	47.81
Arkansas	11	96.37	10	200.21
California	12	240.19	11	199.47
Colorado	3	22.38	8	113.36
District of Columbia	1	7.00	1	1.00
Florida	11	251.65	12	205.75
Georgia	[illegible]	152.92	7	182.00
Idaho	[illegible]	135.89	6	184.40
Illinois	4	15.54	9	119.11
Indiana	8	101.82	6	101.03
Indian Territory	3	63.60	2	99.40
Kansas	2	16.25	[illegible]	72.12
Kentucky	[illegible]	48.53	7	74.77
Louisiana	11	384.72	12	[illegible]
Maine	1	27.75	1	41.71
Maryland	1	25.50		
Massachusetts			1	4.50
Michigan	7	28.85	3	24.80
Minnesota	6	158.09	6	138.07
Mississippi	9	291.29	8	165.14
Missouri	7	86.15	4	29.50
Montana	4	191.75	1	26.00
Nebraska	2	37.51	3	171.55
Nevada	7	218.30	4	282.05
New Jersey	1	0.56	1	2.67
New Mexico	2	83.80	2	151.00
New York	9	40.39	3	95.02
North Carolina	9	148.83	4	34.00
North Dakota	3	183.88	2	247.47
Ohio	2	29.98	4	61.00
Oklahoma	4	159.60	2	36.00
Oregon	3	31.70	7	61.11
Pennsylvania	19	121.78	14	117.72
South Carolina	5	57.50	3	41.00
South Dakota	7	337.73	6	388.23
Tennessee	12	56.45	6	65.00
Texas	18	339.32	18	634.67
Utah	2	24.10	6	153.52
Virginia	7	177.82	5	121.27
Washington	7	324.54	5	103.06
West Virginia	8	145.97	5	78.78
Wisconsin	5	116.87	5	141.84
Wyoming	4	66.71	3	206.95
Total	265	5,212.46	250	5,623.33
Canada	12	976.70	15	1,007.05
Mexico	9	333.03	8	296.50

UNITED STATES.

ALABAMA.

Alabama Western (Ill. Cent.)—Between Mississippi state line and Haleyville, 36.61 miles; Birmingham terminals 2.06 miles; total	38.67
Atlanta, Birmingham & Atlantic—Georgia state line west toward Talladega	79.80
North Alabama (L. & N.)—Extension of Cain Creek branch, on Skelton Creek extension from Vulcan to Praco	13.00
Southern—Extension of Flat Top Spur to point beyond Village Creek, 4.26 miles; Spur lines, 1.59 miles; total	5.85
South & North Alabama (L. & N.)—Acton Basin line from main line near Helena to Acton Coal Basin	6.50
Tombigbee Valley—Healing Springs north to Silas	11.00
	154.82

ALASKA.

Alaska Central—North toward Fairbanks	21.00
Seward Peninsula—Little Creek to Sunset, 6.00 miles, Little Creek Junction to McDonald, 7.00 miles; end of track to Shelton, 1.00 mile; total	14.00
Tanana Valley—Gilmore to Chatanika	21.00
Copper River & Northwestern—Katalla east toward Bering river coal fields; Ktalla west and northwest	35.00
	91.00

ARIZONA.

Arizona & California (A., T. & S. F.)—Mile 80.18 near Bouse, west to mile 106.84, one mile west of Parker	26.66

ARKANSAS.

Arkansas, Oklahoma & Western—Springtown to Siloam Springs	10.00
Bauxite & Northern—Bauxite to Bauxite Junction	3.00
Crittenden Railroad—Wildcat to Parkin Junction	2.00
Dardanelle, Ola & Southern—Dardanelle to Ola	15.00
El Dorado & Wesson—Wesson north	3.00
Gurdon & Fort Smith (Mo. Pac.)—To Caddo Gap	3.85
Gurdon & Fort Smith Northern (Mo. Pac.)—Caddo Gap north to Womble	5.52
Little Rock, Maumelle & Western—Little Rock to Douglas	16.00
Missouri & North Arkansas—From Leslie southeast toward Helena	20.00
Osceola, Little River & Western—Giles to Youngs	2.00
Prescott & Northwestern—Helbig to Cheney, 10.00 miles, Rosoboro to Spears, 6.00 miles; total	16.00
	96.37

CALIFORNIA.

Bay Shore (So. Pac.)—Between San Francisco and San Bruno	7.68
California Northeastern (So. Pac.)—Between Weed and Klamath Falls	13.74
Coast Line (So. Pac.)—Between Santa Cruz and Davenport	7.10
Empire Railway (So. Pac.)—Rossi to Stratton	8.26
Nevada, California & Oregon—From 10 miles north of Madeline to Likely	10.00
Northwestern Pacific—Wendling to Floodgate	1.80
Pajaro Valley Consolidated—Salinas to Alesne Junction	2.30
Peninsular (So. Pac.)—Between Mayfield and Vasona	7.69
Southern Pacific—Smeltzer to Benedict	4.62
Tonopah & Tidewater—Dumont north to Nevada state line, 56.00 miles; branch Death Valley Junction to Lila C mine, 7.00 miles; total	63.00
Western Pacific—Stockton to Sacramento, 43.00 miles; Marysville to Junction, 48.00 miles; total	91.00
Yosemite Valley—North Fork to El Portal	23.00
	240.19

COLORADO.

Colorado & Southern—Marshall to Eldorado Springs	3.00
Denver, Northwestern & Pacific—Near Kremmling west to Yarmony	17.50
Rio Grande—Strong to Tioga	1.88
	22.38

DISTRICT OF COLUMBIA.

Philadelphia, Baltimore & Washington (P. R. R.)—Maryland state line to Washington	7.00

FLORIDA.

Apalachicola Northern—Point [illegible] miles south of [illegible] south to Apalachicola	60.00
Atlanta & St. Andrews Bay—Cottondale north to Youngstown	[illegible]
Atlantic & Eastern Coast Terminal—At Jacksonville	[illegible]
Charlotte Harbor & Northern—Ft. Ogden to Boca Grande	37.00
Florida Central—Delph to Maysville	1.00
Florida East Coast—Largo Key south to Knight Key West	44.00
Peninsula Railway—Between Bartow and Tampa	1.00
Plant City, Arcadia & Gulf (S. A. L.)—Plant City south	7.25
Seaboard Air Line—Terra Ceia Junction to Terra Ceia	5.40
Tampa Northern—Hillsboro river north to Brooksville	44.50
Woodville Railroad—Lavender to Spring Hill	4.00
	251.65

GEORGIA.

Atlanta, Birmingham & Atlantic—Chattahoochee river west to Alabama state line, 4.40 miles; Manchester to Atlanta, 77.40 miles; total	81.80
Bostwick—Apalachee to Bostwick	6.00
Brinson Railroad—Savannah north to Springfield	25.00
Florida Central—Thomasville to Boddenbury	[illegible]
Louisville & Nashville—Atlanta connection from Hills Park yard to West End, Atlanta	7.12
	152.92

IDAHO.

Idaho & Washington Northern—Grand Junction north to Washington state line, 33.80 miles, branch from Coleman east to Clagston Junction, 6.60 miles; total	40.40
Minidoka & Southwestern (O. S. L.)—Minidoka to Rihl	14.96
Northern Pacific—Culdesac southeast to Grangeville	55.00
Oregon, Washington & Idaho (O. R. R. & N. and Nor. Pac.)—Lewiston west toward Washington state line	0.70
Yellowstone Park (O. S. L.)—Foggs Mill to Montana state line	24.83
	135.89

ILLINOIS.

Chicago & Western Indiana—96th street to 106th street, Chicago	1.25
Illinois Central—Between Herrin and Zeigler	2.00
Marion & Johnson City (Mo. Pac.)—Marion to near Johnson City	7.84
Wabash Southern (Mo. Pac.)—Five miles northeast of Zeigler to Benton	4.45
	15.54

INDIANA.

Bloomington Southern (Ill. Cent.)—Bloomington south	2.52
Chicago, Cincinnati & Louisville—Griffith to Louisville Junction	12.00
Cincinnati, Bluffton & Chicago—Bluffton northwest to Huntington	23.00
Evansville & Terre Haute—At Evansville	3.00
Gary & Western (C. L. S. & E.)—Dixie to Gary	5.00
Indiana Harbor (N. Y. C. Lines)—Gibson east	1.50
Indianapolis & Louisville (C., I. & L.)—Southwest between Wallace Junction and Victoria	29.00
Southern—Jasper northeast to West Baden	25.80
	101.82

INDIAN TERRITORY.

Midland Valley—Jenks west to Glen Pool	6.50
Missouri, Oklahoma & Gulf—Dustin south to Rose, 25.60 miles, Dewar branch, McDonald north to Walters, 4.50 miles; total	30.10
Oklahoma Central—Purcell to a point eight miles west of Blanchard	27.00
	63.60

KANSAS.

Denver, Enid & Gulf (A., T. & S. F.)—Sun City northwest to Belvidere	9.65
St. Joseph & Grand Island—Stouts to Highland	6.60
	16.25

KENTUCKY.

Kentucky Midland—Central City to Cypress Creek	8.00
Louisville & Nashville—Cumberland Valley division, up Left Hand Fork of Straight Creek, 0.55 miles; Chenoa branch of Bear Creek extension, from Chenoa to coal mines in Bell county, 2.25 miles; Caney Fork branch, from Chenoa branch, 1.10 miles; total	3.90
Morehead & North Fork—Morehead to Paragon	10.00
Morganfield & Atlantic (L. & N.)—Marganfield south to Providence	25.33
Pine Mountain (L. & N.)—From Knoxville division near Williamsburgh, finished from Savoy to Clear Fork river	1.10
	48.53

LOUISIANA.

Baton Rouge, Hammond & Eastern (Y. & M. V.)—Between Baton Rouge and Covington	20.75
Colorado Southern, New Orleans & Pacific (St. L. & S. F.)—Crowley branch, Eunice to Crowley, 23.00 miles; Kinder to Atchafalaya river, 64.44 miles; Atchafalaya river to Pt. Allen, 33.37 miles; total	120.81
Hammond & Houltonville—Nine miles west of Lawson City to Hammond	5.00
Jasper & Eastern (Gulf, Col. & S. F.)—Cravens east to Oakdale	24.50
Louisiana & Arkansas—Tioga to Pineville	5.02
Louisiana & Pacific (S. A. & S. S.)—De Ridder to Fulton, 26.00 miles; Fulton to Banks, 16.00 miles; total	42.00
Louisiana East & West (T. & P.)—Villeplatte southwest to Eunice	14.00
Morgan's Louisiana & Texas (So. Pac.)—Arnaudville to Port Barre	12.30
New Orleans Great Northern—Bogue-Chitto branch, Lawrence north toward Tylertown, Miss., 16.00 miles; on branch from Skidoll via Mandell to Abita Springs, 26.00 miles; total	42.00
Opelousas, Gulf & Northeastern (T. & P.)—Opelousas southwest to Crowley	33.00
Rock Island, Arkansas & Louisiana (C., R. I. & P.)—Alexandria to Eunice	55.34
Tremont & Gulf—Dodson south to Winnfield	10.00
	384.72

MAINE.

Bangor & Aroostook—South La Grange north to main line 4.56 miles west of Sebools	27.75

MARYLAND.

†Washington, Westminster & Gettysburg—District of Columbia boundary to Laytonsville	25.50

†Will probably be operated by gasolene motor cars.

MICHIGAN.

Au Sable & North-Western—Crooked Lake Junction to Curran	6.00
Detroit & Mackinac—Alpena to lower south branch of Thunder Bay river	6.38
Detroit Terminal—At Detroit	5.00
Duluth, South Shore & Atlantic—To mines	2.00
Grand Rapids & Indiana—Veneer to Falmouth	2.97
*Kalamazoo, Lake Shore & Chicago—Between Toquin and Paw-Paw	4.50
Keweenaw Central—Mohawk to Mineral Range Junction, 1.00 mile; Mandan to Keweenaw Copper Company's mine, 1.00 mile; total	2.00
	28.85

*Change in location of old main line.

MINNESOTA.

Big Fork & International Falls (Nor. Pac.)—Big Falls northeast to International Falls	34.00
Duluth & Northern Minnesota—Mile post 45 to mile post 50	5.00
Duluth, Missabe & Northern—Main line to Wacootah mine, 1.74 miles; Holman to Holman mine, 1.32 miles; total	3.06
Duluth, Rainy Lake & Winnipeg—Mile 50 to Rainier	43.00
Great Northern—Kelly Lake to Fermoy	23.40
Minneapolis, St. Paul & Sault Ste. Marie—Brooten to Mississippi river	49.63
	158.09

MISSISSIPPI.

Greenville, Elizabeth & Wolfs Mill (Southern)—Napanee to Wolfs Mill, 5.00 miles; Wolfs Mill east to Kergs Mill, 6.60 miles; total	11.60
Leland Southwestern (Y. & M. V.)—Leland southwest	8.60
Mississippi & Alabama (Ill. Cent.)—Between Ruslor and Alabama state line	39.79
New Orleans Great Northern—Mays Creek north toward Jackson	53.00
Natchez & Eastern (Miss. Cent.)—Brookhaven west to Homochitto river, 23.00 miles; Natchez east toward Brookhaven, 18.00 miles; total	41.00
Mississippi Central—Ten miles south of Hattiesburg toward Scranton	5.00
Natchez, Columbia & Mobile—Old Camp to Camp Eleven	3.50
Sunflower & Eastern (Y. & M. V.)—Between Blue Lake and Webb	4.61
Yazoo & Mississippi Valley—Tennessee state line south to Lake View, 60 miles; between Philipp and Charleston, 20.59 miles; between Silver City and Kelso, 13.00 miles; total	34.19
	201.29

MISSOURI.

Chester, Perryville & Ste. Genevieve—West Chester to Minnith	23.00
Mississippi River & Bonne Terre—Elvins south to Mitchell	4.00
Missouri & North Arkansas—Seligman northwest toward Joplin	15.00
Missouri Southern—Reynolds to Ohlman	4.00
Saline Valley (C., G. & C.)—Minnith to Klapek	5.00
Springfield Southwestern (Mo. Pac.)—Springfield to Crane	34.15
Versailles & Sedalia—to mines	1.00
	86.15

MONTANA.

Billings & Northern (Gt. Nor.)—Armington southeast towards Laurel	32.00
Butte, Anaconda & Pacific—Anaconda to Browns	6.00
Chicago, Milwaukee & St. Paul—Pacific Coast extension, between Ismay and Perry, 38.00 miles; Harlowton and Delphia, 92.30 miles; Whitehall west, 4.30 miles; Butte east 9.30 miles; total	143.90
Yellowstone Park (O. S. L.)—Idaho state line to Yellowstone	9.85
	191 75

NEBRASKA.

Chicago, St. Paul, Minneapolis & Omaha—New Castle to Wynot	18.44
South Omaha & Western (Mo. Pac.)—Lane toward South Omaha	4.07
Union Pacific—Hordville west to Central City, 4.96 miles; Belmar to Luther, 10.04 miles; total	15.00
	37.51

NEVADA.

Bullfrog Goldfield (Ton. & Goldf.)—Springdale south to Beatty and Gold Center, thence northwest to Rhyolite	26.00
Caliente & Pioche (S. P., L. A. & S. L.)—Caliente north to Pioche	32.49
Fallon Railway (So. Pac.)—Between Hazen and Fallon	1.11
Las Vegas & Tonopah—Rhyolite north to Goldfield	74.00
Silver Peak—Blair Junction to Blair	17.50
Tonopah & Tidewater—California state line north to Gold Center	28.00
Western Pacific—Utah state line west to Shafter	39.00
	218.30

NEW JERSEY.

West Jersey & Seashore (P. R. R.)—Wildwood branch extension, Wildwood to Wildwood Crest	0.56

NEW MEXICO.

Cimarron & Northwestern (St L., R. M. & P.)—Cimarron northwest to Van Bremmer Park	36.00
Eastern of New Mexico (A., T. & S. F.)—Between Texico and Belen 35.09 miles; Clovis to Cameo, 1.87 miles; Belen to Rio Puerco, 10.84 miles; total	47.80
	83.80

NEW YORK.

Adirondack & St. Lawrence—De Kalb Junction to Hermon	4.00
Delaware & Hudson—Rouses Point to connection with Napiersville Junction Railway	1.10
Erie & Jersey (Erie)—between Guymard and Ollsville	4.38
Genesee Valley Canal (P. R. R.)—Scottsville branch Scottsville to Garbutt	2.60
Glenfield & Western—Fish Creek to Menteola	2.84
Greenwich & Johnsonville—Greenwich to Salem Junction	11.00
Lehigh & Lake Erie (L. V.)—Tiffi Farm (Buffalo) to L. S. & M. S. at West Seneca	3.00
Nypano Railroad (Erie)—Between Pennsylvania state line and Lakewood	10.47
Pittsburg, Shawmut & Northern—Approaches to bridge at Stony Creek	1.00
	40.39

NORTH CAROLINA.

Carolina & Tennessee Southern (Southern)—West between Bushnell and Tenico state line	1.50
Carolina Valley—High Point north towards Greensboro	2.00
Carthage & Pinehurst—Pinehurst to Carthage	12.50
Durham & South Carolina—Farrington to Goshwell	3.75
East Carolina—Three miles south of Farmville to Hookerton	10.20
Norfolk & South—Raleigh to Pamlico Junction, 2.10 miles; Zebulon to Chocowinity, 75.77 miles; Chocowinity to Washington, 38 miles; Bayboro toward Oriental, 8.30 miles; Mackeys Ferry toward Columbia, 5.00 miles; Edenton toward Skinners Point, 2.00 miles; total	97.06
South & Western—Altapass to present end of track, 0.77 miles; Marion to North Cove in McDowell county, 14.05 miles; total	14.82
Tallulah Falls—Prentiss to Franklin	4.00
	148.83

NORTH DAKOTA.

Chicago, Milwaukee & St. Paul—Pacific Coast extension, South Dakota state line to Ives	89.10
Great Northern—Berthold-Crosby line northwest to Crosby, 61.72 miles; Walhalla north to International boundary, 5.36 miles; total	67.08
Minneapolis, St. Paul & Sault Ste. Marie—Dogden to Max	27.70
	183.88

OHIO.

Lake Erie, Alliance & Wheeling (L. S. & M. S.),—Piney Fork south to Dillonvale	5.00
Lorain & West Virginia (Wabash)—Between Wellington and Elyria, 15.79 miles; branch to quarries, 9.19 miles; total	24.98
	29.98

OKLAHOMA.

Colorado, Texas & Mexico—Mangum south	14.00
Kansas City, Mexico & Orient—Clinton south to Dill City, 20.00 miles; North Fork Red river to Elmer, 27.00 miles; total	47.00
Oklahoma Central—Byers to Middleberg, 50.00 miles; Middleberg to Chickasha, 15.00 miles; total	65.00
Wichita Falls & Northwestern System—Texas state line north to Fredwick	33.60
	159.60

OREGON.

Central Railway of Oregon—From 6.73 miles beyond Union Junction to Con	5.20
Oregon Railroad & Navigation Co.—Elgin toward Joseph, 6.80 miles; St. Johns east to Woodlawn, 5.20 miles; total	12.00
Umatilla Central (O. R. R. & N.)—Pendleton to Pilot Rock	14.50
	31.70

PENNSYLVANIA.

Allegheny Valley (P. R. R.), Pennfield Branch—Pennfield to terminus	1.48
Baltimore & Ohio—Yorn Run branch on Connellsville division	1.15
Brookville & Mahoning (P. S. & N.)—Brockwayville south to Ramseytown, 33.00 miles; Beaver Run branch from three miles south of Brookville to Conifer, 5.00 miles; total	38.00
Columbus & Erie (Erie)—Between Columbus and New York state line	8.34
Eriton Railroad (Erie)—From B. R. & P. Ry to Erieton in Clearfield county	.72
Indian Creek Valley—Indian Creek to Rodgers Mills, 10.00 miles; branch Iron Bridge to Mill Run, 2.00 miles; total	12.00
Kyler Run (Erie)—From Toby branch north up Kyler Run Hollow in Elk county	1.42
Ligonier Valley—Branch, Ligonier to Wilpen	2.50
New Park & Fawn Grove (Stewartstown)—Between Stewartstown and Fawn Grove	2.00
Pennsylvania—Apollo branch extension, 0.21 miles; Wimper branch extension to Eureka mine, 0.80 miles; West Brownsville to Junction with P. M. & S., 4.45 miles; Grindstone branch, 2.59 miles; Cambria and Clearfield division, Coal Run branch extension, 1.08 miles; total	2.13
Pennsylvania, Monongahela & Southern (P. R. R.)—From junction with Monon division to Millsboro	4.39
Philadelphia & Reading—On Philadelphia, Harrisburg & Pittsburgh branch in Cumberland county	.50
Pine Run (P. R. R.), P. & N. W. Div.—Junction with C. & C. Ry. south of Irrona	2.39
Pittsburgh, Binghamton & Eastern—Cedar Ledge to Powell	21.00
*Pittsburgh, Shawmut & Northern—Paine to Detsch	5.00
Rocky Ridge—Rocky Ridge north to Evanston	5.00
Susquehanna & New York—Pleasant Stream to Marsh Hill, 2.05 miles; Newberry to Newberry Junction, 2.15 miles; total	4.20
West Clarion (Erie)—Connection at Brockwayville with B., R. & P. Ry	.76
White Deer & Loganton—Duncan Tea Springs to Loganton	8.80
	121.78

SOUTH CAROLINA.

Bennettsville & Cheraw—Bennettsville south to Drakes	11.00
Chesterfield & Lancaster—Pageland west	6.00
Due West—Donnells to Due West	4.50
Greenville & Knoxville—Greenville north to Marietta	15.00
Seaboard Air Line—Catawba Valley branch, Spence south to Great Falls	21.00
	57.50

SOUTH DAKOTA.

Chicago & North-Western—Between Bonesteel and Dallas	11.88
Chicago, Milwaukee & St. Paul—Pacific Coast extension, Cashmere west to North Dakota state line	65.50
Minneapolis, Dakota & Pacific (M. & St. L.)—Two miles west of Northville west to Missouri river, main line	89.61
Pierre & Fort Pierre Bridge & Ry. (C. & N. W.)—From Pierre to connection with the P., R. C. & N. W. east of Fort Pierre	1.82
Pierre, Rapid City & North Western (C. & N. W.)—Between Fort Pierre and Rapid City	65.02
South Dakota Central—Rutland north to Arlington	22.00
White River Valley (C., M. & St. P.)—Kadoka to Farmingdale	81.90
	337.73

TENNESSEE.

Illinois Central—Atoka to Kerrville	5.50
Jackson & Southeastern (Ill. Cent.)—Between Jackson & Perry	.37
Little River—Forks to First Crossing	4.00
*Change in location of old main line.	
*Louisville & Nashville—Adams to Forts	4.30
Memphis & Chattanooga (Southern)—Between Chattanooga and Alabama state line	6.20
Memphis & State Line (Ill. Cent.)—Between Woodstock & Leewood, .87 miles; between Auton and Nonconnah, 3.00 miles; total	3.87
Mobile & Ohio—Clanton to Jackson	2.00
Southern Railway—Spur lines	4.08
Swan Creek Railway (L. & N.)—Mt Pleasant toward Flanagan	4.00
Tennessee & Carolina Southern (Southern)—North between Carolina state line and Maryville	12.00
Tennessee Railway—Smoky Straight Fork	4.00
Yazoo & Mississippi Valley—Etter south to Mississippi state line	6.13
	56.45

TEXAS.

Beaumont & Great Northern—Onalaska southeast toward Beaumont	15.00
Beaumont & Saratoga Transportation—Voth toward Saratoga	2.00
Beaumont, Sour Lake & Western (C. S., N. O. & P.)—Houston east to Trinity river	37.00
Caro Northern—Caro to Mt. Enterprise	16.50
Chicago, Rock Island & Gulf—North between Irving and Carrollton	3.50

Fort Worth & Denver City (C. & S.)—Alvord to Ross [illegible]	[illegible]
Galveston, Harrisburg & San Antonio (So. Pac.)—[illegible], 1.67 [illegible]	[illegible]
Kansas City, Mexico & Orient—[illegible] to Knox City, 12.00 miles; San Angelo [illegible] 11.[illegible]	[illegible]
Nacogdoches & Southeastern—[illegible]	[illegible]
[illegible] & Pacific—[illegible] to [illegible]	[illegible]
St. Louis, Brownsville & Mexico ... [illegible]	9.70
Shreveport, Houston & Gulf—[illegible]	[illegible]
Stephenville, North & South Texas—Stephenville [illegible] to Hamilton	44.[illegible]
Texas & Pacific—West Port Arthur to Port Arthur	[illegible]21
Trinity & Brazos Valley (C. & S.)—[illegible] to Waxahachie	[illegible].00
[illegible] County Lumber Company Railroad—[illegible]	[illegible]
Weatherford, Mineral Wells & Northwestern (T. & P.)—Mineral Wells [illegible] to Graford	20.50
Wichita Falls & Northwestern System—Wichita Falls north to Oklahoma state line, 17.00 miles; Wichita Falls [illegible] to [illegible], [illegible] miles; total	60.00
	[illegible]12

UTAH	
Salt Lake & Ogden—[illegible] Weber county [illegible] north to Ogden city [illegible]	4.10
Western Pacific—Between Salt Lake City and Nevada state line	20.00
	24.10

VIRGINIA	
Chesapeake & Ohio—Covington to Jordan Junction [illegible]	18.10
New River, Holston & Western—[illegible] to [illegible]	4.50
Norfolk & Western—[illegible] branch between Cripple Creek and [illegible]	1.72
[illegible] & Western—St. Paul to [illegible] Run	7.52
Virginia Air Line—Lindsay to Palmyra	17.00
Virginia [illegible]—Taylor's [illegible] to Kenbridge	7.00
Virginian Railway—East of South Norfolk to east of Belt Junction, 1.14 miles; east of Adams to west of Nottaway, 41.28 miles; west of [illegible] to east of Manson, [illegible] miles; [illegible] west 0.88 miles; east of [illegible] to east of Big Stony, 6.10 miles; west of Hardy to west of [illegible], [illegible] miles; total	121.98
	177.82

WASHINGTON.	
Idaho & Washington Northern—Idaho state line north to Newport..	9.19
Ilwaco Railroad (O. R. R. & N.)—East between Ilwaco and Knappton	4.20
North Yakima & Valley—North Yakima west to Farmville ..	30.00
Oregon, Washington & Idaho (O. R. R. & N. and Nor. Pac.)—East between Riparia and Lewiston, Idaho	34.50
Portland & Seattle—Kennewick to Vancouver	220.00
Tacoma Eastern—[illegible] to Glenavon	3.00
Washington & Great Northern (Gt. Nor.)—Between Molson and international boundary, north of Chopaka	23.65
	324.54

WEST VIRGINIA.	
Buffalo Creek & Gauley—Dundon to Cushmont..........	9.00
Chesapeake & Ohio—Lawson up Sycamore Creek 0.60 miles; Dingess Run to Ethel, 4.50 miles; total	5.10
Coal River Railway (C. & O.)—St. Albans to Sproul, 15.20 miles; Sproul to Peytona, 14.00 miles; Sproul to Madison, 22.50 miles; total	51.70
Iron Mountain & Greenbrier—Not specified..........	4.00
Kanawha & West Virginia—Charleston to Blakesley..........	39.00
Morgantown & Kingwood (L. & N.)—Kingwood south to Rowlesburg	18.00
Norfolk & Western—Dry Fork branch, Berwind southeast to Canebrake	2.30
Virginian Railway—West of Ingleside, 1.44 miles; Macajah to east of King, 15.43 miles; total	16.87
	145.97

WISCONSIN.	
Chicago & North Western—From one mile west of Marathon City to Rib Falls, 4.75 miles; between Elton and Van Ostrand, 6.37 miles; total	11.12
Duluth, South Shore & Atlantic—In Douglas county..........	.83
Wisconsin & Northern—Scott to Van Ostrand, 19.84 miles; north of Crandon to W. & N. Junction, 2.88 miles; total	22.72
Wisconsin & Michigan—Jarvis to Sycamore..........	1.20
Wisconsin Central—Ladysmith northwest toward Superior..........	81.00
	116.87

WYOMING.	
Chicago, Burlington & Quincy—Worland south to Kirby	20.45
Laramie, Hahns Peak & Pacific—From 15 miles west of Laramie to Centennial	15.00
Oregon Short Line—North Kemmerer branch, Kemmerer to mine..	7.26
Saratoga & Encampment—Walcott south to Saratoga..........	24.00
	66.71

CANADA.	
Canadian Northern—Edmonton, Alb., to Stony Plain, 21.00 miles; Edmonton to Morinville, 23.00 miles; total	44.00
Canadian Northern Quebec (Can. Nor.)—St. Jerome, Que., to St. Sauveur	10.00
Canadian Pacific—Milverton, Ont., west to Goderich, 51.50 miles; Neudorf, Sask., via Lanigan to point 26 miles west of Saskatoon, 252 miles; between Weyburn, Sask., and Stoughton, 12 miles; between Reston, Man., and Wolseley, Sask., 98 miles; total	413.50
Central Ontario—[illegible]'s Creek, Ont., to Maynooth, 10.50 miles; Maynooth north, 2.00 miles; total	12.50
Grand Trunk Pacific—Between Winnipeg, Man., and Edmonton, Alb., 325 miles; between Knowlton, Man., and Fort William, 100 miles; total	425.00
Great Northern—International boundary north of Walhalla, N. D., north to Morden, Man., 15.25 miles; Fernie, B. C., towards Michel, 10.00 miles; total	25.25
Maritime Coal Ry.—Fundy, N. S., to Joggins	1.00
Napierville Junction (D. & H.)—At St. Constant, Que., connection with Grand Trunk and Canadian Pacific	1.25
Niagara, St. Catherine & Toronto—Thorold, Ont., to Fronthill..........	7.50
Quebec & Lake St. John (Can. Nor. Que.)—In Quebec, Gosford branch mile 1 to Clarks, 1.50 miles; La Tuque branch, mile 28 to mile 40, 12.00 miles; total	13.50
Temiskaming & Northern Ontario—Mile 203 to mile 208, Waytayberg river, Ont.	5.00
Vancouver, Victoria & Eastern (Gt. Nor.)—From international boundary northwest to Keremeos, B. C.	18.20
	976.70

MEXICO.	
Cananea, Yaqui River & Pacific (So. Pac.)—From 15 miles south of Corral, Sonora, to Alamos, 76.80 miles; 10.3 miles north of Corral to Cumuripa, 25.00 miles; total	101.80
Inter-California (So. Pac.).—Calexico southeast	19.24
Kansas City, Mexico & Orient—Chihuahua [illegible], [illegible] miles; [illegible] west, 12.00 miles; total	18.[illegible]
Mexican Central—[illegible]; [illegible] total	42.[illegible]
Mexican International—[illegible] to [illegible]	17.00
Mexican Pacific Coast (So. Pac.)—National [illegible] to [illegible] San [illegible] to [illegible] K. C. M. & O.	84.00
Parral & Durango—[illegible]	3.00
Rio Grande, Sierra Madre & Pacific—[illegible]	[illegible]
San Juan de [illegible]—Between San [illegible] and [illegible]	1[illegible]
	[illegible]

Trainmen's Hours in Great Britain.

The British Board of Trade has issued its statement of overwork by railroad employees in the month of June last, as reported by the companies under an order issued by the Board July 31. The Board now requires such a record for one month in each quarter of each year. Under the terms of the order the record must show the number of employees of different classes—trainmen, signalmen and examiners—who, on one or more occasions during the month have been on duty more than 12 hours at a time, or who, after so working, have been allowed to resume work with less than nine hours' rest. A second table is given showing a summary of these same periods of duty as they appear, after deducting time spent in traveling home on being relieved. The number of employees embraced in the report now given is 112,442, and in the month under review they worked 2,865,309 days. The number of days on which these men worked over 12 hours was 2.65 per cent. of the total days worked. The percentage, after making the deductions for time spent in going home, was in most cases about 10 per cent. less, although in the case of freight trainmen it was 30 per cent. less.

In connection with this subject American readers will be interested in a report of the conditions on the Lancashire & Yorkshire as investigated last May by Lieutenant-Colonel Druitt, whose statement was published by the Board of Trade in its annual report on employees' hours of labor. Investigations were made of conditions on other roads also. In England, as in the United States, the labor unions and the government together have forced the reduction of working hours of trainmen and signalmen to rigid limits, with the important difference, however, that on the British roads, as is indicated in the report above referred to, the limit beyond which it is held to be more or less dangerous for a trainman to work is 12 hours. On American railroads this period, 12 hours, is the practical limit which superintendents and trainmen use as a basis in preparing their schedules, but the government has not yet undertaken to declare trainmen overworked until they have been on duty 16 hours continuously.

Lieutenant-Colonel Druitt's report deals with the pay of the men, their hours and their holidays, the question of the sufficiency of the forces at division points and all the conditions surrounding their work. We quote his general statement and his chapter on "relief":

CONDITIONS ON THE LANCASHIRE & YORKSHIRE.

To move a large amount of merchandise on this railroad under existing conditions of trade, and at the same time to keep the men's hours within reasonable limits, is a difficult problem. Owing to the line being crowded with passenger trains during the day, and the way business is carried on by merchants, all goods traffic has practically to be done at night. The merchandise is rushed to the goods yard at the last possible moment after business hours, and the owners expect it to be delivered at its destination, perhaps 20 or 30 miles away, by the time the shops open next morning, quite forgetting that the goods have to be weighed, labeled, packed into trucks at the receiving yard, and the trucks to be then taken to marshaling sidings and made up into trains for the various destinations. Owing to the exceptional boom in the cotton trade during the last six months or more, the unusually large amount of goods to be moved has sometimes made the trains start very late, perhaps two hours or more after scheduled time. And as the amount to be carried is not known till the last moment, the enginemen and guards have to be in attendance with the engine at the schedule time, and be on duty perhaps two hours before starting. Also, owing to the abnormal amount of traffic resulting from the great boom in trade, the various trains block each other, especially at yards and junctions where branch lines join the main line, and wagons have to be transferred from one train to another, while very often the branch line trains are late. The result is that a train often gets four or five hours behind time in a distance of 30 miles, and takes perhaps 12 hours or more doing that distance. In East Lancashire especially the traffic between Manchester and Colne, Burnley, Accrington, Haslingden and Ramsbottom has been heavier during the last winter than ever known before.

Relief.—This is a difficult question to adjust. The regulations are as definite as possible, but it has been found impossible to carry them out during last winter so as to relieve every man before he has worked long hours; and as regards goods guards, if they did get relieved after 12 hours with a train, the time spent traveling after-

ward brought up the hours very often to 13 or over. It is impossible to provide relief at fixed points, as it is quite uncertain when the trainmen requiring relief will arrive at that point, and if an average time is fixed the train may pass before the men require relief. Then, as shown above, the traffic is almost all at night, when no passenger trains are running, and if a man starts duty at 6 or 7 p.m. he will require relief at some point not known until he telegraphs from it at 4 or 5 a.m. So it is often impossible to get relief to him except perhaps by another goods train or light engine; and if the men are relieved they may have to wait an hour or two for a passenger train to take them home, or they may get part of the way by a goods train or light engine. Sometimes relief men just miss the men to be relieved, as trains cannot be kept waiting when they have the road, and so the relief men have to follow after the others the best way they can. Sometimes, also, a man who wishes to make long hours will wire for relief at a place which he knows the relief man cannot possibly reach in time. The company showed me particulars of a number of cases where men had not carried out the regulations in asking for relief in time or in the proper manner, and so had worked long hours in consequence. That this is done by a few young unmarried men, who wish to make long hours and earn extra wages, was admitted by men to me in private; but, as a rule, the best men are only too glad to get home as soon as possible. As a rule the men did get relieved, except during fog and bad weather, but after being in charge of a train for 12 hours and then traveling afterward made the hours excessive.

Lieutenant-Colonel Druitt finds that wipers only 18 or 19 years old are frequently employed as firemen where it is necessary to relieve the older men after they have worked 12 hours, and a large number of such lads are being taken into the service. The railroad companies, in their endeavors to meet the severe demands of the government, make much (in their reports) of the fact that men can rest while on their way home after ending a tour of duty, but it appears that on these trips the men often have to ride in a caboose or a locomotive, so that Colonel Druitt thinks they do not rest much.

The only definite recommendation made by the inspector is that there should be a minimum limit of rest time between tours of duty, exceptions to be allowed only under very special or urgent circumstances. It appears that last winter was exceptionally severe on the railroads. There was an unusually heavy movement of freight, there was much fog and snow and much sickness of the men. Under these conditions the number of trained men at the disposition of the company was not large enough.

Protecting Steel Bridges Against Brine from Refrigerator Cars.*

The committee is agreed on two points: That the proper remedy for the trouble is in so constructing the cars that the brine can be retained till it can be drawn off by the train hands without injury to structures; and that no paint has been found that is effective in protecting the metal.

Mr. Berg (L. V.) reports: "The Lehigh Valley has not adopted any special construction methods for the protection of bridges against the action of salt brine from refrigerator cars, except the ordinary protection of the steel work by paint. We have found no satisfactory paint thus far to withstand this action for any length of time, so that certain parts of the bridges, depending upon local conditions and class of construction, have to be painted every year."

Mr. Montzheimer (E., J. & E.) says: "The best way to obviate this trouble is to have the drips from the refrigerator cars piped to the center of the track and then protect our bridges so that water dipping on the center of the track will not go to the steel work."

Mr. Draper (Ill. Cent.) sends a sketch of a protection that is proposed to be tried on his road. He says: "The print shows the proposed method of protecting our floor system from salt water and from the weather. It is a galvanized iron box trough used as a spacing block between the ties, and made with a pitch in order to turn the water off very rapidly. This protects the floor system from the rust from the rails, which is as bad as salt brine in destroying the paint. We have used on this road all classes of paint, but have not found anything that will overcome salt water, and I think that in the future we will have to resort to this method of covering to keep off the dirt, rust and salt water from the steel.

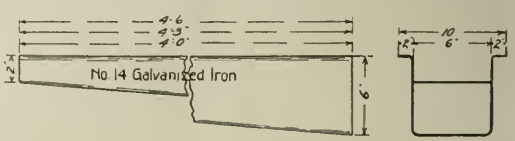
"Our estimated cost of putting an ordinary deck on a steel structure is $4.50 per foot for labor and material. This method of covering will add $1.65 per foot, making a total of $6.15 per running foot; and I am satisfied that we will receive better results by keeping our steel work properly covered with paint. This is to be used for deck and through plate girders and through truss spans. The girders and spans where we have the corrugated floor system and use a 6 in. x 8 in. yellow pine tie, should be covered on the outside of the rail with 1½-in. matched lumber. This will overcome the drip from falling direct on to the steel."

The committee recommends that all equipment which scatters salt brine along the line of tracks be provided with a copper tank on each car with sufficient capacity to hold all the salt brine that may be made from melting ice, and have it emptied at destination of car, or at points where such car is re-iced. The practice of scattering salt brine should be stopped; and it can be stopped much cheaper and with better results than to try to protect the structures from such action.

In 1898, at the Richmond meeting, a report on this subject estimated that one refrigerator car would produce about 200 gals. of brine in 24 hours. The suggestion was made that the cars be piped so that the brine be discharged at center of track and the structures provided with troughs to carry it clear of the metal work. In the discussion of this report, tanks were suggested and a method of filling between the ties with blocks bedded in paint somewhat similar in principle to Mr. Draper's scheme. President Berg stated that the Master Car Builders' Association had considered this matter and a committee had submitted two schemes, one of which, consisting of piping to center of track and discharging through a hose reaching nearly to the ground was adopted by the association as "Recommended Practice."

At the Quebec meeting, in 1903, Benjamin Douglas, of the Michigan Central, described his method of applying asphalt to floor plates by heating the iron and pouring on hot asphalt. This formed a sort of enamel, the asphalt adhering to the iron perfectly. A modification of this method could be applied to ordinary floors affected by brine drippings. It was also suggested at this meeting that tops of stringers and floor beams be covered with ready roofing or similar material as a protection from brine.

At the Pittsburg meeting, in 1905, Mr. Reid, of the Lake Shore, and Mr. Cartlidge, of the Chicago, Burlington & Quincy, reported on the use of roofing felt on stringers; the latter finding it satisfactory and the former stating that it soon cut through. Mr. Loweth, of the Chicago, Milwaukee & St. Paul, stated that he was trying "iron bark," a proprietary material consisting of canvas ducking saturated in a preparation of linoxyn and a resinous flux. A recent letter from Mr. Loweth states that on several spans of deck girders with creosoted timbers laid close and covered with ballast, the "iron bark"



ELEVATION

Proposed Method of Protecting Floors of Iron Bridges from Brine and Water; Illinois Central.

placed over the girder flanges under timber was in perfect condition after two years' wear. On several standard-floor bridges with 4-in. spaces between ties, the "iron bark" had cut through under the ties or crimped up between them. The material and its application is expensive and except in the case of solid continuous timbering does not seem to be entirely satisfactory. It is the material used for covering the cables of the Williamsburg bridge at New York.

The report is signed by R. P. Mills, chairman; A. Montzheimer, Walter G. Berg, F. O. Draper, Charles Carr.

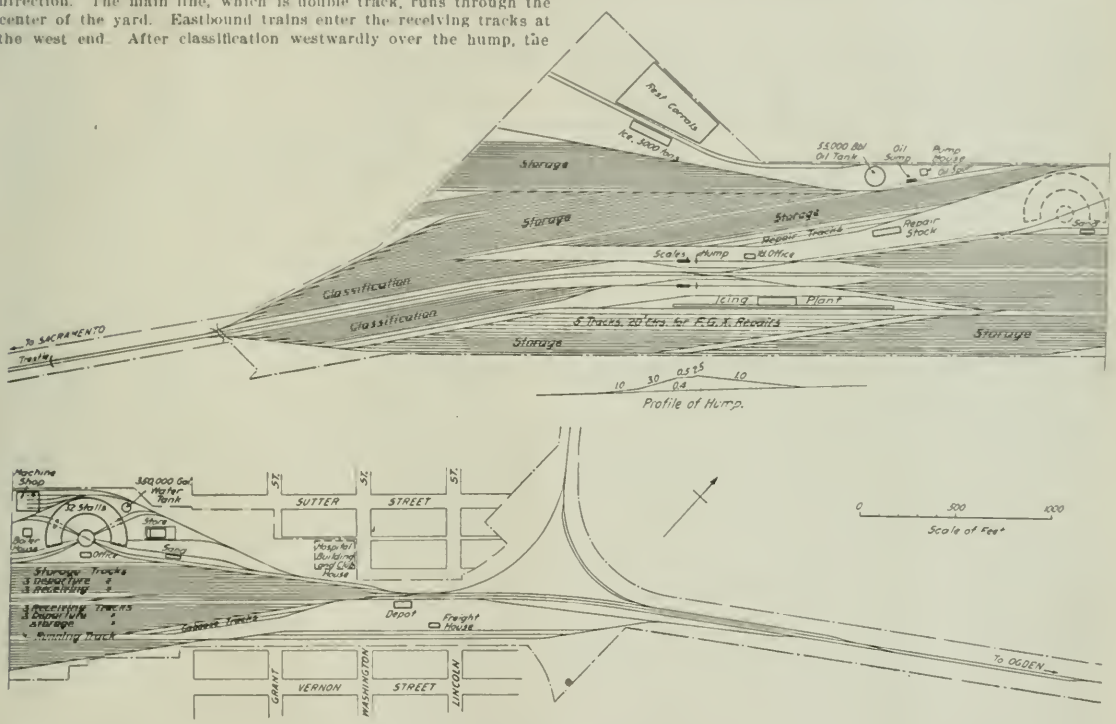
*Abstract of a report to the Milwaukee convention of the Superintendents of Bridges and Buildings.

The Roseville Yard of the Southern Pacific.

A plan of the yard lately completed by the Southern Pacific at Roseville, Cal., is shown herewith. The arrangement is somewhat peculiar, due to the physical condition of the site. Roseville is about 18 miles northeast of Sacramento, and is the junction of the line to Ogden and what is known as the east side line in the Sacramento valley. The San Francisco-Portland line follows the west side of the valley. The two join at Tahama, 105 miles north of Roseville.

The situation of Roseville with respect to Sacramento, and the proximity of the Sierra Nevada mountains on the east, made it necessary to have at this point a receiving, departure and classification yard. Freight coming into Sacramento from the west or south is forwarded north or east from Roseville, and vice versa. Trains coming over the mountains are made over at Roseville for the lighter grades of the Sacramento valley, while through trains bound east have to be broken up into sections for the heavy mountain grades.

The yard has two humps, but it will be observed from the plan that all of the classification tracks are at the western end. This is because the yard is on a 0.4 per cent. up-grade eastwardly, which would prevent switching and classifying cars by gravity in that direction. The main line, which is double track, runs through the center of the yard. Eastbound trains enter the receiving tracks at the west end. After classification westwardly over the hump, the cars are drawn back by way of the run-around tracks to the departure tracks. There is ample storage room, and provision is made for doubling the present engine house accommodations.



Roseville Yard of the Southern Pacific.

Electric Railways in Sparsely Settled Communities.

BY E. P. ROBERTS.*

There are three general classes of electric roads: the city, or urban; the suburban, and the interurban. The city line proper is one lying entirely within the limits of a city, and, in general, its receipts depend on the magnitude (population and area) of the city rather than on the population per mile of road, as in small cities the distance from residence centers to business centers is usually short, and people can and do walk. On the other hand, in the large city, the distance between residence and business centers is usually large, and people ride more frequently than in the other case. As a result there may be a smaller population per mile of road in a large city, and yet such road may have far greater receipts per mile mile of track is greater.

Suburban roads are usually an extension of the city system and operate on highways, frequently with cars of the city type. The schedule provides for rather frequent stops, though less in number than for an interurban road. Suburban roads may be classified as those connecting a terminal city with one or more outlying towns and villages, and those which serve a suburban residence district. Generaly speaking, the latter class will show greater earnings per capita for equal density of population, excluding the population of and per capita than in the smaller city, where the population per the terminal city from the population per mile of road.

Freight traffic on a city road is nearly always a negligible quantity, but in the case of a suburban or interurban road may reach a very respectable value. The electric roads doing the largest freight business are usually those which run through the most sparsely settled districts. This is frequently due to the fact that the steam freight service in such district is limited, or entirely absent. It is also a fact that such roads are generally built with the expectation of doing a considerable freight business, or are forced to develop such business because of the small passenger traffic. As the light passenger traffic can be taken care of by cars operating under considerable headway, the track is available for freight service. In most cases such roads have single track, with sidings of such length and location as may be required.

Not infrequently suburban roads, or those which should properly be designed as suburban roads, are equipped with large and heavy cars geared for high maximum speeds and attempt to make fast schedules, while at the same time doing a suburban business and making frequent stops. Such practice is almost always uneconomical, as it gives on the one hand, a poor suburban service, the cars being too large, the seating not best suited to the service, the headway infrequent; on the other hand, a wretched interurban service. A heavy car geared for high speed is very poorly adapted to suburban service with its frequent stops, and also results in an excessive amount of power for the service given. Where the number of stops is large, it is folly to gear a car for high schedule speed. In fact, with from six to eight stops per mile it is useless to gear a car for a higher speed than from 25 to 30 miles an hour, as no gain in schedule speed at all commensurate with the cost can thereby be obtained. Another difficulty arising from the use of large and fast cars for suburban service is the necessity for the high rates of acceleration which are required in order to make the time card when the traffic is heavy and the stops numerous. Such high rates of acceleration require large and expensive motors, and make heavy demands on the power house, sub-station and line.

The equipment on interurban roads should always be geared for the very lowest speed that will make the required schedule, plus a sufficient margin for delays. Any higher gearing results in an

*Abstract of a paper read by E. P. Roberts, of the Roberts & Abbott Company, Cleveland, Ohio, before the American Street & Interurban Railway Association.

unnecessary expense for car equipment, in some cases unnecessarily high repair bills, unnecessary expense for power, and also a larger power house and sub-station equipment than would otherwise be required. The motor equipment selected should always be of ample capacity for the work which it has to do. New equipments may be heavily loaded for a long time before the effect of such overloading becomes evident, and smaller overloads are slow to show their effect. But when the trouble once starts it comes all at once. It sometimes happens that a road will increase its schedule speed, making the necessary changes in gearing to secure the required maximum speed, and apparently everything is lovely, but in one to two years there comes a sudden epidemic of burnt out armature and field coils, and within a very short period it is necessary to rewind practically every motor on the road. This is the inevitable result of long continued overload.

The entire population directly on the route should always be considered in estimating probable earnings. When one city greatly preponderates it should be excluded, but its population noted. For sections a greater or less distance from the route we use a percentage based on local conditions, and take into account the character of the population, the reasons for travel and the comparative facilities, including accessibility. For example: Near the principal city a person residing three miles or less from the corporation limits of the city, and three miles from the proposed road, would seldom, if ever use it, whereas, if he were a considerably greater distance from the city, and three miles from the road, he would use it almost as much as if he lived directly on the route, provided that there was not another electric or a steam road nearer to him. If such road were a steam road consideration would be given to the service provided by it.

It is also evident that if the location of the proposed road is along a river, especially a wide river with few bridges, the population on the other side of the river from the road has lessened in value; it might not, geographically speaking, be a quarter of a mile distant, but from the standpoint of accessibility may actually be several miles away. In some cases and because of connection with steam or electric railroads, or river transportation, or existing stage routes, considerable value should be given to a population at a considerable distance from the route, whereas in other cases, and as above indicated, the population quite near the route may have little value. The population so obtained is what we term the "equivalent" population, by which is meant the population, which, if all of it were directly on the route, would equal in amount of travel the actual population as it is actually located. For example: a population of 1,000 may be considered as equal to 100 or 200 or more directly on the route.

Usually it makes little difference to the interurban road whether the principal city has 100,000 or 500,000 population, provided that it is the principal city in that general section of the country, and therefore the one to which all business tends. If the interurban road has a pleasure resort, it might seem fair to assume that it would receive more passenger traffic from a terminal city of 500,000 than it would from a smaller terminal city. On the other hand, the larger city will have more places of amusement, and it is a question whether such seeming probable result will prove to be a fact. The freight and express business *from* the principal city depends on the conditions along the route, and the same is true of travel for business reasons, and also largely for social reasons, and is not affected by the size of the principal terminus. The travel *into* the principal terminus is not affected by its population, provided, as before stated, it is the principal city in the general section of the country. The receipts per capita depend upon the reasons for travel, comparative facilities, habits of the people, character of population, comparative costs of travel, etc.

The following examples show on typical roads the relation between receipts per capita and population per mile of road, exclusive of the population of the terminal city.

Road No. 1 is a double-track interurban in the central west, with its terminal in a large city, but having no other towns of any considerable size. It has a rather large suburban resident population, especially during the summer, and the double-track main line of the road is paralleled by a third track operated by the same company, and two or three miles from the main line, but connecting with it at both ends. The earnings include both lines. The population of the principal city is excluded. Its data are:

	1904.	1905.
Population, total	20,402	20,692
Population, per mile	463	470
Earnings, total	225,751	245,809
" per mile	5,130	5,560
" per capita	11.06	11.84

Road No. 2 is a 42-mile road in the central west, having a medium-sized terminal city, the population of which is excluded from the total.

	1904.	1905.
Population, total	38,469	40,005
Population, per mile	915	952
Earnings, total	181,201	173,153
" per mile	4,311	4,123
" per capita	4.71	4.33

Road No. 3 is a 34-mile road having several small cities, whose population is included in the totals.

	1904.	1905.
Population, total	71,338	73,249
Population, per mile	2,100	2,150
Earnings, total	136,918	147,851
" per mile	4,000	4,330
" per capita	1.90	2.20

Road No. 4 is a 39-mile road having a large terminal city and one smaller terminal city. The larger city is excluded and the

Road No. 5 is an 80-mile road in the central west, having only

	1904.	1905.
Population, total	28,424	28,781
Population, per mile	730	740
Earnings, total	225,410	248,912
" per mile	57,880	6,300
" per capita	7.90	8.60
" per mile	2,572	2,885
" per capita	2.56	2.82

Road No. 6 is also a road in the central west, 30 miles in length, and having one medium-sized city, the population of which is excluded from the totals.

	1904.	1905.
Population, total	32,373	32,993
Population, per mile	1,079	1,100
Earnings, total	85,055	80,100
" per mile	2,835	2,770
" per capita	2.66	2.43

Road No. 7 is a road in the central west, having one large and one very large terminal city; both of these are excluded from the totals; miles of track, 160.

	1904.	1905.
Population, total	116,993	118,957
Population, per mile	731	743
Earnings, total	660,000	699,339
" per mile	4,125	4,370
" per capita	5.64	5.87

Road No. 8 is also in the central west, having 92 miles of track and one large terminal city, the population of which is excluded from the totals.

	Last half '04-first half '05.
Population, total	85,082
Population, per mile	924
Earnings, total	404,880
" per mile	4,400
" per capita	4.75

Road No. 9 has one large, one medium and one small terminal city. The large terminal city is excluded and the other is included in the total; miles of track, 45.

	1904.	1905.
Population, total	59,166	62,124
Population, per mile	1,315	1,353
Earnings, total	234,278	223,605
" per mile	5,205	5,000
" per capita	3.95	3.60

Road No. 10 is a large road in the central west, having 134 miles of track, and one very large terminal city, the population of which is excluded.

	1904.	1905.
Population, total	92,539	94,200
Population, per mile	692	702
Earnings, total	475,361	543,226
" per mile	3,547	4,054
" per capita	5.13	5.87

Road No. 11 is a 59-mile road in the central west, having three small cities, all of which are included in the totals.

	1905.
Population, total	52,032
Population, per mile	887
Earnings, total	197,934
" per mile	3,475
" per capita	3.80

Having obtained the "equivalent" population, as already described, the next and most important step is to determine the probable income per capita. Consideration must be given to the reasons for travel, comparative existing facilities, including railroad timetables and rates, and possibilities or probabilities of existing or of other proposed roads furnishing increased facilities. The habits of the people must be studied, the existing trend of traffic and every factor which may influence the situation. Some of these factors can be given an approximately definite value, and others are largely a matter of experience. The same method is followed in connection with freight, both package and box freight, including milk, garden truck, etc., also mail, although the latter is not generally of great financial value, but policy may make it desirable.

Express matter and so-called package freight can usually be carried either in a special compartment of a regular car or in a special express car similar in general make-up to the passenger car used on the road, and, in either case, can be handled without interfering with the regular schedule and without any extraordinary demands for power. Bulk freight, on the other hand, to be profitable must be handled in fairly large quantities, and this requires the operation of train units of several cars. If such trains are run in the daytime when the regular passenger traffic is on the road, it necessarily interferes more or less with the regularity of the passenger schedule, as they move at slower speeds than the passenger trains. In addition, freight trains demand a large amount of power, consequently require a considerable addition to the power house, and also make it necessary to install sub-stations of such capacity as are required for one or more freight trains in addi-

tion to the regular load due to passenger cars. If there are a sufficient number of freight trains on the road to keep the additional machinery in the sub-stations reasonably well loaded this is not objectionable, but, on the other hand, if but one or two trains are on the road at a time it necessitates the installation of large capacity sub-stations, and consequently light average load and power efficiency. Where it is possible to haul freight during the night when passenger service is partially or entirely discontinued, it may be possible to avoid the installation of additional sub-station machinery for freight service. Even in this case, however, the freight haulage may involve the operation of several sub-stations to handle one or two trains, with a resulting low factor and poor efficiency in the sub-station. Another difficulty which arises in the hauling of heavy freight trains on the average interurban road, is that of delivering sufficient power to the train by means of the ordinary trolley wire. This difficulty does not apply in the case of third-rail roads or the single-phase a.c. road. Where bulk freight is to be handled in quantities on an electric road, it is just as necessary to keep down to a low grade as in the case of a steam road. The co-efficient of tractive resistence in the case of a 10-car freight train at 15 miles per hour, and on level track is only some 7 or 8 lbs. per ton; where, on the other hand, each 1 per cent. of grade adds 20 lbs. per ton; that is, on a 1 per cent. grade the tractive resistance is perhaps 27 lbs. per ton, or nearly four times as great as that on a level track. Freight service, therefore, demands low grades so as to keep down the cost of locomotives, of power house, sub-stations, and line equipment.

The consideration of the route may start with the principal terminal city, and it is of great importance to have the terminal station in such city well located relative to the retail district, which is generally also the amusement center. Generally interurban roads entering a city of any considerable size use the tracks of the local street car system, but sometimes it is possible to obtain an independent entrance, and, when finances warrant it, this is preferable. It is, however, seldom warranted unless the anticipated travel is considerable, and, of course, is materially affected by the cost of construction required in the city, including the cost per mile and total mileage, which includes the first cost and the maintenance of street paving, sprinkling charges, if any, etc., and city taxes.

In a general way, the shorter the route in the city, or more correctly, the less the time of the run in the city, the better for the interurban railway. This materially depends on the frequency of service given by any competing steam road and by the time required between the station of the steam road and the retail center, not only in the principal terminal city, but also in the principal towns along the route. For example, on a new road which is being built a large amount is being spent in order to reduce the time required in the principal city, because the competitive steam railroad service is very frequent, there being two competitive steam roads, each operating trains hourly. In a case where the competition is four or five trains each way daily, most of which are through trains, generally one or two hours late and only stopping at two points along the route other than the principal city, it is not advisable to make large expenditures in order to save a small amount of time.

Another point is the location of the road in cities and towns along the route. The receipts of an interurban line depend largely on the accessibility of its cars and frequent service, but, on the other hand, accessibility in the cities and towns generally means somewhat increased first cost, also a longer time for the run. If freight cars are to be handled it means considerable additional trackage for the freight line. The recent development of the alternating current motor system makes it desirable for roads which use this system to keep on private right of way as much as possible, and when in cities and towns to use only such streets as will allow the use of high voltage trolley. As a matter of fact the high voltage trolley is now used in some towns of considerable size, but it is hardly probable that this will be permitted in all towns.

The number of stops made by a car has a very decided effect on the size of motor necessary to drive it, and with any given schedule and car the less the number of stops the smaller and cheaper the motor equipment. Taking a given car geared to a maximum speed of 40 m.p.h., with eight stops per mile, the possible schedule speed is less than 10 m.p.h. With four stops per mile the possible schedule is less than 15 m.p.h. With two stops per mile the schedule speed is about 20 m.p.h., and with one stop per mile the schedule speed is about 26 m.p.h. On the other hand, with one stop in eight miles a schedule speed of 34 m.p.h. can be made. This is on a level and straight road. Had the same car been equipped with motors geared to but 30 m.p.h., it would have been made with eight stops per mile a schedule speed of eight m.p.h., which is practically the same as before; with four stops per mile it would have made a schedule of 13 m.p.h.; with two stops per mile a schedule of 17 m.p.h. The schedule will not only be as good as that made with higher gearing, but also the motor equipment can be decidedly smaller and cheaper, and the fluctuation of load at the power house will be much smaller than that resulting from the higher speed car.

Unless grades are considerable, the advantage of grade reduction, as far as time is concerned, will generally be found small and not comparable with lessening the number of stops. For example: In one case we prepared a preliminary estimate of the cost of the grading required to obtain a maximum 1, 1½ and 2 per cent grade through a country rolling the entire distance and the time which would have been saved by reducing from 2 per cent. to 1 per cent. was not greater than a reasonable allowance for time lost in the principal city on account of delays in the congested district; whereas, the additional cost required for the reduction of grade would be very considerable.

Since the single-phase a.c. motor has become an accepted fact, it is in some cases advisable to consider plans and to make estimates of cost based both on d.c. and on a.c. equipment. The general characteristics of the single-phase a.c. road, as compared with d.c., are low first cost of line and substation equipment, high first cost of car motor equipment, and ability to deliver power either to many small units or to a few large units, and in either small or large blocks. The characteristics of the d.c. equipment are high first cost of equipment of substations and line, low cost of car equipment, and considerable cost for substation attendants, and ability to deliver power to a considerable number of units in small blocks, but requiring much greater investment than d.c., when required to deliver large quantities of power to a small number of units. As a result the a.c. system is more especially adapted to the interurban roads where first cost must be as low as possible and where the number of cars operating is comparatively small, and also to the operation of trunk lines, freight roads, etc., where there are a small number of heavy trains to be moved, and therefore, in a general way, for "interurban roads in sparsely settled districts." On the other hand, the d.c. equipment is preferable for the city road, the elevated road and the suburban roads with heavy traffic, where the number of trains is large. The interurban road which is equipped with the single-phase trolley is in a position to handle freight in large units to much better advantage than the road having d.c. equipment, as it is not limited as to the amount of power which a trolley wheel can take from the wire, but only as to the maximum load which the sub-station can carry; and in this case the sub-station equipment is comparatively cheap, it is possible to have a sufficient sub-station capacity to handle heavy freight in addition to the passenger service.

Some interurban electric railroads should never have been built, as under no conditions were they warranted. Others have been improperly designed. In some cases the construction has been too expensive and in other cases too cheap. Other roads have not been properly maintained, and still other roads have not been properly managed. Success depends on obtaining the best location, proper design under the special conditions, proper construction and competent operation. The first three are to a large extent unchangeable once the road is built.

Block Signal Costs on the Pennsylvania Railroad.

The block signal installations made by the Pennsylvania Railroad in the three years 1904-5-6 aggregate nearly 1,500 miles. The cost was $830,451 and $191,758 was added to the annual operating expenses. The Pennsylvania now has every mile of its main lines protected by block signals, and all but about 500 miles of the entire mileage (6,032 miles) east of Pittsburgh and Erie. The details by divisions are shown below (cents omitted).

BLOCK SIGNALS INSTALLED EAST OF PITTSBURGH AND ERIE, YEARS 1904-05-06.

Division.	Mileage of road.	Number of tracks.	Cost of installation.	Addition to annual op. expenses.
Automatic Block Signals.				
New Jersey	.....	..	.....	.....
Eastern Pennsylvania	14.9	4	$119,285	$12,786
Western Pennsylvania	29.83	4	126,240	5,764
Buffalo & Allegheny Valley	1.0	2	2,122	.....
Erie Division & N. C. Ry.	.....	...	.....	.....
Phila., Baltimore & Washington	24.2	1, 2 & 4	111,736	9,900
Philadelphia Terminal	2.73	2	8,346	.....
West Jersey & Seashore R.R.	35.63	2 & 3	273,186	22,960
Total	108.29	..	$640,915	$51,411
Telegraph Block Signals.				
New Jersey	10.8	1 & 2	$3,396	$1,800
Eastern Pennsylvania	34.67	2	28,910	24,374
Western Pennsylvania	68.7	2	25,250	13,004
Buffalo & Allegheny Valley	350.0	1 & 2	55,421	28,489
Erie Division & N. C. Ry.	897.45	1 & 2	49,462	48,529
Phila., Baltimore & Washington	61.96	2	12,635	16,083
Philadelphia Terminal	.....	..	.....	.....
West Jersey & Seashore R.R.	28.91	2	14,449	8,066
Total	1,452.49	..	$189,535	$140,346
SUMMARY.				
Automatic Block Signals.				
Two-track sections	3.73	..	$10,468	.....
Four-track sections	44.73	..	245,525	$18,551
Mixed	59.83	..	384,922	32,860
Total	108.29	..	$640,915	$51,411
Telegraph Block Signals.				
Two-track sections	194.21	..	$81,255	$61,527
Mixed	1,258.25	..	108,279	78,819
Total	1,452.49	..	$189,535	$140,346
Total, automatic and telg.	.....	..	$830,451	$191,758

It will be noted that in the case of the automatic signals the

annual operating expenses equal only about one-twelfth of the cost of installation, while with the telegraph block system the yearly operating expenses equal about nine-twelfths of the first cost.

We do not know what items are included in operating expenses, but assuming that depreciation is included, and that capital is worth 6 per cent. per annum, a rough calculation of the yearly cost per mile may be made as follows: Automatic, expenses, $51,411; interest, $38,455; total, $89,866, or about $830 per mile of road. Telegraph block system, expenses, $140,346; interest, $11,372; total, $151,718, or about $104 per mile of road. It is to be borne in mind that about half of the automatic mileage consists of four-track line. The telegraph block system is largely single-track, and, by reason of the longer block sections provides only for a traffic far less dense than that carried by the lines equipped with automatic signals.

Co-efficients of Friction Between Wheels and Rails.*

BY GEO. L. FOWLER.

(Reprinted from a volume of reports made to the Schoen Steel Wheel Co.)

The resistance of a wheel to slipping on the rail depends upon two causes frequently confused, but which are to be considered separately. These are friction and abrasion.

Frictional resistance is due to the roughnesses of the two surfaces in contact, and may be compared to the lifting of the weight to be moved over the successive inequalities of the surface on which it rests. Abrasion, on the other hand, involves the removal or cutting away of the particles of the masses in contact. The slipping of a wheel, such as would produce a flat spot, involves both frictional resistance and abrasion. If there were no slipping of the wheel on the rail there would be no wear, provided the rolling action did not produce sufficient pressure on any one point to crush the metal or cause it to flow. But there is always more or less slip even on a straight line.

There are two kinds of slipping to which car wheels may be subjected. One is the skidding action due to the locking of the wheels by the brake-shoes. The other form occurs when the driving wheels of electric motor cars, for instance, are turned faster than the corresponding rate of motion of the car and the whole periphery of the wheel slides over the rail. In order to determine whether the resistances to these two kinds of slipping were the same, certain experiments were made.

The apparatus was designed to produce, as nearly as possible, the actual conditions of track work.

Two pieces of steel rails of 75 lbs. section, one of which had been worn smooth in service; the other, a piece of new rail, together with a section of a steel wheel and a section of a cast-iron wheel, with the treads of both smooth and free from imperfections, were used for the tests. The testing machines were made by Tinius Olsen & Company, one with a capacity of 100,000 lbs. and the other a capacity of 50,000 lbs.

The apparatus is shown in the accompanying illustrations for the skidding movement. The wheel section was set on the rail and loaded by the 100,000 lbs. capacity machine. It was then slipped over the rail by a pull on the connection rod reaching to the other machine which measured the amount of the pull required to slip the wheel on the rail.

In loading the wheel, the pressure was applied through a plate resting on two rollers. In this way the friction, except that between the wheel and the rail, was reduced to practically nothing.

For the spinning motion, the bearing plate above the rollers was made convex and the bottom plate resting on the top of the wheel was made concave; both surfaces being concentric with the tread of the wheel. A pull on the wheel, therefore, caused it to roll under the bearing plate as though it were revolving on its own center. The arrangement of this is clearly shown in the diagram.

The force required to move the wheel on the rail was weighed by a bell crank with a knife edge bearing, resting on a heavy casting attached to the bed plate of the small testing machine. The vertical arm was attached to the pull rod and the end of the horizontal arm had a bearing on a wedge or knife edge that was forced down by the platen of the machine.

The wheel section was placed in position on the rail and weighted with a predetermined load. Pressure was then applied to the wedge on the small machine. This pressure was transferred through the bell crank as a pull on the connecting rod. When slipping occurred, the event was marked instantly by the drop of the beam of the small machine. The movement of the wheel over the rail usually amounted to about 1/8 in. As the object of the investigation was to determine the friction at rest no attempt was made to measure the pull after the first slip occurred. This was markedly less than that required to start the movement from a state of rest.

Separate tests were made with steel and cast-iron wheels on the old and new rails, for both the skidding and spinning motions. In loading the wheels, the weights were increased by regular increments of 2,000 lbs. up to 30,000 lbs. Three tests were made with each loading and for each condition of wheel movement. The average of the three tests in each case is given in the accompanying table.

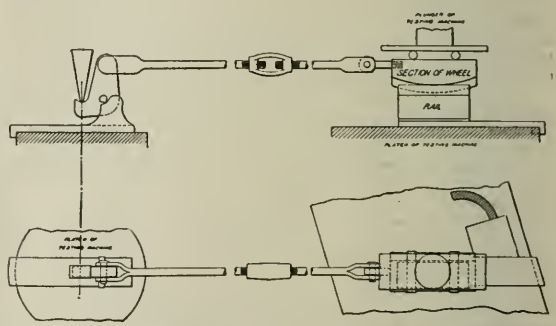
There was so little difference in the pull required to slip the wheels on the old and new rails that an average of the results obtained is given as the resistance to spinning and skidding of the two wheels on a steel rail.

Coefficients of Friction Between Wheels and Rails

Load on wheel.	Kind of motion—Spinning—Steel wheel.	Spinning—C.-I. wheel.	Skidding—Steel wheel.	Skidding—C.-I. wheel.
2,000 lbs.	.259	.243	.287	.287
4,000 "	.240	.215	.254	.259
6,000 "	.234	.208	.245	.254
8,000 "	.228	.206	.246	.242
10,000 "	.215	.204	.238	.233
12,000 "	.212	.205	.237	.223
14,000 "	.207	.199	.233	.226
16,000 "	.204	.196	.232	.219
18,000 "	.204	.198	.231	.219
20,000 "	.201	.194	.236	.220
22,000 "	.205	.191	.238	.223
24,000 "	.204	.192	.235	.224
26,000 "	.205	.189	.232	.223
28,000 "	.203	.186	.236	.217
30,000 "	.203	.183	.234	.214

The table shows that the resistance to spinning of the steel wheel is somewhat greater than that of the cast-iron wheel, a fact which is brought out quite forcibly by the coefficients of friction, in which the coefficient of the steel wheel is invariably higher than that of the cast-iron.

It also appears from this table, that the coefficient of friction of the steel wheel decreases as the load is increased, up to a pressure of about 15,000 lbs., after which it is practically constant. The coefficient of friction of the cast-iron wheel decreases rather rapidly, like that of the steel wheel, up to a load of 15,000 lbs., after which it falls away slowly, though a tendency to decrease with the increase of load is manifest.



Arrangement of Apparatus to Test the Frictional Resistance of Car Wheels to Skidding.

As regards skidding, the values of the coefficients of the two wheels bear the same relation to each other as they do for spinning. The coefficient of resistance is greater for the steel wheel than for the cast-iron wheel; and there is the same falling off in the value of the coefficient as the load is increased up to about 15,000 lbs. after which that of the steel wheel is nearly constant, while that of the cast-iron wheel continues to fall away slowly. It would be difficult to explain these phenomena without the data obtained in the investigations previously described, made to determine the area of contact between the wheel and the rail, and the relative rate of abrasion of the steel and cast-iron wheels on the emery wheel. The results of those investigations also serve to explain why the coefficient for a skidding wheel is higher than the coefficient for a wheel that is spinning.

In the case of the cast-iron wheel, it was shown in the preceding chapter that the imposition of a heavy load caused a breaking down of the metal in the rail at a certain point, while no such failure occurred with the steel wheel under the same load. The cast-iron wheel being rigid, inelastic and incompressible on the tread, was forced down into the metal of the rail, causing the rail to do all of the yielding needed to produce the area of contact obtained; with the result that it was soon compressed beyond its elastic limit and given a permanent set. The steel wheel yielded as well as the rail, thus relieving the rail of a part of its compression and increasing the area of contact. This behavior of the two wheels explains, in part, the results obtained in these tests. In addition, it must be remembered that the normal coefficient of friction is greater between steel and steel, than it is between cast-iron and steel.

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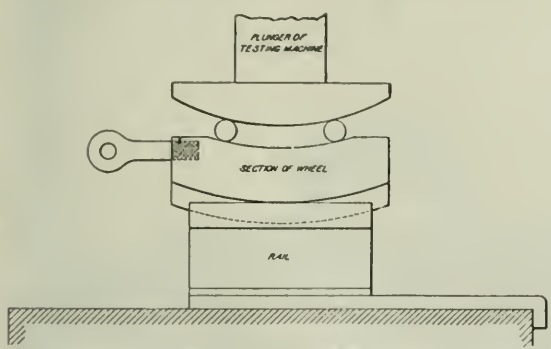
When the cast-iron wheel is loaded on the rail, it indents the rail in proportion to the pressure applied, without being distorted itself. If, then, it is turned, as by a motor, it simply revolves in the concave depression in the rail, without undergoing any deformation itself and with no resistance other than that of overcoming the friction between the surfaces of the wheel and rail. The steel wheel, on the other hand, is itself compressed, as well as the rail, so that when it is turned a continuous progressive compression of the tread is set up, equal to the amount of the original compression. Hence, the resistance to turning will be equal to the frictional resistance plus that set up by this compression.

It was shown that the cast-iron wheel was cut away much more rapidly under the emery wheel than were the steel tires and wheels. In the tests for skidding, the loads were successively applied without readjusting the wheel on the rail, with the result that the steel wheel was skidded about 1¼ in. and the cast-iron wheel about 1 in. This was done under loads increasing from 2,000 lbs. up to 30,000 lbs. Under this treatment, the steel wheel developed a slid flat spot about 7/16 in. long, and the cast-iron wheel a spot about ⅞ in. long. In both cases the rail was spotted and the metal was rolled up in folds, indicating the direction of the motion of the wheel. The piece of rail used with the steel wheel was spotted for a distance of about 1¾ in. while the piece used with the cast-iron wheel was spotted for a length of about 1½ in. This abrasion of the cast-iron wheel probably accounts for the lower resistance to skidding as compared with the steel wheel. For the same weight and for the same distance of skidding, the amount of metal abraded from the cast-iron wheel was in almost exactly the same ratio to that removed from the steel wheel, as is shown in the diagram of abrasion tests.

It will be remembered that, for the lower wheel loads, the



Arrangement of Apparatus for Testing the Frictional Resistance of Car Wheels to Spinning.

investigation of contact areas showed that there was comparatively little difference between the areas obtained with cast-iron wheels and with steel wheels, and that it was inferred that the total compression of the metal was approximately the same in both cases. Under these circumstances it would be expected that, if the power required to distort the metal of a steel rail and tire were the same, the resistance to skidding of the steel wheel and the cast-iron wheel would also be the same. But, owing to the more rapid abrasion of the cast-iron wheel, as soon as it begins to skid it wears, and, by thus increasing the area of contact, it lessens the depression of the rail, decreases the amount of metal to be distorted, lowers the resistance to the motion, and makes the coefficient of friction of skidding less on the cast-iron wheel than on the steel wheel.

This depression of the rail due to the imposition of the wheel load accounts for the higher coefficient of friction obtained with a skidding wheel than with a spinning wheel. With a wheel spinning, there is no continuous deformation of the metal of the rail to be affected. In skidding, there is a depression of the rail to be carried forward like a wave, which naturally raises the resistance and makes the coefficient greater than where slipping over one spot alone takes place.

While it is not safe to draw rigid conclusions from the limited amount of data obtained, it does appear that inasmuch as the steel wheel offers greater resistance to spinning it is better adapted for use as the driving wheel of an electric car than the cast-iron wheel; and further, its higher coefficient of friction renders it less liable to skidding.

This matter of wheels skidding, with the consequent development of flat spots on the tread, was considered of enough importance to warrant further investigation.

It has been noted by many other investigators that steel wheels do not flatten as readily as cast iron wheels. By some this is attributed to the fact that small flat spots, once formed on the tread of a steel wheel may be rolled out, whereas they have a tendency to grow larger on cast iron wheels. The abrasion and skidding tests which have been made seem to show, however, that it is the lower resistance to grinding of the cast-iron wheel that accounts for the more rapid development of these flat spots.

To briefly recapitulate, these tests showed that the rate of grinding of the first ⅛ in. below the tread was about 4.64 times as fast in the cast-iron wheel as in the Schoen steel wheel. For the second ⅛ in. the ratio became 6.37, and for the third ⅛ in., 15.93, showing the rapid decrease of wearing resistance of the cast-iron wheel below the surface. In the skidding tests in the laboratory, the effects were confined to the metal close to the surface and it was found that, with the same amount of skidding, the amount of metal removed was about 5.12 times as great on the cast-iron wheel as on the steel wheel. A further check on these figures was afterwards obtained by taking the time required to remove approximately the same amount of material from the treads of cast-iron and steel wheels in a wheel grinding machine. It was found that it took from four to five times as long to grind down the steel wheels as it did to grind the cast-iron wheels. In all of the foregoing investigations, the metal of the wheel under test was kept cool, either by a stream of water or by doing the work so slowly that natural radiation counteracted the tendency to heat and the temperature of the metal was not raised above 100 deg. Fahr.

For the purpose of ascertaining whether the results of these investigations were comparable with the results obtained in actual railroad service, when the wheels were locked and skidded under a car, series of tests were made by skidding the wheels under a loaded car.

Through the courtesy of the New York, Ontario & Western a piece of track and a suitable box car were supplied for the tests. One pair of wheels and axle were removed from under the car, and replaced by an axle on which a Schoen steel wheel and a new cast-iron wheel had been pressed. These wheels were 33¼ in. and 33 in. in diameter, respectively. This pair of wheels was placed at the end of the car, and was fitted with two brake-beams, so that twice the usual brake-shoe pressure could be applied on the wheels. By this means, the wheels could be held in a fixed position throughout a run. But it was more difficult to hold the wheels at low speed than at high speed.

The car was loaded until the weight on the pair of wheels to be tested was exactly 24,000 lbs. The car was then hauled back and forth over a piece of track 1,850 ft. long. The brake was set and the wheels skidded for the whole distance. The car was hauled at two speeds, namely, three and 12 miles an hour.

When the car was hauled at a speed of three miles an hour, flat spots were made on the steel wheel in area about .30 in., while the spots formed on the cast-iron wheel were in area .80 in. These areas correspond to diameters of about ⅝ in. and 1 in. respectively, though the spots on the cast-iron wheel were elongated to about 1⅛ in., which indicated somewhat more metal removed. The volume of metal abraded from the cast-iron wheel was about 5¾ times greater than that from the steel wheel.

While the movement was slow the wheels remained cool. But when the speed was increased to 12 miles an hour, heating took place and the cutting was more rapid on the steel wheel.

For the first 1,850 ft. run the areas of the flat spots produced at a speed of 12 miles an hour averaged 8.125 sq. in. on the steel wheel and 4.445 sq. in. on the cast-iron wheel. The estimated amount of metal worn away was 4.63 times as much with the steel wheel as with the cast-iron wheel.

When the skidding was continued the rate of wear increased very rapidly with the cast-iron wheel, while there was little increase with the steel wheel. At the end of the run of 3,700 ft., the area of the flat spot on the steel wheel was 8.43 sq. in., an increase of .305 sq. in., while the area of the spot on the cast-iron wheel was 5.72 sq. in., an increase of 1.275 sq. in. From this it appears that the cast-iron wheel wore away more rapidly than the steel wheel after the hard surface metal had been broken through.

The indications are that in skidding a short distance at low speed a cast-iron wheel is more apt to develop a flat spot than is a steel wheel. On the other hand, if the skidding continues for some distance at a high speed, the wheel becomes heated and then the steel wheel is the first to yield, unless the surface chill of the cast-iron wheel has already been worn through.

The General Manager of the Swedish State Railroads, Sahlin, has resigned, and will retire at the end of the year. He had held the position only two years, during which the system of administration of the State Railroads was greatly changed. He is to be succeeded by F. W. H. Pegelow, who is now manager of a private railroad, but has been in the State Railroad service before. Sahlin had a legal education and his career has been in the government service, being telegraph manager when appointed railroad manager.

Pegelow is an engineer, and was for a long time locomotive superintendent of the State Railroads. He was for several years a member of Parliament. As Assistant General Manager V. Klemming has been appointed. He has been at the head of the State Railroad department of locomotives and shops, and is widely known on the continent as a mechanical engineer.

The Bush Terminal Company.

The cost of moving freight long distances has been steadily decreasing for many years, larger ships, locomotives and cars having cheapened the cost per ton of long-haul transportation. Methods of handling freight for short distances have not, however, been much improved. Labor costs more now than before and so the cost of cartage is higher than ever. The ideal terminal aims to do away with as much hand labor as possible. Freight is carried by land or water to a terminal; it is then unloaded and left in store until the consignee wants it. When that time comes, the consignee may have it carted direct from the storehouse to destination, which, as far as he is concerned, is his stock-room or any other point from which he delivers goods to the final purchaser. On the other hand, he may decide to reship the goods; in either case some one has to pay the cost of carrying them from the railroad or steamship terminal to the storehouse and from the storehouse to some other place. To avoid as much as possible this expensive handling, the terminal should provide in itself receiving facilities, storage room and shipping facilities. To perform these three functions is more and more difficult the larger the city which the terminal serves. In a small town reached by one railroad there is no problem. When a competing railroad builds through the other end of the town there results on a small scale, all the difficulty which large cities have to deal with. Some of the big interior cities have built union terminals having direct rail connection with all roads entering the city. Cupples Station, at St. Louis, is perhaps the best known example. This terminal consists of a system of warehouses each served by a spur track, the different merchants being tenants of the warehouses. A car is run into the proper building and lifted on an elevator to the floor where the consignee has storage room and there unloaded. If the freight is to be reshipped out of the city by railroad an empty car is brought up to the door and reloaded so that the whole process requires only two handlings of the freight.

Such a terminal is impossible in New York City. There is no spot where a terminal could be erected with all-rail connection with every railroad except at such enormous outlay of capital as to be prohibitive. Most of the railroads reaching the city have individual rail terminals on the west shore of the upper bay and freight terminals on the water front in Manhattan. Cars are carried to the freight terminals on car floats and there unloaded. The freight goes into storage, sometimes being carried on drays for long distances through congested streets, and when it is removed from the storehouse has to be carried in the same slow and expensive manner to another terminal or to destination.

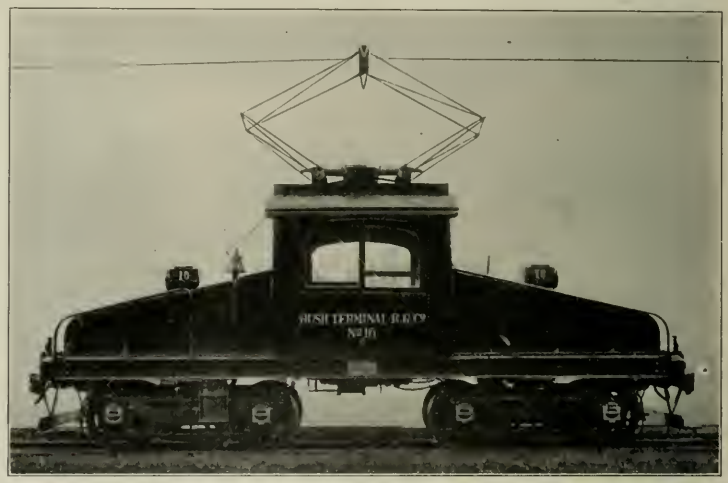
The Bush Terminal is in South Brooklyn on the east shore of the upper bay. It does three distinct kinds of business, but the operation of each of them is made more efficient by the proximity of the others. It is designed to decrease the cost of local handling by the economies possible through concentrating the different stages. It is a deepwater terminal for freight steamships. It stores freight and it operates a terminal railroad.

The company acts as terminal agent for the following roads: The Baltimore & Ohio, the Central of New Jersey, the Delaware, Lackawanna & Western, the Erie, the Lehigh Valley, the New York Central & Hudson River, the New York, Ontario & Western, and the West Shore. On lighterage business it is paid so much per ton, while on yard business it is paid various rates according to the classification of different kinds of freight. The net earnings from this business are comparatively small.

The Pennsylvania Railroad, in conjunction with the Long Island, will have its own complete system of terminals, but when the yard improvements of the Long Island at 65th street are finished, the Bush Terminal Railroad will connect with it and in that way, through the New York Connecting Railroad, have direct rail connection with New England roads.

For the accommodation of freight steamships, the company has six covered piers now, and is planning a seventh. These piers are all of the same general design. They are 1,340 ft. long and 150 ft. broad, with 270 ft. water space between piers. They are built on piles within which crib work is built, and the enclosed space filled with sand dredged in making the channel and deep water along the side. The framework is iron and is covered with wood. The system of fire protection is by sprinklers installed on the piers, though it is more carefully worked out in the warehouses. The piers are leased to steamship companies, and have been partitioned off according to the needs of the lessees, since often one company does not need the whole of the pier but only enough of its length to accommodate one or two boats. As the accompanying plan shows, each division of a pier is served by a separate spur track, which runs along the north side of the pier with a switch opening into each division. The partitions are of corrugated iron, and the openings in the partitions can be closed by a metal curtain in case of fire. The most northerly pier, No. 7, is to be remodeled, and pier No. 1 will be built soon.

The freight storing facilities are of three kinds. The most interesting are the lofts, which, as shown in the accompanying plan, are on Second avenue north of 37th street. So far two have been built and work is under way on the third. The first two lofts are entirely occupied and half of the space in the third has been contracted for by tenants; the rest is mostly under consideration. While these lofts may be used as factories, most tenants use their space as stock-rooms. Each building is six stories high and has 300,000 sq. ft. of floor space. Electric current for light and power is delivered to the lofts at 220 volts pressure. Steam for heating, and power in case the tenants install steam engines, is carried from the terminal company's power house in 12 in. x 8 in. mains. It is



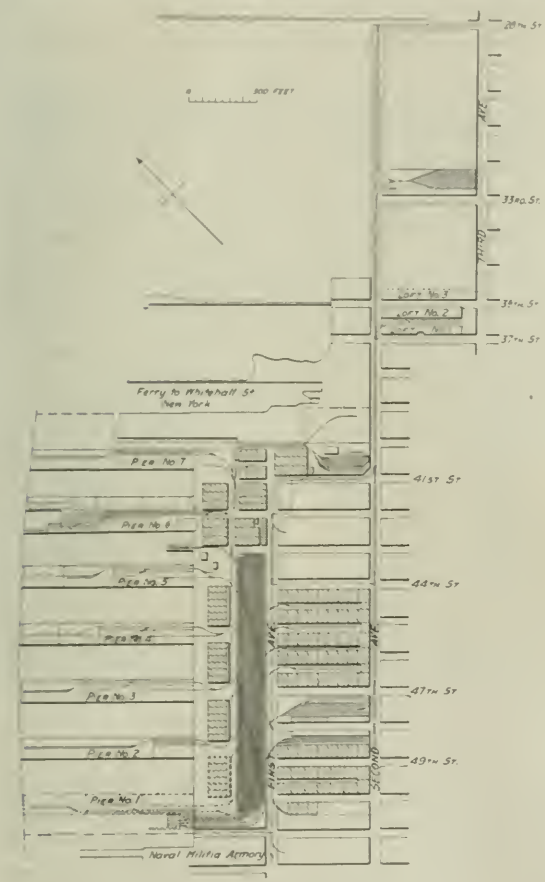
Electric Switching Locomotive; Bush Terminal Railroad.

delivered to each floor at 110 lbs. pressure. In each building are four electric elevators of three tons capacity. These buildings are also equipped with sprinklers. A shipping platform extends along the entire length, 600 ft., on one side of each building. When a freight car comes alongside, the floor of the car is on a level with this platform. On the other side of the building is a similar platform or doors to which the trucks come. All the space in the first two factories has been rented to tenants, who use the space either for storage or for manufacturing purposes. The company plans 18 buildings like these, which will take up all the space from 37th to 28th streets. They are being built at the rate of about one a year.

Directly behind the piers are 62 of the warehouses; these particular structures are for high grade freight. Each is six stories high, some are of mill construction and others are of reinforced concrete. The brick buildings are fireproof so far as such structures can be, and there is an automatic sprinkling system in each warehouse, so that the insurance rates are exceptionally low. A portable electric hoisting machine is used for slinging bales and cases up to the upper floors of these buildings. Behind this group of warehouses is the main yard, which has a capacity for 1,000 standard freight cars. As can be seen on the plan, tracks from the yard run behind each block of warehouses for loading, others run down to the factories, and a line of tracks runs to the present car-float transfer bridge between piers 5 and 6. A four-track transfer bridge is to be built, as indicated, just south of the proposed pier No. 1. About 200 cars a day are handled on the car floats. Behind the main yard are the rest of the 131 warehouses; these are for low grade traffic, mostly cotton, and are one-story structures. Concrete roadways run between every two blocks of

the houses for the use of trucks. Very little of the higher grade freight is distributed to destination or brought from destination by other means than railroad. One of the secondary freight yards is between 47th and 48th streets. This is used for local and less than car load business. The yard between 41st and 40th streets is a transfer yard only. Between 32d and 33d streets another local freight yard is being built. The freight house at this point is finished but will be used for storing construction material until the yard is in operation.

The company owns three tugs, five car floats, four covered lighters, three open lighters and two steam lighters. It has five steam locomotives and two electric locomotives. The first electric locomotive was built by the General Electric Company about three years ago. The second has just been finished by the General Electric Company and the American Locomotive Company jointly. The accompanying photograph shows this engine. The truck construction differs from that ordinarily used for electric motor trucks. It follows rather a type which has been used with success for tender



Plan of the Bush Terminal.

and leading trucks of steam locomotives. The bolsters are carried rigidly on the side frames, and the weight of the frame and bolster is transmitted to the equalizers through one semi-elliptic spring on each side instead of through bolster springs and helical side springs, as in the M. C. B. equalized truck. The driving axles are 6 in. in diameter and are of forged steel, with 36-in. fused steel-tired wheels. Each truck is equipped with two GE-55-A (90 h.p.) two-turn motors, with a gear ratio of 52 to 21. These motors with this gearing will give at their one hour rating a tractive effort of 3,000 lbs. per motor, or 12,000 lbs. per locomotive, at a speed of about 18 miles an hour.

The cab is built of sheet steel, supported by a framework of small angles. There is a main operating cab and sloping end cabs, with narrow side platforms extending from the main cab to the ends of the locomotive. The floor of the locomotive is 3/8-in. sheet steel, but in the main operating cab this is covered with a 3/4-in. wood flooring. The arrangement of apparatus in the cab is shown in another photograph. The locomotive is equipped for both straight and automatic air. In the center of the main cab is a Cp 25 air compressor having a capacity of 56 cu. ft. per minute. In the operating engineer's corner is located a U 6 master controller and the valves and handles for operating the combined straight and automatic air. In the end cabs are a sand box, air drum, contactors and rheostats. As the locomotive is to be used solely for switching service, it has a pantagraph trolley instead of the ordinary wheel trolley which has to be swung around when the direction of the engine is reversed.

The locomotive is equipped with bell, whistle and headlights. The headlights have 32 c.p. incandescent lamps, and lamps for illuminating gages are wired on the headlight circuit and controlled with the same switches. The locomotive is 29 ft. long over bumpers, 11 ft. 9 in. high over cab, the rigid wheel base is 6 ft. 6 in. long and the weight on drivers is 80,000 lbs.

M. H. Smith on Excess of Traffic Over Facilities in Alabama.*

Although the interests of the shipper and consignee seem to be identical, the two do not always co-operate. To illustrate, a lumber manufacturer ships to a customer, possibly a commission merchant, a car which is not unloaded, and for that reason the manufacturer is unable to secure additional cars and is oftentimes greatly embarrassed and suffers a heavy loss. This is no way seems to concern the party at fault, although he may be directly affected by the failure of the milliman to secure cars in which to make additional shipments. In cases where the shipper and consignee are the same, as in the case of a shipment of ore, limestone, coal or coke to a furnace, the carrier is in a position to enforce the prompt unloading because, if the owner fails to promptly unload, he does not secure cars in which to load additional material. This brings operations to a standstill, and he will, therefore, arrange to promptly unload the cars.

As an illustration of the difficulties under which the carrier labors, take the conditions that existed last winter at Mobile, which is a large export shipping port, especially of lumber. If lumber is sold for export to be reshipped at a somewhat indefinite date, depending upon the arrival of a vessel, the consignee, to avoid the expense of unloading and storing, desires to keep the property on cars until the vessel arrives. The accumulation during the month of July and August, 1906, was very great. This was aggravated by the storm in September, 1906, and conditions became desperate. The facilities of the Louisville & Nashville were so overtaxed that it became almost impossible to place cars to be unloaded for consignees who were prepared to promptly unload, and, in fact, the movement of through freight traffic was seriously interfered with and threatened with paralysis or stoppage. At the same time, the manufacturers of lumber were in great distress because of the inability of the company to furnish cars for other shipments, not only to Mobile, but to all other points.

A statement was prepared showing the numbers of the loaded cars on hand at 7 o'clock a.m. December 15, 1906, and the length of time they had been on hand. It was found that of the total of 193 cars of lumber, 52 had been on hand prior to December 1, 1906, some of which were received in October, or had been on hand 52 days. Of all classes of property, there were 524 carloads that had been held from 3 to 60 days. On December 29, 1906, another check was made of loaded cars that had been on hand December 15, 1906, which showed that 33 of such cars were still on hand undelivered. To relieve the situation, the management was compelled to adopt arbitrary measures—temporarily stop the shipment of some classes of property to Mobile, and, in some cases, to unload and store oil cake and lumber. During all this time, many shippers, especially manufacturers of lumber, were in distress because they could not get cars.

The conditions that have prevailed at Mobile are typical of those over the entire Louisville & Nashville system. The business of many consignees has outgrown their facilities for promptly receiving and handling all of the property the increased business requires, and thus renders it difficult for them to promptly relieve the cars.

The reasonableness of making a just and lawful charge for the storage of property in cars which the consignee fails to promptly unload is so manifestly in the interest, not only of the carrier, but of its patrons, that it is conceded—is not denied.

Let us now consider the relations between common carriers and shippers. It is the duty of a common carrier to transport property to the extent of its facilities, for all who may desire to have property transported, upon equal terms. It must provide facilities for receiving, caring for, and forwarding property to destination. When, by the terms of the transportation contract, the shipper is to load the property, cars must be furnished to enable him to do so; but

*From a statement to the committee of the Alabama legislature on Commerce and Common Carriers, in regard to reciprocal demurrage.

a carrier can only be equitably, and, I think, lawfully required to provide facilities for normal traffic—cannot be required or compelled to furnish facilities beyond its ability or capacity. A carrier having equipped himself with a vehicle moved by one horse for the movement of a limited traffic, cannot be required to handle traffic requiring a vehicle moved by four horses. A railroad constructed and equipped for handling a limited local traffic, with a single track, adverse grades and curves, cannot be required to furnish two, four, or more tracks, or the facilities furnished by railroads in some parts of the country operating four, and sometimes eight tracks, over grades where a single locomotive may move 3,000 tons against a load on the inferior single-track road of 300 tons.

Take the South & North Alabama Railroad as an illustration. It is a road originally built with limited capital, through a rugged country, across drainage, and when opened for traffic there was not a community of 100 persons on the line between Montgomery and Decatur. The alinement is crooked and the grades excessive, equivalent to more than 80 ft. to the mile. The heaviest locomotive in use, having a tractive power of 35,000 lbs., can move but 740 train tons.

A double track has been built from Black Creek to Oxmoor, a distance of 14.6 miles, from Decatur to Flint, 5.4 miles, from Calera to Hardy, 12.6 miles, and numerous passing tracks have been created. In addition, large expenditures have been made to provide increased terminal facilities at Decatur, Birmingham, (Boyles), Montgomery, etc. Nevertheless, the traffic now pressing is greater than can be moved, and if the present volume of traffic is to be continued and increase, it will be necessary to reconstruct the line, reduce grades and curvature, lay second tracks, increase the equipment, and construct shops and other facilities. The cost will be very great. The work of reducing grades and laying second track between Oxmoor, Ala., and Hardy, 14.41 miles, has been begun, at an estimated cost of $1,010,500. I roughly estimate that to reduce grades and curvature, and build second track over the entire line, Montgomery to Decatur, with the necessary increase in equipment, shops and terminal facilities, will cost not less than $15,000,000, and, under existing conditions, the work could not be completed in less than five years. Under the existing financial conditions, the money cannot be provided, and after the expenditure of the money already provided, and the work undertaken is completed, the remainder of the work cannot be entered upon unless there is a favorable change in financial conditions. At the present time, neither the South & North Alabama, nor the Louisville & Nashville can obtain the capital necessary to prosecute the work. It therefore follows that in this case the carrier must restrict its traffic to existing facilities; that is, must refuse to undertake to move traffic in excess of its facilities.

Foreign Railroad Notes.

A Russian company engaged in fishing on the Pacific coast asks for special car-load rates on salted herrings over the Siberian Railroad to Russian stations, where they will compete with herrings from the Caspian Sea.

The Province of Buenos Aires, Argentina, has authorized the government to contract with the firm of Otto Bemberg & Company to build a considerable mileage of railroad having its outlet at the port of La Plata, which is on the estuary of that name some 40 miles southeast of the city of Buenos Aires.

The Swiss seem to be a deliberate people. For some time there has been a great deal of discussion of plans to make an outlet to their railroads through the Eastern Alps. Now the general management of the State Railroads reports to the Parliament that to examine these plans and come to a conclusion will take eight years.

The Chinese are contemplating the building of a railroad from Hankow, the river terminus of the long railroad from Pekin southward, westward to a point on the Yang-tse-Kiang above the rapids which interpose between long stretches of navigable stream above and below. A preliminary survey of the most difficult part of the line has been made by Chinese engineers, assisted, or perhaps superintended, by some Japanese—which is an event in the history of China.

France also has its train robbery, with the latest modern improvement, namely, an automobile to escape on. The robbers, three in number, took a first class compartment, made their way on the foot-board of the cars to the baggage car, in which two mail agents had charge of money packages, wounded both of them with pistol shots, and threw out the money packages. The wounded agents succeeded in pulling the cord which signalled the engineman to stop; but when the train slowed down the robbers jumped out. Accomplices had picked up the money and followed the train on an automobile, the track there being alongside the highway, and it picked up the men when they left the train and rushed away without observing the legal speed limit.

Cylinders of Simple and Compound Locomotives of Equivalent Power.

The following table has been compiled and put into practice for proportioning the diameters of the cylinders of two and four-cylinder compound locomotives when designing them to generate a power equivalent to that of a given size of simple cylinder and of the same piston stroke.

It will be noticed that in the earlier list adopted in 1897, at the time when compound locomotives were being pushed to the front most strenuously, the average ratio of area of the simple cylinders and the high-pressure cylinders of the compound locomotives was 1 to 1.17 and 1.026 for two-cylinder and four-cylinder engines respectively. This has been found to be too low in practice with the result that new ratios of 1.25 for the two-cylinder and 1.10 for the four-cylinder have been proposed and are in use. The table gives the area of the simple cylinders from 12 in. to 22 in. in diameter with the corresponding diameters and areas of the high-pressure cylinders of the compound locomotives. In the case of the four-cylinder machines the area given is that of the sum of the two high-pressure cylinders.

Table Showing Actual and Relative Areas of Simple and of Two-Cylinder and Four-Cylinder Compound Locomotives.

Simple.			Sizes of compound cylinders, according to list in effect on and after July 20th, 1897. 2-cylinder compound.			4-cylinder compound.			Proposed sizes of compound cylinders— 2-cyl. compound; Ratio, 1.25.		4-cyl. compound; Ratio, 1.10.	
Diam.	Area.	Ratio.	Diam.	Area.	Ratio.	Diam.	Area.	Ratio.	Nearest diam.	Area.	Nearest diam.	Area.
12 in.	113.098	1.00	13 in.	132,733	1.17	8½ in.	113,490	1.00	13⅜ in.	140,501	8⅝ in.	123,725
13 "	132,733	1.00	14 "	153,938	1.16	9½ "	141,764	1.07	14½ "	165,130	9⅝ "	145,510
14 "	153,938	1.00	15 "	176,715	1.15	10 "	157,080	1.02	15⅝ "	191,748	10⅝ "	169,082
15 "	176,715	1.00	16 "	201,062	1.14	10½ "	173,180	.98	16¾ "	220,354	11⅛ "	194,411
16 "	201,062	1.00	17 "	226,981	1.13	11½ "	207,738	1.04	17⅞ "	250,948	11⅞ "	221,507
17 "	226,981	1.00	18½ to	268,803	1.18	12 "	226,196	1.00	19 "	283,529	12⅝ "	250,370
18 "	254,470	1.00	19½ "	298,648	1.17	13 "	265,466	1.04	20⅛ "	318,099	13⅜ "	281,002
19 "	283,529	1.00	20½ "	330,064	1.16	13½ "	286,278	1.01	21¼ "	354,657	14⅛ "	313,400
20 "	314,160	1.00	22 "	380,134	1.21	14½ "	330,260	1.05	22⅝ "	393,203	14⅞ "	347,564
21 "	346,361	1.00	23 "	415,477	1.20	15 "	353,435	1.02	23½ "	433,737	15⅝ "	383,496
22 "	380,134	1.00	24 "	452,390	1.19	16 "	402,124	1.06	24⅝ "	476,259	16⅜ "	421,196
Average					1.17			1.026				

Winter Wheat Crop.

The Crop Reporting Board of the Bureau of Statistics of the Department of Agriculture finds, from the reports of the correspondents and agents of the bureau, as follows: The newly seeded area of winter wheat is estimated as being 1.9 per cent. less than the area sown in the fall of 1906—equivalent to a decrease of 596,000 acres and a total acreage of 31,069,000. The condition of winter wheat on Dec. 1 was 91.1 as compared with 94.1 on December 1, 1906, 94.1 at the corresponding date in 1905, and a 10-year average of 93.0.

The following table shows for each of the principal states the percentage of acreage sown to winter wheat this fall as compared with that sown last year, the estimated acreage sown this fall, the average of condition on Dec. 1 of the present year, the corresponding average for 1906, and the mean of the December averages for 10 years:

States.	Acreage compared with last year.	Acres, 1907 '08, preliminary.	Avg. condit'n Dec. 1 1907.	1906.	10-year average.
Kansas	100	5,930,000	95	95	95
Indiana	100	2,779,000	91	95	90
Missouri	98	2,271,000	93	91	92
Ohio	96	2,126,000	84	97	94
Nebraska	105	2,359,000	93	98	88
Illinois	101	2,781,000	91	94	94
Pennsylvania	98	1,626,000	86	98	94
California	91	1,519,000	88	90	94
Oklahoma	95	1,379,000	94	93	93
Texas	78	988,000	93	94	93
Michigan	93	806,000	87	89	94
United States	98.1	31,069,000	91.1	94.1	93.0

GENERAL NEWS SECTION

NOTES.

On the El Paso & Southwestern an order has been issued for bidding the running of locomotives backward at night. Yard engines are excepted

The United States District Court for the Eastern district of Virginia has held that to make a ticket non-transferable, when the fact of non-transferability has not been shown in the tariff, is illegal

The Nebraska State Railroad Commission, acting on the complaint of the National Refining Company of Omaha and others, has voted to order the railroads to make a reduction of 30 per cent. in the rates for the transportation of oil

The Ontario Railway and Municipal Board, after repeated tests, has approved Quinn's automatic emergency air-brake and fender for electric cars, a device which, when any obstruction is touched, causes the fender to be lowered and the air-brakes applied.

A press despatch from Oklahoma City says that the railroads of Oklahoma will provide separate cars for negroes February 4, borrowing the necessary cars from their lines in other states. Separate acommodations are now being provided at the stations, but, according to the press despatch, "the two races are not compelled to separate."

The Committee on Car Efficiency of the American Railway Association, Arthur Hale, Chairman, has issued Bulletin No. 11, showing surpluses and shortages of freight cars November 13 and November 27. The shortages amounted to 57,000 on the earlier date and to 18,000 on the later date, indicating that the shortages (aggregating 90,000) which were reported October 30 have been nearly wiped out. The surpluses November 27 amounted to 40,000.

It is announced that early in January the New York, New Haven & Hartford will establish a freight steamship line between New York and Boston direct, putting on the line three new vessels, the Massachusetts, the Old Colony and the Bunker Hill. Boats will leave either city three times a week, starting at 5 p. m., and reaching destination at 1 p. m. the next day. These vessels are capable of making 20 knots an hour and are said to be faster than any other freight steamers in American waters.

It is again reported that the state of North Carolina and the railroads (except the Atlantic Coast Line) have agreed on a uniform basis of passenger rates and that Governor Glenn will call a special session of the Legislature. Governor Glenn says that the Legislatures of other states will probably be called together. This latest agreement is said to be based on the adoption by the railroads of a general rate on all passenger business, interstate and intrastate, of 2½ cents; 2,000-mile books to be furnished for the use of firms and their employees to the number of five persons at flat 2 cents a mile, interstate and interchangeable; 2,000-mile books for family use, a number unlimited, at 2 cents a mile, with 500-mile family books at 2¼ cents.

Congress is in session now and nearly everybody who wants to have anything done puts his desires in the shape of a proposition to enact a law. No branch of the Aduliam Club has yet been established in Washington, but there would seem to be a good field for one. The Texas cattle shippers have asked Congress to compel the railroads to furnish an adequate supply of stock cars. Judge Cowan, of Texas, has told President Roosevelt that Congress should declare the present railroad rates of the country the maximum legal rates, to be increased only on authority of the Interstate Commerce Commission. Evidently regarding this a mild measure, the Judge proposes also that the National Legislature shall compel the railroads to give adequate service. One Congressman has introduced a bill to require railroads to install automatic stops at "selected points" along all of their lines where the speed of trains is more than 30 miles an hour. Other Members of Congress have been asked by certain alleged locomotive engineers to provide for federal inspection of locomotives. Commissioner Lane favors a law empowering the Interstate Commerce Commission to summarily suspend any tariff increasing rates, if shippers complain; the old rates to remain in effect until the proposed increase can be investigated.

New York Railroad Club Entertainment.

On December 20, the New York Railroad Club instead of its usual program devoted the evening to a smoker and vaudeville entertainment at its usual meeting place, the Engineering Societies Building. The affair, which was the first of its kind which the club had given for 30 years, was a great success. More than two-thirds of the 1,400 members of the club were present. The entertainment committee succeeded in getting for the vaudeville especially satisfactory teams, all men, from theatres in and near New York. There were half a dozen numbers and the performers caught the crowd and amused them from the very first. After the vaudeville the club members spent the rest of the evening in the banquet hall, where refreshments were served.

Trains Under the Hudson River March 7.

The Hudson & Manhattan Railroad Company has asked for a two months' extension of time in which to begin the operation of its railroad under the Hudson river, between Manhattan and Jersey City, and the same has been granted by the New York State Public Service Commission. The company was required to operate its line under the river by January 7. In its application the company said:

"We are prepared to operate, as required by the franchise of the New York & Jersey Railroad Company, on or before the 7th day of January, 1908, that portion of the line extending from the center of the Hudson river to Christopher and Greenwich streets, but we do not believe that such operation would be of advantage to the public. If the time for such operation be extended to the 7th day of March, 1908, we shall be prepared to operate a through line from Hoboken to 14th street and Sixth avenue. We believe that the interests of the public will be better conserved by an extension of the time for 60 days. At all times the work has been prosecuted in good faith and with all possible diligence. The completion has been delayed by unexpected obstacles and natural causes beyond our control."

The Cement Products Exhibition.

The Cement Products Exhibition Company held its first exhibition in the Coliseum, Chicago, Dec. 17 to 21 inclusive. It was a success from every standpoint. All available space in the main section of the Coliseum was taken, and the attendance far exceeded expectations. The Northwestern Cement Products Association held its convention in conjunction with the exhibition, using the annex to the Coliseum for a meeting hall.

The total number of exhibitors at the exposition was 105. Among them were the following:

Allis-Chalmers Co., Milwaukee, Wis.
American Steel & Wire Co., Chicago.
American System of Reinforcing, Chicago.
Condron & Sinks Co., Chicago.
Expanded Metal & Corrugated Bar Co., St. Louis, Mo.
General Electric Co., New York.
Robert W. Hunt & Co., Chicago.
Inland Steel Co., Chicago.
Arthur Koppel Co., New York.
Lansing Wheelbarrow Co., Lansing, Mich.
McKelvey Machinery Co., Chicago.
Northwestern Expanded Metal Co., Chicago.
Thos. Prosser & Son, New York.
Universal Portland Cement Co., Chicago.
Western Electric Co., Chicago.

Steel Ties.

It is an important item of news that L. P. Friestedt of Chicago has bought from James E. York the United States patent rights covering the York cross rolling processes. Mr. York's process for making steel ties out of old rail was fully described and illustrated in the *Railroad Gazette*, November 24, 1905. Neither the process nor the plant necessary for it, is costly. It is evidently applicable to merchant steel of I-beam section as well as to old rail. The difficulty with the Carnegie longitudinally rolled steel tie is, primarily, that the width of either the upper or the lower face of the tie is limited to between 7 and 8 inches, while in the cross rolling process there is no width limit whatever. Moreover, in the cross rolling process any curvature can be made in the surfaces, to the end of making a section with a spring, or resiliency, somewhat corresponding to that of a wooden tie, provided the engineer can design such a form. Still further any indentation that the engineer may design can be made for the purpose of prevention of spreading of track—similar to the office of the shoulder tie plate. The sum of it is that by this process an all-steel tie can be economically made if the engineers can design a form of tie and clips which will make the long enduring steel tie safe for high speed traffic. The experience of the Bessemer & Lake Erie with the rigid Carnegie tie seems to have demonstrated that it is safe and economical for the extremely heavy

loads and comparatively low speeds of less than 40 miles an hour permitted on that road. But the safe steel tie for high speed, and especially in frozen ballast, does not yet seem to have been developed. The remarkable energy and skill shown by Mr. Friestedt in his invention and development of the channel bar steel piling makes the new undertaking hopeful.

Pig Iron Furnaces in Dull Times.

In previous periods of business depression and reduced demand for iron, resulting in the blowing out of blast furnaces, it has been noticeable that the number of furnaces out of blast has been a much larger proportion of the whole number than the reduction of the output. But now we see that while the number of furnaces in blast fell off 27½ per cent., from 304 to 226, from Nov. 1 to Dec. 1, their weekly output fell off 31½ per cent., from 491,436 to 347,372 tons. The average capacity of furnaces in blast was 1,617 tons per week Nov. 1 and only 1,537 tons Dec. 1. The explanation is, probably, that nearly the whole plant of the country at this time consists of modern furnaces of large capacity; while in earlier periods there have been many furnaces of small capacity which could produce at a profit only when the demand was great and prices high. Now, the situation of the furnace and the nature of its products are the chief determining factors.

Transatlantic Travel.

Up to Dec. 6, all records for transatlantic travel have this year been exceeded by a wide margin, and the steerage business, incomparably the most profitable of a modern steamship company's resources, is becoming more and more phenomenal every week. The streams of immigration and of emigration are now crossing one another; the inbound rush has not abated, while the outward movement is heavier than it has ever been before, doubtless because of the slackened demand for labor. The figures are as follows:

	Westbound. Jan. 1-Dec. 6			Eastbound. Jan. 1-Dec. 6		
	1907.	1906.	Inc.	1907.	1906.	Inc.
First-class	104,649	93,391	10,658	97,158	89,742	7,416
Second-class	220,125	187,260	38,865	101,048	84,461	16,587
Third-class	1,316,369	1,151,148	165,221	483,442	315,706	167,736
Totals	1,640,543	1,425,799	214,744	681,648	489,909	191,739

Abandonment of a Street Railway Justified.

The Railroad Commission of Ohio, acting on the complaint of Bickerstaff, has refused to call to account the Steubenville, Mingo & Ohio Valley and the Steubenville & Wheeling Traction companies for ceasing to operate a part of their line over the high summit known as Altamont, between Mingo and Steubenville. Certain persons had been induced to purchase lots on Altamont by reason of the promise that an electric line service would be afforded. After the line had been built the county authorities relocated the low-level highway along the river, and the company at great expense built a new track into Mingo. The commission holds that the change was warranted. According to the press despatches, it is said in the opinion that when the state charters a road to parallel and compete with another the first road may be justified in abandoning that portion of its line which suffers by reason of the competition allowed by the state. The chief reason assigned by the commission, however, for upholding the company in its abandonment of the Altamont line is that the line is hazardous to operate. It is unnecessary to operate it as the general public is provided for by the operation of the low-grade division.

Fairbanks-Morse Motor Inspection Car.

Our attention has been called to a typographical error which appeared in the description of this car printed in the *Railroad Gazette* Dec. 6. The statement about the consumption of lubricating oil should be that the car used 1 gallon of oil in 517 miles.

Prize Awarded M. Cuenot by French Academy.

The French Academy of Sciences has awarded M. Cuenot a prize for his study of Track Deformations, which was published in serial and in book form by the *Railroad Gazette*.

INTERSTATE COMMERCE COMMISSION RULINGS.

St. Louis-Little Rock Rates Reduced.

In an opinion rendered by Commissioner Prouty, the Commission has announced its decision in the case of the Merchants' Exchange of St. Louis against the Missouri Pacific. The rates on grain and grain products from St. Louis to Little Rock and other points in Arkansas, 18 cents on wheat and its products and 15 cents on coarse grains and their products, were declared unlawful, so far as applied to grain which has been carried to St. Louis by railroad from points outside that city. The 18-cent rate is ordered reduced 5 cents and the 15-cent rate 4 cents.

Time-Limit for Presentation of Claims.

An official interpretation of the two years limitation provision of the law of June, 1906, has been made by the Interstate Commerce Commission.

"Claims filed since August 28, 1907, must have accrued within two years prior to the date when they were filed, otherwise they are barred by the statute. Claims filed on or before August 28, 1907, are not affected by the two years' limitation in the act.

"The Commission will not take jurisdiction of, or recognize its jurisdiction over any claims for reparation or damages which are barred by the statute of limitations as interpreted by the Commission; and the Commission will not recognize the right of the carrier to waive the provisions of the statute.

"Commissioner Harlan, voting in the negative on the above interpretation of the limitation of the act, desires to be recorded as holding that the limitation in this act, like the limitations in other acts, does not affect the jurisdiction of the Commission, but is a personal privilege that may be waived by defendants in proceedings before the Commission. He expressed himself also as inclined to the view that a defendant who offered to waive the bar of the statute, as to one claimant, might be required by the Commission also to waive it as to all other claimants whose claims involved the same rate or issue, in order to avoid discriminations."

TRADE CATALOGUES.

West Shore Electrification.—Bulletin No. 4546 of the General Electric Company, Schenectady, N. Y., consists of a detailed description of the electrification of the West Shore Railroad between Utica, N. Y., and Syracuse. There are a number of illustrations from photographs of cars, roadway and substations and drawings showing plans of substations and the third rail construction. An interesting feature is the comparison of train sheets before and after electrification, indicating the great increase in train movement.

Boiler, Pipe and Roof Coverings.—The Philip Carey Co., Cincinnati, Ohio, is distributing a new descriptive catalogue of its coverings. These include 85 per cent. carbonate of magnesia, 85 per cent. magnesia, normal, magnet, standard asbestos moulded, air cell and felt pipe brands of coverings; magnesia flexible cement roofing, and asbestos materials, roofing paints and cements. These different coverings are illustrated and described, the illustrations being excellent half-tone engravings from wash drawings or photographs. The book is 6 in. x 9 in., printed on calendared paper, and has 70 pages.

MANUFACTURING AND BUSINESS.

W. R. Burrows, Eastern Sales Manager of The Buda Foundry & Manufacturing Co., Harvey, Ill., has resigned to go into other business.

J. W. Ager, electrical aide in the Bureau of Yards and Docks, United States Navy, has been appointed Manager of the Southern office at Birmingham, Ala., of Muralt & Co., engineers, 114 Liberty street, New York.

Robert H. Blackall, Assistant to the General Manager of the Westinghouse Air Brake Co., Pittsburgh, Pa., has been made Manager of the Railway Supplies Department of the Pittsburgh Lamp, Brass & Glass Co., Pittsburgh, Pa.

The additions which the Boston Elevated is making to its power stations are nearly finished. The improvements are in charge of the Stone & Webster Engineering corporation, Boston, Mass., and include two new 2,700 k.w. Allis-Chalmers direct current generators.

Alfred Lovell, Consulting Engineer, 819 Harrison building, Philadelphia, Pa., in addition to the lines of work recently mentioned in this column, will make a specialty of examinations, reports on, and specifications for, power plants, shops, machinery and mechanical facilities, and also questions of operation.

The firm of Parker & Lee, 20 Broad street, New York, will be dissolved on December 31, when Ivy L. Lee takes charge of the publicity department of the Pennsylvania Railroad. The business will be continued at the same address by the new firm of Parker & Bridge, consisting of George F. Parker and Charles A. Bridge, who was Manager for the old firm.

The firm, of Manning, Hanchett & Young, Consulting, Mechanical, Civil and Electrical Engineers, has been formed with office at 237 Fulton street, New York, and 824 Equitable building, Baltimore,

Md. W. T. Manning, Mem. Am. Soc. C. E., was on the Baltimore & Ohio for many years, resigning as Chief Engineer in 1899. G. T. Hanchett has for the last ten years been a consulting engineer in New York, his previous work having been mostly electrical. He is a member of several electrical societies. W. D. Young, Mem. Am. Soc. Mech. Eng., has been Electrical Engineer of the Baltimore & Ohio since 1896.

A report prepared for the receivers of the Westinghouse Electric & Manufacturing Co., Pittsburgh, Pa., by Hasklns & Sells, public accountants, shows the following assets and liabilities:

Assets	
Property and plant	$21,518,463
Investments	10,104,453
Working assets	17,942,005
Quick assets	10,317,612
Other accounts and notes receivable	5,274,092
Contingent assets	2,290,256
Total	$87,482,881
Liabilities	
Capital stock	$27,038,100
Funded debt	21,319,000
6 per cent. collateral notes, due August, 1910	6,000,000
5 per cent. collateral notes due October, 1917	2,702,702
Current liabilities	13,061,352
Subscriptions	1,559,514
Reserve for possible shortage in inventories	211,955
Contingent liabilities	2,290,256
Profit and loss, surplus	11,194,002
Total	$87,482,881

Iron and Steel.

The Baltimore & Ohio is said to be in the market for 35,000 tons of rails, and to be negotiating with the United States Steel Corporation and the Pennsylvania Steel Company.

OBITUARY NOTICES.

Luman F. Parker, General Solicitor of the St. Louis & San Francisco, died suddenly on December 16. He was born at Lexington, N. Y., on September 26, 1847, and was educated in common schools in Connecticut and at the New Britain, Conn., High School. When he was 22 years old, he went west, living first at St. Charles, Mo., and the next year moving to Union. There he taught school and studied law, being admitted to the bar in Franklin county in 1874. He moved to Rolla, Phelps county, the same year and practiced law there until 1889. He then went to Washington, where he was for some months on the legal staff of General John W. Noble, Secretary of the Interior. The same year he returned to Missouri as trial attorney for the St. Louis & San Francisco. He was appointed General Attorney in 1892 and in 1896 was promoted to be General Solicitor, which position he held at the time of his death.

L. F. Parker.

MEETINGS AND ANNOUNCEMENTS.

For dates of conventions and regular meetings of railroad conventions and engineering societies, etc., see advertising page 24.)

The Short Line Association.

"The Short Line Association" is the name of an organization which it is said has been formed by certain railroad companies operating each less than 200 miles of line, the primary object of the organization being to work for more satisfactory compensation for carrying the United States mails. The President of the association is S. F. Smith, President of the Pittsburgh, Shawmut & Northern. It is said that 40 railroads have already joined.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Ohio River & Columbus.—E. H. Blair, Vice-President, has been appointed also General Manager, with office at Ripley, Ohio. The office of Superintendent has been abolished.

Wisconsin Central.—The main office having been moved to Chicago, a general office has been established at 100 Wisconsin street, Milwaukee, Wis., to comply with the provisions of the company's charter.

Operating Officers.

Grand Trunk Pacific.—The changes in General Superintendents of the Ontario division and the Lake Superior division announced in these columns on December 13 are denied.

Chicago, Milwaukee & St. Paul.—E. W. Morrison, Trainmaster of the La Crosse division, and E. G. Allen, Trainmaster of the Wisconsin Valley division, have been made temporarily chief train despatchers of their respective divisions.

Lake Shore & Michigan Southern.—Dewitt C. Moon, who has succeeded the late E. A. Handy as General Manager of the Lake Shore, was born on July 24, 1856, in western New York. All his railroad service has been on the New York Central Lines. After a common school education he began in 1872 as agent and operator on the Dunkirk, Allegheny Valley & Pittsburgh, one of the lines leased by the New York Central & Hudson River but operated by the Lake Shore. He was made successively despatcher, Trainmaster and, in 1893, Assistant Superintendent. Three years later he was made Superintendent and in 1899 was transferred from the Dunkirk, Allegheny Valley & Pittsburgh to the Rome, Watertown & Ogdensburg division of the New York Central & Hudson River. He was Superintendent of this division for four years and was then appointed Assistant General Superintendent of the Lake Erie & Western. In the fall of 1903 he was made Assistant General Superintendent of the Lake Shore & Michigan Southern and in 1905 was appointed General Superintendent. The next year he was made Assistant General Manager. He is now General Manager of the Lake Shore & Michigan Southern, the Lake Erie & Western, the Dunkirk, Allegheny Valley & Pittsburgh and the Lake Erie, Alliance & Wheeling.

D. C. Moon.

Southern.—Eugene H. Coapman, who was recently appointed Manager of the Northern and Eastern districts, with office at Washington, D. C., was born on August 11, 1865, in Wisconsin. He began railroad work when he was 15 years old on the Chicago, Milwaukee & St. Paul. He was operator and train despatcher from 1880 to 1883 and then went to the Iowa Central as train despatcher. After serving as chief despatcher and Superintendent of Telegraph, he returned to the Chicago, Milwaukee & St. Paul, in 1887, as train despatcher. In 1890 he went to the Illinois Central in the same capacity, being later made chief train despatcher, Trainmaster and finally Terminal Freight Trainmaster. In 1900 he went to the Atchison, Topeka & Santa Fe as Trainmaster and two years later went to the Southern as Superintendent of the Danville division. In December, 1905, he was appointed Assistant General Superintendent of the Eastern district, and in November, 1906, was made General Superintendent of the Northern district, where he remained until appointed to his present position, succeeding the late J. N. Scale.

E. H. Coapman.

W. M. Deuel, who was recently appointed Superintendent of the Coster division, with office at Knoxville, Tenn., has been with the Southern for the last five years. He was yardmaster at Spencer, N. C., for four months and was then for six months Terminal Trainmaster at Birmingham, Ala. In 1903 he was made Assistant Superintendent of the Washington division,

being later transferred to the Knoxville division. He was Superintendent of the Birmingham division for a year and was then made Superintendent of Terminals at Atlanta, Ga., where he remained until his recent appointment.

Engineering and Rolling Stock Officers.

Buffalo, Rochester & Pittsburgh.—H. C. Woodbridge, heretofore Master Mechanic of the Buffalo and Rochester divisions, has been transferred to Du Bois, Pa., to do special work for the Superintendent of Motive Power.

Wisconsin Central.—Harvey Halverson, foreman of the coach department at Fond du Lac, Wis., has been appointed Master Car Builder, with office at that place, succeeding William Percy, resigned to go into other business.

LOCOMOTIVE BUILDING.

The New York, Chicago & St. Louis is said to be asking bids on 20 locomotives. Up to the time of going to press we have not been able to confirm this item.

CAR BUILDING.

The E. A. Bryan Company, Chicago, is asking prices on specialties for 30 cars.

The Porto Rico Railway, through J. G. White & Co., New York, is in the market for 10 box cars and 10 flat cars, all with steel underframes.

The New York, Chicago & St. Louis is said to have ordered 1,000 box cars from Haskell & Barker. We have not yet been able to confirm this item.

The W. C. Lawson Co., Chicago, is said to be considering the purchase of three freight cars. Up to the time of going to press we have not been able to confirm this item.

The Philippine Railways, through J. G. White & Co., New York, have ordered four combination baggage and passenger cars from the American Car & Foundry Company, for March delivery. These cars will be 3 ft. 6 in. gage and will measure 43 ft. 1½ in. long, over end sills, and 9 ft. 6 in. wide. Bodies will be of wood and underframes of steel.

The Missouri, Kansas & Texas has ordered 900 42-ft. gondola cars of 100,000 lbs. capacity and 100 42-ft. dump cars of 80,000 lbs. capacity from the American Car & Foundry Company. The special equipment includes:

Brake-beams	National Hollow, and Damascus
Brasses	Climax
Couplers	Major

The Barrett Manufacturing Co., Chicago, as reported in the *Railroad Gazette* of December 20, has ordered 40 tank cars of 10,000 gals. capacity from the Cambria Steel Co. The special equipment includes:

Brake-beams	Creco
Brasses	Standard Metal Mfg. Co.
Couplers	Climax
Draft rigging	Cardwell
Journal boxes	Symington

The New York, New Haven & Hartford, as reported in the *Railroad Gazette* of December 20, has ordered from Osgood Bradley & Sons 100 passenger cars, 44 of which are vestibuled passenger coaches. The others include: coaches with smoking compartments, combination baggage and smoking cars, combination baggage and passenger cars, combination baggage and mail cars, postal cars and baggage cars. The vestibuled passenger cars will weigh 81,700 lbs. and will measure 60 ft. 2 in. long, 8 ft. 11½ in. wide and 8 ft. 11 in. high, inside measurements, and 68 ft. 8½ in. long, 10 ft. ¼ in. wide and 14 ft. high, over all. The bodies and underframes will be of wood. The special equipment for the vestibuled cars will be as follows:

Bolsters	Commonwealth Steel
Brake-beams	Diamond Special
Brake-shoes	Diamond S, steel back
Brakes	Westinghouse
Brasses	Magnus metal
Couplers	Buhoup
Curtain fixtures	Forsyth
Curtain material	Pantasote
Draft rigging	Sessions friction
Dust guards	Harrison
Heating system	Gold direct steam
Journal boxes	N. Y., N. H. & Hartford's standard
Light	Commercial Acetylene
Platforms	Standard Coupler Co.
Roofs	Canvas
Trucks	Four wheel
Vestibules	Buhoup
Wheels, make of	Paige plate, steel tires

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

Alberta & Northwestern.—Application will be made to the Dominion Parliament for a charter to build a line from a point on the Calgary & Edmonton between Olds and Red Deer northwest along the North Saskatchewan river to a point on the Kootenay plains in the Rocky mountains; also to build a branch to the Brazeau river. McGivern, Hayden & Greig, 19 Elgin street, Ottawa, Ont., are the attorneys.

Atlantic Coast Line.—An officer writes that this company has given contracts to Wade & Bell, Trinity, Fla.; Wade & Morrison, Washington, N. C., and Phillips & Allport, Richmond, Va., for building an extension from Wilcox, Fla., northwest to Perry, 55 miles, for a change of line at Goldsboro, N. C., four miles, and a change of line at St. Mary's River, Fla., 1.5 miles. Surveys are also being made for a change of line on four miles at Inverness, Fla.

Chesapeake & Ohio.—This company is planning to build a branch from Pemberton, W. Va., up Piney Creek, about two miles long.

Delaware & Hudson.—This company during the past year has laid third and fourth tracks to be used by electric cars between Boston Junction, N. Y., and Saratoga, 5.31 miles.

Gulf, Colorado & Santa Fe.—Contract is reported let to John Scott & Sons, of St. Louis, for work on 21 miles of the extension from Center, Tex., northwest to the Texas & Gulf at Zuber. The work is to be finished by April 1. (Oct. 18, p. 473.)

Illinois Traction (Electric).—Track laying has been finished on the Mackinaw-Lincoln branch, closing the last gap in the line from St. Louis via Bloomington to Peoria. The line has been in operation for some time between Lincoln and St. Louis and between Bloomington and Peoria. The overhead work between Lincoln and Mackinaw is to be finished this month and the line opened for traffic early next year. Regular service will then be inaugurated between Peoria and St. Louis, 165 miles.

Missouri & North Arkansas.—Contracts are reported recently let for bridging and track laying on the extension of this road between Kensett, Ark., and Cotton Plant. The grading contract from Kensett southeast to the White river has not yet been let. The road is being extended north from Seligman, Mo., to Neosho, and this work is expected to be finished this month. (Nov. 8, p. 573.)

New York, Pittsburgh & Chicago (Electric).—At a recent meeting of this company, organized to build a short trunk line through Pennsylvania, it was decided to make new surveys for the proposed line between Pittsburgh and the summit of the Allegheny mountains, preparatory to beginning actual work early next spring. Joseph Ramsey, Jr., is President. (Mar. 15, p. 388.)

Temiskamino & Northern Ontario.—Contract has been given to David Chalmers, of Charlton, Ont., for grading seven miles from Outlake Road to Earlton.

York Railways Company.—This company, which was formed by merging many of the electric lines in York county, Pa., has recently given a mortgage to secure funds to build new lines and to make other improvements.

RAILROAD CORPORATION NEWS.

Baltimore & Ohio.—Gross earnings for November, 1907, were $6,998,553, an increase of $72,598; net earnings $2,004,456, a decrease of $444,548. Gross earnings for the five months ended November 30 were $37,230,491, an increase of $2,179,295; net earnings $11,896,900, a decrease of $723,281.

Kansas City Southern.—Gross earnings for November, 1907, were $812,534, an increase of $59,887; net earnings $235,370, a decrease of $84,764. Gross earnings for the five months ended November 30 were $4,358,464, an increase of $785,661; net earnings $1,541,459, an increase of $174,027.

Northern Pacific.—The estimated gross earnings for November, 1907, were $6,364,000, an increase of $600,000; freight earnings increased 10.9 per cent.; passenger earnings, 15.4 per cent., and mail and express earnings decreased 23.2 per cent. The estimated gross earnings for the five months ended November 30 were $34,114,000, an increase of $3,437,000. Of these earnings, freight increased 9.5 per cent. and passenger 21.8 per cent., while mail and express decreased 20.9 per cent.

Rutland Railroad.—The partly estimated income account for the year ending December 31, 1907, is as follows:

	1907.	Change.	
Earnings	$3,080,200	Inc.	$281,000
Expenses	2,227,200	"	249,100
Net earnings	$853,000	Inc.	$31,900
Other income	47,600	Dec.	2,400
Gross income	$900,600	Inc.	$29,500
Fixed charges and taxes	746,100	"	24,800
Available for dividend	$154,500	Inc.	$4,700
Dividend (4.5 per cent., preferred)	135,900		
Surplus	$18,600	Inc.	$4,700